2017

The Effect of Referral Source on Patient Participation in Diabetes Education Programs

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Walden University
2017

Abstract

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MA, Old Dominion University, 1986

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Dissertation Submitted in Partial Fulfillment
of the Requirements for the Degree of
Doctor of Philosophy
Public Health

Walden University
November 2017

Abstract

The goal of diabetes education programs (DEPs) is to improve pattern-management habits for those with type 2 diabetes (T2D), though participation in DEPs remains low, in part due to low physician referral rates. This retrospective study examined secondary data of 162 T2D patients who had been referred to a DEP in a community center in RI to determine whether the referral source affected patient attendance, participation persistence, and outcomes. Self-referred (*n* = 62) and physician-referred (*n* = 100) groups were analyzed for possible associations among the aforementioned variables. Chi-square (*p* = .04) and logistic regression (*p* = .04) indicated that the referral source does have an effect on DEP participation rates, while logistic regression showed that odds for self-referred patients to participate were 1.97 times higher. Multiple linear regression found no difference between the referral source and the number of sessions patients completed, though covariate analysis showed that age (*p* = .02) contributes to the model. Multiple linear regression showed no difference between the number of sessions attended and changes in hemoglobin A1c (HbA1c) levels. It is important to note that those who completed the program and reported pre- and post-program HbA1c levels (*n* = 7) all reported improved outcomes. This highlights the limitation of the small sample size (*n* = 7), which increased the possibility of a Type II error. This community center DEP model can serve as a blueprint, highlighting the importance of diabetes education and leading to positive social change by improving referral and participation rates and resulting in fewer complications, a decreased disease burden, and an improved quality of life.

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Dedication

To Joyce, for your never-ending support and constant reminder to enjoy the journey as I pursue my dreams and live my life. I am forever grateful.

Acknowledgments

As with anything that is truly meaningful, it takes a significant amount of time and dedication to earn a Ph.D. It is a long, winding journey that can test even those with the most patience and motivation. This would not have been possible without a number of people whose enthusiastic support and gentle encouragement served to strengthen and inspire me and to make this accomplishment possible. I share this with all of them.

To the wonderful group at my study site: This would not have been possible, nor as meaningful, without you. I am looking forward to additional collaboration.

To my colleagues: I am inspired by the enthusiasm and dedication you have for our institution and its mission to prepare students for service and leadership. I love being a part of the APUS team and strive to be a worthy colleague.

To Walden University: My committee chair, members, professors, advisors, and multi-layered support staff have all carefully guided me through this program with their expertise and passion for creating a community of positive social change-makers. I am a better person for this journey, and I thank you.

To my mentors, whom I will reach out to individually: Each of you appeared in my life at the perfect moment to help me along my journey. I am forever grateful.

To my family and friends: It is impossible to thank each of you individually, but please know that I appreciate your patience, understanding, and generous support. I am grateful for your love and am looking forward to more time for play and laughter.

To Joyce: It has been a joyful journey. Let us continue . . .

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Chapter 1: Introduction to the Study

Introduction

Diabetes education programs (DEPs) were developed with the goal of improving the knowledge, understanding, and lifestyle habits that patients with type 2 diabetes (T2D) need to successfully manage their disease, avoid complications, and improve their quality of life (Badariah, Amutha, Quek Kia, & Anuar Zaini Md, 2014; Eborall et al., 2016; Powers et al., 2015). Education is important because T2D symptoms respond well to behavior modifications (American Diabetes Association [ADA], 2016a; Kemppainen, Tossavainen, & Turunen, 2013; Powers et al., 2015). To date, there have been several investigations that look at the rates of referral for T2D patients to DEPs (see Gucciardi et al., 2011; Haas et al., 2014; Li et al., 2014; Manard et al., 2016). However, there is limited information related to the proportion of patients who receive a referral to a DEP versus the number of patients who ultimately enroll in and attend these programs (Cauch-Dudek, Victor, Sigmond, & Shah, 2013; Schäfer et al., 2014). In addition, there is even less information related to identifying the factors that may influence a patient's receptiveness to attending an outpatient educational intervention related to self-care for chronic diseases (Holtz, Annis, Morrish, Davis Burns, & Krein, 2016).

Problem Statement

Globally, obesity and T2D are significant public health issues and many adult Americans have a high risk of developing obesity and T2D (Gill et al., 2012; Laws, St. George, Rychetnik, & Bauman, 2012; North & Palmer, 2015). By the year 2050, approximately 33% of this population will have been diagnosed with T2D (Powers et al., 2015). Additionally, there are roughly 57 million American adults with blood sugar levels that put them in the pre-diabetes category (U.S. Department of Health and Human Services [USDHHS], 2013). About 25% of those who have T2D are undiagnosed (USDHHS, 2013).

Obesity and T2D are chronic diseases that respond well to behavior modifications, which makes addressing lifestyle habits with patients an important aspect of their treatment (ADA, 2016a; Kemppainen et al., 2013; Powers et al., 2015). Improved disease management habits taught by clinicians (physicians, nurses, and diabetes educators) that include topics such as improved dietary intake and physical activity habits, can result in the improved overall health of patients (Kemppainen et al., 2013; Krousel-Wood, et al., 2012; Noordman, van der Weijden, & van Dulmen, 2012; Willard-Grace et al., 2015). Primary care clinicians have an ideal opportunity to provide disease management education for patients with T2D during office visits, though this does not happen all that often (Gucciardi et al., 2011; Haas et al., 2014; Healthy People 2020 (HP2020), 2016; Li et al., 2014; Manard et al., 2016; Noordman et al., 2012; Sallis et al., 2015). In fact, there is current data that suggests that such conversations, especially regarding dietary habits, occur only in approximately 12.2% of patient office visits (McGinnis, Davis, Howk, DeSordi, & Thomas, 2014).

The current healthcare system is focused primarily on the treatment of disease and does not emphasize the prevention of T2D or ongoing disease management regarding sustainable lifestyle changes (ADA, 2016a; McGinnis et al., 2014; Powers et al., 2015). These combined challenges make T2D a massive and complicated public health challenge in the U.S., especially given that T2D often leads to additional and even more devastating chronic diseases such as cardiovascular disease (CVD), renal complications, and amputations, among others (Eborall et al., 2016; USDHHS, 2013). To this end, the National Diabetes Education Program (NDEP), the ADA, the American Association of Diabetes Educators (AADE), and the Academy of Nutrition and Dietetics (AND) were all formed to provide education for the prevention of T2D, the promotion of earlier diagnosis, and better disease self-management skills for those who have been diagnosed with T2D, all strategies which lead to fewer complications and improved patient outcomes (NDEP, n.d.; Powers et al., 2015).

The relationship between the source of patient referral to a DEP, either physician- or self-referred, and whether these patients begin, participate in, and complete the program has not yet been clarified; this was addressed in this investigation. In addition, the correlation between the number of session a patient attends and changes in their hemoglobin A1c (HbA1c) levels was discussed. Ultimately, the goal is to add this information to the knowledge base

Purpose of the Study

The goal of any DEP is to improve patients’ knowledge, understanding, and practice of the multifaceted approach necessary for the successful long-term self-management of T2D (Badariah, et al., 2014; Eborall et al., 2016; Powers, et al., 2015).

There are multiple and complex reasons why patients attend or do not attend DEPs despite the reported benefits of education related to the self-management of chronic conditions (Holtz et al., 2016). However, despite evidence of the benefits to patients who participate in DEPs, the rate of participation in these programs throughout North America remains relatively low (Cauch-Dudek et al., 2013; Gucciardi et al., 2011; Pipe-Thomas, 2012; Powers et al., 2015).

Although there have been several studies that investigate the referral rates to DEPs for patients with T2D, there is limited evidence that relates to the proportion of patients who receive a referral to a DEP versus the number of patients who enroll in and attend these programs (see Cauch-Dudek et al., 2013; Gucciardi et al., 2011; Haas et al., 2014; Li et al., 2014; Manard et al., 2016; Schäfer et al., 2014). In addition, there is even less information related to identifying the factors that may influence a patient’s receptiveness to attending educational interventions related to self-care for chronic diseases (Holtz et al., 2016). Identifying factors that can improve the understanding of why patients choose to attend, or that help to highlight why some are not receptive to attending outpatient education programs may be helpful in improving DEP participation rates.

While the fasting blood glucose (FBG) measurement provides information regarding the T2D patient’s blood sugar levels from the previous 12 hours, the HbA1c measurement gives a better indication of the patient’s longer-term (the previous 2-3 months) diabetes management (ADA, 2014; Jalali, Shahbazian, Afsharmanesh, &

Mousavi Dehmordi, 2016). The health belief model (HBM) is a theoretical framework is useful here because it is linked to the motivational constructs one has in attempting to make a behavior change (Badariah et al., 2014; UT, 2014). The constructs of this framework, several of which include cues to action, perceived benefit, and perceived barriers can be measured directly via survey questions, while other constructs such as self-efficacy can be integrated into the diabetes education modules (Badariah et al., 2014). And, because the foundation of successful long-term diabetes management is education, the use of the HBM as the framework for this intervention improved the possibility that patients' compliance with healthier behaviors would improve due to an improved sense of self-efficacy (Adejoh, 2014; Bayat et al., 2013; Jalilian, Motlagh, Solhi, & Gharibnavaz, 2014; Karimy, Araban, Zareban, Taher, & Abedi, 2016). Taken together, this improvement in self-efficacy and compliance in patients with T2D ultimately improves health outcomes (Bayat et al., 2013; Jalilian et al., 2014; Karimy et al., 2016).

The purpose of this non-experimental quantitative retrospective analysis was to examine, over a 2-year period, the records of patients who were referred to a certified diabetes educator (CDE)-led DEP, Living Well with Diabetes, in a small senior community center in Rhode Island (RI). The referral groups, self-referred or physician-referred, were evaluated to determine whether the referral source had an effect on whether or not a patient ultimately attended and/or completed a DEP. In addition, because the DEP intervention has its theoretical basis rooted in the framework of the

HBM, additional analysis sought to determine if there was an association between the number of educational sessions a patient attended and their 3-to-4-month blood sugar indicator, their HbA1c levels.

Nature of the Study

A retrospective analysis compared patient records of adults with T2D who were referred to a DEP in a small senior community center in RI (*N* = 162). These patients were adults, primarily aged 65 and older and were either self-referred (*n* = 62) or referred by their physician (*n* = 100) to the Living Well with Diabetes program. This retrospective design afforded the investigator the advantage of having access to all of the records for these patients who had been referred to this facility's DEP during the 2-year timeframe covering the years 2015 and 2016, which increased the number of potential subjects immediately available for study, as compared to a prospective analysis (Sedgwick, 2014). Data analysis examined the associations that were present among the variables (Glanz, Rimer, & Viswanath, 2008; University of Twente, 2014).

The Health Belief Model

The Living Well with Diabetes program has based its theoretical framework in the HBM. The HBM, as a theoretical framework, is commonly used in public health research, and was useful here because it is linked to the motivational constructs one has in attempting to make a behavior change (Badariah et al., 2014; University of Twente, 2014). The constructs of the HBM, several of which include cues to action, perceived benefit, and perceived barriers, can be measured directly via survey questions (Badariah et al., 2014). Other constructs such as self-efficacy can be integrated into the diabetes education modules themselves, which is the case for the Living well with Diabetes program (Badariah et al., 2014).

Research Questions

1. *RQ1:* While controlling for age, race/ethnicity, gender, the number of years since their T2D diagnosis, and level of education, what is the relationship between the referral source of a DEP (MD-referral or self-referral) and patient participation in the program?
2. *RQ2:* While controlling for age, race/ethnicity, gender, the number of years since their T2D diagnosis, and level of education, what is the relationship between the referral source of a DEP (MD-referral or self-referral) and the number of sessions a patient completes?
3. *RQ3:* Controlling for age, race/ethnicity, gender, the number of years since their T2D diagnosis, and level of education, how does the number of educational sessions that each patient attends correlate with the change in their HbA1c levels?

Diabetes Education Program Goals and Objectives

One of the goals of Healthy People 2020 (HP2020) is to design educational interventions that are directed toward helping the U.S. population avoid preventable chronic diseases and leading higher quality and longer lives (HP2020, 2016). To this end, this goal also includes teaching those who have already been diagnosed with chronic diseases how to appropriately manage their symptoms through health behavior changes and medication management. To help achieve these goals, DEPs were established to provide education and support for patients who have been diagnosed with T2D, as well as for those with prediabetes with the hope of preventing T2D (ADA, 2016a; Powers et al., 2015).

T2D is a chronic disease that generally develops over time, whose development has been linked to patients' lifestyle habits, and is a chronic disease that responds well to behavior modifications (ADA, 2016a; Kemppainen et al., 2013; Krousel-Wood, et al., 2012; Noordman et al., 2012; Powers et al., 2015; Willard-Grace et al., 2015). Because of these factors, DEPs focus on addressing lifestyle habits, such as healthy nutrition, physical activity, and medication management with patients (Kemppainen et al., 2013; Krousel-Wood, et al., 2012; Noordman et al., 2012; Willard-Grace et al., 2015). The ability to make these lifestyle changes provides the potential to make an almost immediate positive impact on a patient's symptoms (Kemppainen et al., 2013; Krousel-Wood, et al., 2012; Noordman et al., 2012; Willard-Grace et al., 2015). This positive impact also helps to improve long-term compliance.

The fact that health behavior changes can have such positive effects on patients' symptoms and quality of life makes it hard to underestimate the importance of diabetes education. Helping patients who have been diagnosed with T2D to establish a greater level of knowledge about their disease and its causes, as well as best practices for successful daily pattern management, is a primary ongoing goal of DEPs (Powers et al., 2015). Improving one's knowledge and understanding of this information, especially with the help and support of ongoing diabetes educational interventions, has been shown to improve health outcomes, including HbA1c levels, enhanced self-efficacy, a reduction of diabetes complications, and an improvement in quality of life (ADA, 2016a; Adejoh, 2014; Kemppainen et al., 2013; Krousel-Wood, et al., 2012; Noordman et al., 2012; Powers et al., 2015; Willard-Grace et al., 2015).

Definition of Terms

Type 2 Diabetes (T2D): T2D is a disease that occurs when one's blood glucose is too high. With T2D, the body does not make or use insulin well and could account for up to 95% of all cases of diagnosed diabetes (Centers for Disease Control and Prevention (CDC), 2015).

Hemoglobin A1c (HbA1c): Hemoglobin is a protein found in red blood cells and links (glycates) with glucose (ADA, 2014). The more glucose there is in the blood, the more glucose-hemoglobin links there are, and this HbA1c measurement provides an indication of one's average blood glucose control over the past several months and, more importantly, provides an idea of how well one is doing with their diabetes management plan (ADA, 2014). Using HbA1c levels to help monitor and manage a diabetes plan is a good idea because this test, done approximately twice each year, can help to confirm the results of daily blood sugar measurements and trends, which helps to show how healthy lifestyle changes can make a long-term positive difference and help confirm patient-stated behavior changes (ADA, 2014).

Diabetes Self-Management Education (DSME): DSME is the process of facilitating the knowledge, skill, and ability necessary for diabetes self-care (Powers et al., 2015).

Diabetes Education Program (DEP): DSME programs are often referred to as DEPs. This is the case for the Living Well with Diabetes education program in the small Senior Community Center in RI where this retrospective investigation took place.

Health Belief Model (HBM): The HBM as a theoretical framework is commonly used in public health research and is useful here because it is linked to the motivational constructs one has in attempting to make a behavior change (Badariah et al., 2014; University of Twente, 2014). The constructs of the HBM, some of which include cues to action, perceived benefits, perceived barriers, and self-efficacy, can be measured directly via survey questions, and these constructs can also be integrated into the diabetes education intervention modules (Badariah et al., 2014).

Assumptions

The design of this study was based on several assumptions. First, the medical records used for the study were assumed to be sufficiently accurate and up-to-date in order to be able to accomplish the goals of this investigation. Another assumption was that each patient’s willingness to participate in the DEP, whether they were self-referred or referred to the program by their physician, did not bias this investigation. It was also assumed that the differences between these two referral groups were captured by their level of participation in the program and the information contained in these retrospective medical records.

Additionally, it was assumed that the Certified Diabetes Educators (CDEs) had similar educational backgrounds, were trained under the same diabetes management curriculum, and were the only educators to present this Living Well with Diabetes *DSME* curriculum. The diabetes education intervention used the recommended ADA guidelines, with the added support of the HBM constructs. The HBM explains unhealthy behavior choices and the barriers that exist to making effective health behavior changes.

Based on the statements regarding this diabetes education curriculum and stated theoretical framework, it was assumed that equity existed in the content and quality of teaching for each patient who participated in this DEP. Finally, it was assumed that a patients' initial and/or continuing nonadherence to program participation and/or healthier disease pattern self-management was due to the constructs described by the HBM and in deeply-rooted unhealthy behavior patterns that developed over many years.

Limitations

The use of the HBM helps to improve one's self-efficacy by providing the needed education and training through behavior change interventions, especially complex lifestyle changes such as changes in dietary or physical activity habits, which is an added strength of the HBM (Glanz, et al., 2008). Used this way, however, the HBM does not always simultaneously account for risky behaviors such as smoking or the use of seatbelts, and this may ultimately have a negative influence on one's decisions in making health-related changes (Glanz, et al., 2008). In addition, the HBM framework does not account for the impact of one's emotions, such as insecurity or fear, which could be an essential factor when predicting health-related behaviors.

A limitation of this local Living Well with Diabetes intervention was that program enrollment was limited since most participants enrolled only after a formal recommendation (referral and prescription) from their physician. Based on both current and historical participation numbers, it was reasonable to expect this program to enroll 5-10 participants each time it is offered. And, while there are exponentially more adults in this state with T2D than typically participate in this program, not all are referred for outpatient diabetes education. However, given that this program is regularly offered 5-7 times each year, it was not expected that enrolling the necessary number of participants would present any organizational problems.

The classic clinical trial research design allows for random placement of subjects into a control or experimental group, helping to improve the level of internal validity of investigations. A limitation of the retrospective design, which was used for this investigation, is that it limits the ability to generalize the results (Vassar & Holzmann, 2013). However, the information gleaned from the results of this investigation will help to provide information regarding the effectiveness of this ongoing Living Well with Diabetes program, inform future investigations, and offer suggestions toward converting more patient referrals to actual DEP participants (Vassar & Holzmann, 2013).

Significance of the Study

Despite the long lifespan that Americans enjoy, many are at risk of developing T2D (Gill et al., 2012; Laws, St. George, Rychetnik, & Bauman, 2012; North & Palmer, 2015). Nevertheless, there is evidence showing that T2D is preventable in many people (APHA, 2016; Eborall et al., 2016; USDHHS, 2013). However, for those who have already been diagnosed with T2D, their future can still be a healthy one, as lifestyle modification and proper self-care habits can help patients reduce additional risk factors and prevent further complications that often accompany T2D, especially in marginalized populations that are often at greatest risk for T2D (APHA, 2016; Eborall et al., 2016; USDHHS, 2013). Diabetes education interventions are a vital tool in helping patients to understand their disease and how improving their disease management habits can enhance their outcomes and quality of life, while decreasing the potential for subsequent disability and higher healthcare costs.

This investigation is significant because there has been no formal quantitative research that has attempted to measure the actual participation in DEPs for T2D patients compared to those who have been referred by their physician, or who were self-referred, versus the number of referred patients who actually follow through to participate in a DEP. There have been several studied that focused on patient non-attendance and patient-receptiveness, but none that specifically targeted the differing attendance rates for each source of referral. A qualitative investigation that identified several themes for non-attendance for patients with newly diagnosed T2D was conducted by Winkley et al in

2015. And, there was a recent meta-analysis of 12 studies that had previously published in the U.S., Canada, Europe, India, and Pakistan that reviewed why physician-referred patients to a DEP choose not to attend (Horigan, Davies, Findlay-White, Chaney, & Coates, 2016).

An investigation by Holtz et al (2016) stated an intent to identify factors that might influence a patients' receptiveness to a physician's referral to chronic disease support programs such as DSME. This effort added to the knowledge base information about better strategies for identifying and referring patients who might be open to participating in educational interventions focused on providing support for a variety of chronic conditions (Holtz et al., 2016). It did not specifically pertain to T2D patients or DEPs, nor did it track patient self-referrals. Regarding self-referred patients, there is a lack of evidence regarding the conversion of one's self-referral to actual participation in a DEP. Given the importance of education and support in the successful management of T2D, and the challenge of converting those patients who have been referred to DEPs into actual participants, the aim of this investigation was to help address this gap.

This project is unique because, in addition to the group DEP classes, there is an opportunity for individual nutrition counseling from a CDE who is also a registered dietitian (RD), as well as the opportunity for one-on-one discussions with a pharmacist/CDE. These opportunities are generally not provided by one's physician, which makes this program a vital and comprehensive part of the process of learning new life-management skills (HP2020, 2016; Noordman et al., 2012; Powers et al., 2015; Sallis et al., 2015). In addition, because this program is housed within a senior community center, there is the opportunity for daily contact with the program's director, who is also a nurse and the director of the Senior Community Center Health Office. This is another unique selling point to all potential DEP participants who call or visit this community center to participate in a variety of programs and services. So, because of this shared space, the publicity for the program, and the openness of the staff, there are also a fair number of self-referred patients to this program.

Considering that the prevalence of T2D has reached almost epidemic proportions in the U.S., understanding why patients do not often follow through from referral to participation can help medical staff and educators develop strategies that could mitigate the challenges to DEP participation that patients face. Strategies like this could ultimately help reduce the burden of diabetes (both patient and health-care related) in this country, as well as around the world. Because of this, the results of this research will support positive social change by providing a greater understanding of the types of patients that need additional help in pursuing education for healthy behavior change and disease management, leading to decreased health and financial burden of T2D.

Additionally, these results could help to inform the design of interventions, beginning with immediate strategies for when a DEP director receives a patient referral to their program. And, while diabetes education interventions are successful in teaching the necessary knowledge and skills for better long-term diabetes self-management and the avoidance of debilitating complications that can accompany T2D, getting more patients involved in these programs would provide even better results (Eborall et al., 2016; HP2020, 2016; Matte & Velonakis, 2014; Powers et al., 2015).

This approach can help to bolster two of the basic tenets of public health: namely the prevention of disease (in this case, the prevention of additional chronic diseases), and the advancement of a lifestyle that is more focused on wellness through the encouragement of healthy behaviors (APHA, 2016). If participation in these programs can be increased, then the burden of diabetes that includes additional comorbidities such as CVD, hypertension, blindness, and amputations, among others, can begin to be lessened (APHA, 2016). Having patients follow through from referral to actual participation is key. Most important, however, is that the results of this study can provide vital information toward increasing the number of patients who participate in much-needed diabetes education programs, regardless of the referral source.

Chapter 2: Literature Review

Introduction

This literature review provides an overview of T2D, its risk factors and complications, standard care for T2D, an overview of DEPs, qualifications of diabetes educators, and the HBM. In addition, information pertaining to patient referral sources, participation rates, and patient outcomes from the recent literature were reviewed. There are more than 29 million people in the U.S. with diabetes, as well as an additional approximate 86 million adults in the U.S. (about one-third of the total adult population), that could be classified as being pre-diabetic, and approximately 90% of them do not know (CDC, 2016). Indeed, T2D accounts for up to 95% of all diagnosed diabetes in U.S. adults and is the primary cause of blindness, lower-limb amputations, and kidney failure in this population (ADA, 2016a; CDC, 2016). T2D is considered to be on track to be one of the largest epidemics in history and a major threat to the health of the U.S. population in the 21st century (Adejoh, 2014). These facts imply that patient education that is geared toward the goal of improving patient disease pattern management habits is, or can be, a vital component in the care of the diabetic patient.

Lifestyle habits such as poor diet and physical inactivity are significant factors that can contribute to the poor management of T2D, so effective interventions such as education on improving these habits can help to prevent or delay the more serious T2D complications (ADA, 2016a; HP2020, 2016; Powers et al., 2015). Evidence has shown that the successful management of T2D can be enhanced through participation in DEPs, as these programs provide training and support geared toward helping patients make improvements in disease pattern management changes such as lifestyle habits and medication management, both of which have been shown to improve health outcomes (Peterson, Brown, & Warren-Boulton, 2015; Powers et al., 2015).

The relationship between what is known about the referral patterns to DEPs and patient participation and attrition rates has not yet been clarified, was addressed with this investigation. Therefore, the aim of this retrospective analysis was to examine, the records of patients who were referred to a DEP, Living Well with Diabetes, in a small senior community center in RI to compare their referral sources (physician- or self-referred) with program participation. An additional goal was to determine how participation rates might affect their HbA1c levels as an indicator of their self-efficacy.

With the above goals in mind, this literature review provided an overview of T2D, its mitigating risk factors, and the importance of health behavior modifications in achieving the desired positive outcomes while avoiding the occurrence, or worsening, of complications. In addition, the current standard treatment for T2D will be presented, along with the current challenges to education that are present, and result in what has become a complicated U.S. public health crisis (Eborall et al., 2016; HP2020, 2016). The theoretical framework, the HBM, will be reviewed with specific reference to how this theory can help to guide the implementation of DEPs and, specifically, its self-efficacy construct. Finally, an overview of DEPs in their varied formats, along with referral sources and patient outcomes, will be presented.

Literature Review Search Strategy

This systematic literature review focused primarily on gathering information about DEPs, the qualifications of diabetes educators, and patient outcomes. The process for searching the research literature for this project was conducted electronically using the following databases: CINAHL & MEDLINE Simultaneous Search, Medline with full-text, CINAHL Plus with full-text, ProQuest Nursing, Allied Health Source, and Science Direct, Google Scholar, and the Centers for Disease Control and Prevention (CDC). The search was predominantly limited to full-text articles from January 2007 to 2016, though earlier research studies were used when warranted. The key terms or phrases used for the search were *diabetes education programs*, *T2D risk factors and complications*, *diabetes educator qualifications*, *referral rates to DEPs*, *diabetes education outcomes*, *the HBM*, and *self-efficacy*, as well as variations of these terms.

The search of the above-mentioned databases produced approximately 150 articles, of which about 75 fit the criteria that matched the parameters of this investigation. This review focused on the most recent relevant research investigations, the great majority of which were published within the past 5 years. The findings that are gathered and reviewed here are primarily from original quantitative investigations and meta-analyses.

Toward the goal of exploring the topic of the HBM and its self-efficacy construct, as well as referral patterns to DEPs, research articles dating back to 1975 were reviewed. However, the bulk of the research reviewed included investigations from the most recent 5 years. Among other topics, this literature search provided information relating to DEP implementation, the importance of patient education, and the gaps in patient referrals to DEPs, patient participation rates, and DEP patient attrition rates.

Associated Diabetes Risk Factors and Complications

The rise in the prevalence of obesity in the U.S. is almost matched by the concomitant rise in associated chronic diseases such as T2D, hypertension, high cholesterol, CVD, stroke, and kidney disease, all of which may be preventable but also whose long-term effects can be devastating (CDC, 2016; Smith et al., 2011; USDHHS, 2013). Not surprisingly, this rapid increase in T2D prevalence in recent decades has become a major public health concern (Ley et al., 2016). Overweight, physical inactivity, and poor diet are behavioral risk factors related to T2D (Karimy et al., 2016; Ley et al., 2016). One of the stated goals of HP2020 is to foster healthier lifestyles and to reduce the incidence (and severity) of chronic disease risk through educational interventions that promote healthier diets, physical activity, and a move toward a healthier body weight (HP2020, 2016; Ley et al., 2016; Sallis et al., 2015).

Additional possible T2D complications include vascular problems, which impose additional challenges to the patient as well as an additional cost burden to the health care system (Karimy et al., 2016). This additional health resource consumption is an additional valid reason to encourage patient education for those with T2D. Since there is a higher risk of cardiovascular and other chronic diseases for those with T2D, the effective management of blood pressure and cholesterol levels, along with smoking cessation, are vitally important. Through ongoing education, those with diagnosed diabetes, their support network, and their health care providers can work to reduce the occurrence of these and other complications (CDC, 2016). Increased physical activity and healthier nutrition habits, whether they lead to weight loss or not, are associated with a reduced risk of developing CVD, hypertension, vascular issues, other T2D complications, and all-cause mortality (Matte & Velonakis, 2014; Sallis et al., 2015; Swift, Johannsen, Lavie, Earnest, & Church, 2014).

Standard T2D Care

As new technologies are continuing to be developed for the testing of one’s blood glucose levels and administering the appropriate medications, patient education remains a desired key component of the management of their T2D. As such, the successful management of T2D is largely dependent on each patient’s own disease pattern management, including blood glucose monitoring, and lifestyle behaviors that include (but are not limited to) healthy dietary habits, physical activity, and stress management (ADA, 2016a; Powers et al., 2015). However, even as many physicians are recommending these positive lifestyle changes, the development and maintenance of these healthier habits continues to be one of the most challenging aspects of T2D management, mostly because of the difficulty in creating meaningful and lasting behavior change (ADA, 2016a; Adejoh, 2014; Pipe-Thomas, 2012).

Clinical Practice Guidelines

While clinical practice guidelines are crucial to improving the health of the population, as well as individual patients, in order to achieve the optimal desired outcomes for those with T2D, the care plan must be individualized for each patient. The ADA highlights the following topics that clinicians should keep in mind as they advise T2D patients; patient-centeredness, diabetes across the life span, and advocacy for patients with diabetes (ADA, 2016b). Patients with diabetes have an increased risk of chronic diseases. Being patient-centered means that a treatment and education approach will include a wide-ranging plan, which will help to mitigate the risk of these chronic diseases while also addressing the standard T2D concerns such as blood sugar control, nutrition, and physical activity (ADA, 2016b).

Treatment focus. In an article outlining how the current system of treating T2D patients fails patients, Davidson (2009) highlights the absence of suitable clinical decisions as a reason for continued poor patient outcomes. The clinical decisions for T2D patients are technically appropriate, as they do focus on the daily activities and practices such as medication management and basic lifestyle change advice (Davidson, 2009; Reynolds et al., 2016). If followed, these positive healthy lifestyle changes can reduce the onset or severity of typical comorbidities such as hypertension and elevated cholesterol levels that often manifest in patients with T2D (CDC, 2016; Karimy et al., 2016; Ley et al., 2016; Smith, et al., 2011; USDHHS, 2013). However, there is evidence that current treatment efforts that include appointment reminders, reminders of current bloodwork results, using a case manager, and physician education, all in support of T2D management education for patients have been mostly ineffective in improving patient outcomes (Davidson, 2009). Accordingly, because noncompliance is common among this group of patients, it would be appropriate to spend more time with these patients focusing on decreasing barriers to behavior change and improving self-efficacy by utilizing the additional communication and support that DEPs provide (Davidson, 2009; Reynolds et al., 2016).

Treatment across the lifespan. Once diagnosed with T2D, a patient automatically has a disease that needs to be managed across their lifespan (ADA, 2017; Powers et al., 2015). This can be especially concerning for older patients, since there is not a lot of research evidence that would guide treatment decisions for this group that highlight the need for improved coordination between physicians and diabetes education teams regarding the ongoing treatment and support for those with T2D (ADA, 2016b). To this end, the ADA recognizes that a framework for effective T2D care would include a more optimally organized plan of care, coordinated across healthcare disciplines, and that includes support and education for ongoing self-management (ADA, 2016b). These strategies can work well if supported through ongoing advocacy, across all groups, which would help to support life-long patient-centered care (ADA, 2016b).

Physicians as Educators

Primary care clinicians have an opportunity to provide disease management education for patients during office visits; though this does not happen all that often

(HP2020, 2016; Noordman et al., 2012; Sallis et al., 2015). In fact, there is current data that suggests that such conversations, especially regarding dietary habits, only occur in approximately 12.2% of patient office visits (McGinnis et al., 2014). Existing evidence shows that adding regular physical activity should be among the first recommendations given in the clinical setting to patients for the treatment of chronic diseases such as T2D (Sallis et al., 2015). However, physicians continue to identify the lack of time they get to spend with each patient as the primary barrier to being able to add, or implement, T2D education or health behavior coaching practices to their treatment practices (Davidson, 2009; Sallis et al., 2015). This challenge supports the need for more of an emphasis to be placed on outpatient diabetes education.

Barriers to physicians as educators. Quite possibly, one of the reasons that physicians are limited in their ability to add patient education to their treatment practices is that the current healthcare system is focused primarily on the treatment of clinically diagnosed disease (McGinnis et al., 2014). As such, the physicians' focus does not emphasize either the prevention of T2D or the ongoing disease pattern management and positive changes that are needed in health behavior habits (McGinnis et al., 2014). These challenges make T2D a substantial and complicated public health challenge in the U.S., especially given that the ongoing and accumulated complications of T2D often lead to additional, and even more devastating and debilitating, chronic diseases such as CVD, renal complications, vascular issues, and amputations, among others (Eborall et al., 2016; USDHHS, 2013).

Long-term Management

Even with the advances in technology that patients with T2D have access to that help them with the monitoring, management, and treatment of their disease, the long-term management of their T2D continues to be a significant challenge (ADA, 2016a; ADA, 2016b; Adejoh, 2014). It is when patients have the ability of patients to manage their disease over the long-term that leads to positive outcomes and long-term health (ADA, 2016a; ADA, 2016b; Adejoh, 2014). However, the chances of maintaining these practices for the long-term continues to be challenging for most patients due to the lack of the ability to make long-term healthy behavior changes. Ongoing diabetes education and support is poised to successfully address these challenges.

Overview of Diabetes Education Programs

One of the overarching goals of Health People 2020 is to design interventions that are aimed at helping the U.S. population to avoid preventable diseases (HP2020, 2016). Achieving this goal will yield a healthier populace while improving longevity and quality of life (HP2020, 2016). Healthy People 2020 interventions also include the appropriate management of chronic diseases for those who have already been diagnosed. To this end, DEPs were established for both the support of T2D patients as well as for those with prediabetes (ADA, 2016a; Powers et al., 2015).

Genesis of Diabetes Education Programs

There seems to be an association between older patients and better adherence to improved T2D pattern-management recommendations, including medication management and improved lifestyle habits such as nutrition and physical activity (Reynolds et al., 2016). To this end, the National Diabetes Education Program (NDEP), the American Diabetes Association (ADA), the American Association of Diabetes Educators (AADE), and the Academy of Nutrition and Dietetics (AND), were all formed to provide patient education for the prevention of T2D, the promotion of earlier diagnosis for T2D, and better disease management practices for those who have been diagnosed (NDEP, n.d.; Powers et al., 2015). These are all strategies that can help lead to fewer complications and comorbidities, as well as an improvement in patient outcomes (NDEP, n.d.; Powers et al., 2015).

T2D is a chronic disease that responds well to behavior modifications. As such, DEPs focus on addressing lifestyle habits, such as diet and physical activity (Kemppainen et al., 2013; Krousel-Wood, et al., 2012; Noordman et al., 2012; Willard-Grace et al., 2015). Addressing the changing of these habits with patients can make an almost immediate positive impact on a patient’s symptoms (Kemppainen et al., 2013; Krousel-Wood, et al., 2012; Noordman et al., 2012; Willard-Grace et al., 2015).

The Benefits of Education

There is conclusive evidence that a structured educational approach can be an effective tool to aid patients in gaining the necessary knowledge needed to develop healthier lifestyle and disease management habits (Pipe-Thomas, 2012; Powers et al., 2015). The main goal of DEPs is to help patients with T2D to establish a greater level of knowledge about their disease, its causes, and the best practices for successful daily pattern management (Powers et al., 2015). Improving one's knowledge and understanding of this information, especially with the help and support of ongoing diabetes educational interventions, has been shown to improve health outcomes, including HbA1c levels, enhanced self-efficacy, a reduction of diabetes complications, and an improvement in quality of life (ADA, 2016a; Adejoh, 2014; Kemppainen et al., 2013; Krousel-Wood, et al., 2012; Noordman et al., 2012; Powers et al., 2015; Willard-Grace et al., 2015).

DEPs have also been shown to positively affect a patient's knowledge about diabetes and support their improvements in lifestyle behaviors and quality of life, decrease diabetes-related distress and depression, and reduce emergency department visits and hospitalizations (Chomko, Odegard, & Evert, 2016). This improved level of knowledge augments daily T2D pattern-management that is essential for preventing complications that often accompany this disease that result from poor and/or erratic pattern management habits (Jalilian et al., 2014).

The National Diabetes Education Program

The NDEP is a federal program sponsored by the National Institutes of Health (NIH) and the Centers for Disease Control and Prevention (CDC) (Griffey, Piccinino, Gallivan, Lotenberg, & Tuncer, 2015). The goals of the NDEP are to improve diabetes management and patient outcomes through education, the promotion of early diagnoses, and to prevent or delay the onset of T2D in the U.S. and its territories (Griffey et al., 2015).

Due to the multifaceted nature of the NDEP, its theoretical basis is also multifaceted to account for the many modes of communication, types of learning, and varied behaviors of the population. This includes the individual, their families and social groups, along with the larger community. In recent years, the NDEP has focused more on helping people change their behavior patterns with the goal of improving the sustainability of healthier habits (Griffey et al., 2015).

Implementation of Diabetes Education Programs

There are various ways in which DEPs are delivered. They can range from one 2-3-hour class or a series of 1-2-hour classes that can span several weeks (Dorland & Liddy, 2014). DEPs are an important aspect of patient care, and the providers of DSME and support are especially well-suited to help patients develop and maintain the health and lifestyle behaviors that can improve treatment outcomes (ADA, 2016a). Currently, however, there are substantial barriers to providing education and support for patients with T2D as well as those with prediabetes, including reimbursement, institutional/financial support, staffing, and non-cooperative physicians (ADA, 2016a; Butcher et al., 2011). While there is literature that recognizes that the appropriate medical care, DSME, and medication must be available to all T2D patients, access to these programs is an additional challenge that will need to be addressed (Rinker & Wolf, 2012).

Standards of Successful DEPs

As discussed, successful diabetes care that leads to improved patient outcomes requires a systematic approach toward supporting each patient’s behavior change efforts (ADA, 2016b, Powers et al., 2015). Well-planned DSME programs that are run by experienced and qualified diabetes educators have been shown to improve patient self-management, satisfaction, and glucose control (Powers et al., 2015). In addition, individual medical nutrition therapy (MNT) delivered by an RD has been shown to help decrease blood glucose and HbA1c levels in patients (Parker, Byham-Gray, Denmark, & Winkle, 2014).

The ADA Diabetes Education Recognition Program is based on established standards for diabetes education and ensure consistent, high-quality DSME for all patients, regardless of their ability to pay (ADA, 2016a; Rinker & Wolf, 2012). These standards include content areas that include physical activity, nutrition, and pharmacology that help foster a patient’s ability to make informed decisions about their care and self-management activities (ADA, 2016a; Rinker & Wolf, 2012). Programs that achieve the ADA recognition have met the standards for providing educational programs to people with diabetes and, thus, are able to seek insurance reimbursement for DSME services (ADA, 2017; CMS, 2012; Rinker & Wolf, 2012). This is an important distinction and helps clinical practices and community health centers to justify the addition of a DSME program to their available services. And, from a patient perspective, the fact that their physician knows about and recommends this program, and that their insurance will cover the cost, can be important motivators that helps them to attend an outpatient DEP.

Qualifications of the DEP Educators

Since diabetes education and self-care remains the cornerstone of diabetes management ADA-recognized DSME program sites also have the staffing requirement to have both a registered nurse (RN) and a registered dietitian (RD) as the primary educators (Badariah et al., 2014; Rinker & Wolf, 2012). The educational resources that are available to clinicians and community health workers for a DEP curriculum are easily accessed and will be reviewed. Also, the training requirements for DEP educators that each organization provides will be discussed below.

NDEP and ADA Resources

To support these DSME programs, the NDEP and ADA provide freely available web resources aimed at aiding physicians to establish and implement DEPs that focus on self-management education, an array of psychosocial issues and stressors, along with supplementary material for older T2D patients who may suffer from additional challenges such as comorbidities, cognitive impairments, and deficiencies in functional status (ADA, 2015; ADA, 2016b; NDEP, n.d.; Peterson et al., 2015). The scope for treating different populations with T2D is more wide-ranging than ever, and these resources promote individualized, patient-centered, and culturally appropriate strategies that support clinical practice guidelines (ADA, 2015). These organizations also provide training that is focused on addressing the various audiences that these interventions address (Griffey et al., 2015).

Training Diabetes Educators

In the early 2000s, the AADE outlined the role that diabetes educators have in educating those with diabetes. The AADE developed the Certified Diabetes Educator (CDE) program in order to train educators to appropriately address the important job activities that CDEs perform, including assessment, intervention and disease management for those with diabetes and prediabetes (AADE, 2015; Zrebiec, 2014). While there are still barriers with reimbursement and staffing for diabetes education programs, there are thorough guidelines in place for the training of diabetes educator, curriculum development, and program implementation.

ADA. The ADA has extensive recommendations for the management of diabetes. However, a review of the literature pertaining to diabetes education interventions indicates that a standard format for the staffing of DEPs seems to be that the staff/clinicians of the facility (who may not be CDEs) would be the educators that teach the program. For example, a recent investigation by Dorland and Liddy (2014) described study sites whose diabetes education teams consisted of a dietician, nurse, and pharmacist who followed-up with each patient (Dorland & Liddy, 2014). Another investigation reported that nurses led the DEPs while at the same time being responsible to implement a range of other (non-related) health promotion activities (Kemppainen et al., 2012). Additionally, recent studies have revealed that health promotion activities might be unclear to some nurses, as some may lack the necessary understanding and skills to implement DEPs appropriately (Goodman et al., 2011; Kemppainen et al., 2012). Also, there may be organizational barriers that effect the implementation and delivery of DEPs (Goodman et al., 2011; Kemppainen et al., 2012).

In some instances, a physician education program can be designed with the intent being to update physicians about the current standards of care for T2D patients, including educational interventions (Koffarnus, Mican, Lopez, & Barner, 2016).

Diabetes prevention program. The landmark diabetes prevention program (DPP) offers instruction for their DSME curriculum, so if it is financially feasible for an organization that wishes to implement such a program, they can send their staff for this training (Srebnik, Chwastiak, Russo, & Sylla, 2015). This training program is staffed by master trainers from the CDC's National Diabetes Training and Technical Assistance Center (Srebnik et al., 2015). In addition, upon DEP implementation, it is not uncommon for some diabetes educators to adjustments to the program in order to enhance its effectiveness for the specific local population they will be addressing (Srebnik et al., 2015; Willard-Grace et al., 2015).

National standards for DSME programs. The National Standards for Diabetes Self-Management Education and Support recognizes that, in addition to medical/clinical professionals (MDs, RNs, RDs), health educators, case managers, and community health workers (CHWs), have been shown to contribute effectively as a part of the diabetes education and support team (AADE, 2015; Butcher et al., 2011). These DSME standards also recommend that CHWs and lifestyle coaches receive training in diabetes management, and the teaching of self-management skills prior to working with T2D patients (AADE, 2015). As well, the CHW should only work in this capacity under the supervision of a diabetes educator using evidence-based guidelines, and who is able to support the CHW and lifestyle coach and to address any clinical issues or questions that may arise (AADE, 2015). Lifestyle coaches may also have other credentials (e.g., RD, RN), but these credentials are not required (CDC, 2015). And, after DSME training, the CHW will then be recognized as a Level 1 Diabetes Educators Associate (DEA) by the AADE (AADE, 2015; CDC, 2015). The CHW is an important asset to public health because in many communities, especially minority communities, diabetes education -or any health education services would be completely inaccessible without CHWs (AADE, 2015; CDC, 2015).

There are abundant guidelines that help with the organization and implementation of DEPs, and these programs are offered across a wide array of settings by a variety of healthcare professionals and CHWs (AADE, 2015; Srebnik et al., 2015). However, primary care clinics are increasingly struggling to provide education to their patients due to the challenges discussed previously. The increasingly short supply of primary care clinicians coupled with the growing number of patients with multiple chronic diseases and comorbidities, having a variety of individuals with the ability to provide DEP in any number of settings is invaluable (Willard-Grace et al., 2015).

The Health Belief Model

If it is expected that T2D patients will adhere to their physicians' or diabetes educators' self-management recommendations, then it is important for these professionals to understand their patients' current knowledge of diabetes along with their beliefs regarding their ability to change behaviors and follow the guidelines (Adejoh, 2014; Noordman et al., 2012).

Patient Knowledge

There is evidence that the understanding of a patient's knowledge about T2D, along with their beliefs about their intention or ability to make lifestyle changes is helpful in the development of an effective educational intervention program for those living with diabetes (Adejoh, 2014; Noordman et al., 2012). It is incumbent on patients with T2D to learn as much as possible about T2D and its management, which generally requires external support such as education, and helps to improve one's willingness to make healthy behavior changes and self-efficacy (Gucciardi et al., 2011).

Theory Foundation

Health behavior theories are based on the understanding that obtaining the basic knowledge of a disease or issue is a necessary element toward actual health behavior changes, healthier outcomes, and long-term improvements in quality of life (Badariah et al., 2014). The HBM, developed by Becker and Maiman (1975), is a useful framework whose foundation is based on the understanding that individuals will act to prevent, control, or treat a health problem if they if they perceive that they are at risk, if the disease is severe, and that health action is beneficial (Adejoh, 2014; Karimy et al., 2016). The HBM helps to clarify self-care activities for patients such as diabetes pattern-management recommendations (Adejoh, 2014; Jalilian et al., 2014; Karimy et al., 2016). Also, the HBM is focused on behaviors that are related to their long-term self-management and can be used as a framework for understanding and enhancing patient adherence to the diabetes treatment regimen (Adejoh, 2014; Jalilian et al., 2014; Karimy et al., 2016).

Use of HBM

The HBM has been used to address a variety of health behaviors. Health-risk behaviors such as seat belt use, smoking, immunizations, and the use of contraceptives as well as preventive health behaviors such as nutrition habits and physical activity (Glanz, Lewis, & Rimer, 1990). The HBM is grounded on the understanding that people will take health-related actions if they believe that these actions would enhance their health and if they perceive that they can be successful with that action (Glanz, et al., 2008; University of Twente, 2014). The HBM posits that one’s behavior is generally based on factors such as their individual perception of their perceived susceptibility to a disease, their perceived severity of the condition, the perceived benefits of changing a behavior, and any challenges that they perceive as barriers to making healthy behavior changes (Adejoh, 2014; Glanz, et al., 2008). Taken together, these factors can help to determine an individual’s readiness to act (Adejoh, 2014; Glanz et al., 2008). From a public health perspective, the HBM has been broadly used to design and implement programs and services, especially when an organization is undertaking a wellness or health-promotion intervention (Adejoh, 2014; Glanz et al., 2008; University of Twente, 2014).

Attitudes and Beliefs

By focusing on the individual's attitudes and beliefs toward the behaviors that are being addressed, public health professional can facilitate a change toward more positive health behaviors (Glanz, et al., 2008; University of Twente, 2014). With this type of focus, the HBM can be widely used in practice settings, for community health interventions, and as a conceptual framework for health behavior investigations (Glanz, et al., 2008). This helps to describe any changes in, as well as the continuance of, health-related behaviors that, as discussed, often will ensue as a response to an apparent health threat (Glanz, et al., 2008). To illustrate, if an individual wants to lose weight, they may have to make the choice between improving their nutritional habits or beginning a physical activity program; their level of confidence in their ability to make better food choices or to begin an exercise program will often determine their level of motivation, which will ultimately dictate their success (Daddario, 2007).

DEPs have been designed using the framework of the HBM to guide the education modules, what is needed to convey the perceived severity of T2D, and the perceived benefits of healthy behavior changes to affect a cue to action (Badariah et al., 2014). The additional constructs of the HBM include perceived susceptibility -or one's opinion about the seriousness and consequences of their condition, perceived barriers to changing a behavior, and self-efficacy -or ability to successful make a change and are also generally included in the approach to DEP delivery (Badariah et al., 2014; Bayat et al., 2013).

Using the HBM as a framework by which to design and deliver DEPs may help patient compliance, especially if they are worried about their T2D diagnosis and believe that they may be susceptible to serious complications (Badariah et al., 2014). Since education is the cornerstone of diabetes management, using the framework of the HBM improves the likelihood of improving patient compliance and long-term adherence to the suggested healthier behaviors and medication management (Adejoh, 2014). Of key importance to the effectiveness of DEPs, the HBM has been shown to help increase self-efficacy in patients with T2D, thus helping to improve health outcomes (Bayat et al., 2013; Jalilian et al., 2014; Karimy et al., 2016).

Strengths and Limitations of the HBM

The directness of the HBM framework helps researchers in identifying important relevant constructs (perceived severity, benefits, or barriers, cues to action, and self-efficacy), which improves the chance that these constructs can used successfully to guide research interventions whose focus is geared toward making positive changes in one’s health-related behaviors (Daddario, 2007; Glanz, et al., 2008). The use of the HBM also helps to improve one’s self-efficacy by providing the needed education and training through behavior change interventions (Glanz, et al., 2008). This pertains especially to complex lifestyle changes such as changes in dietary or physical activity habits, which is an added strength of the HBM (Glanz, et al., 2008). Used this way, the HBM does not always simultaneously account for risky behaviors such as smoking or the use of seatbelts, and this may ultimately have a negative influence on one’s decision in making health-related changes (Glanz, et al., 2008). In addition, the HBM framework does not consider the impact of one’s emotions such as insecurity or fear, which could be an essential factor when predicting changes in health-related behaviors.

Patient Outcomes

Despite the belief in, and popularity of DEPs, the current understanding is inconclusive regarding the comprehensive effectiveness for T2D patients (Liu, Min Jie, & Brateanu, 2014). However, there are results providing evidence that a well-structured patient-centered approach to diabetes education provides potential benefits to patients with T2D, specifically regarding the reduction in risks of complications (Liu et al., 2014). There are investigations that show promising outcomes for T2D patients who have completed as few as one to several DEP sessions (ADA, 2016b). Also, outcome measures show improvements in blood pressures, lipid profiles, body weight, along with a decrease in the concomitant dosages of and/or numbers of medications patients take (Dorland & Liddy, 2014; Liu et al., 2014; North & Palmer, 2014).

Even with the limited evidence showing the long-term effects of CHW-let DEPs, current results are positive and suggest that DEPs are a great method for improving both patient outcomes as well as for decreasing healthcare costs across a range of populations (Prezio, Pagán, Shuval, & Culica, 2014). Perhaps not-surprising, is the fact that even with the common problems of noncompliance or only short-term adherence to healthier behaviors, one-on-one sessions between the educator and the T2D patient helps to improve the accountability for both the patient and the educator (Prezio et al., 2014). When the HBM is used as a framework to design DEPs, results show that focusing on the on the self-efficacy component may increase the likelihood of adherence to the new healthier behavior (Karimy et al., 2016). Results also suggest that it is wise to focus on this component because self-efficacy, along with perception of susceptibility, might play a more crucial role in the development of self-care behaviors such (such as disease pattern management) than other HBM components (Sansbury, Dasgupta, Guthrie, & Ward, 2014).

Patient Referral Sources

Thus far, this discussion has been about the health effects of T2D, the positive benefits that DEPs can provide, the importance of trained educators in this process, and the significance of improving one’s self-efficacy to enhance their disease management habits. However, none of this is of any true consequence if there are not patients to teach. And, despite the evidence of the benefits of DEPs toward a healthier patient and an improved quality of life, participation rates in these programs remain far too low to truly ease the overall burden of T2D (Gucciardi et al., 2011). Based on standard practice recommendations and national guidelines for the management of T2D, healthcare providers should refer all patients with diagnosed T2D to DEPs, both for education-related information to self-care pattern management and for ongoing support (ADA, 2016c; Hooks-Anderson, Crannage, Salas, & Scherrer, 2015; Powers et al., 2015).

T2D is a chronic disease that is almost wholly self-managed, so an effective tool such as DSME can help patients to gain the knowledge and skills needed to be successful (Chomko et al., 2016). Diabetes education is a collaborative process supported by the entire healthcare team, however, despite the benefits of DEPs, only approximately 33% of individuals with T2D in throughout the U.S. and Canada attend these programs (Chomko et al., 2016; Gucciardi et al., 2011).

Centers for Medicare and Medicaid Services and Reimbursement

Both the ADA and AADA diabetes education curricula are Centers for Medicare and Medicaid Services (CMS) designated nationally accredited organizations, and therefore, are eligible for third-party billing, which should encourage physician referrals (ADA, 2016c; ADA, 2017; CMS, 2012). If, as mentioned above, only about 33% of patients with T2D are attending DEPs, and with the knowledge that patients can attend with no out-of-pocket costs, one should wonder whether physicians are not referring all T2D patients to educational programs, or if patients are not following through on their referrals.

For DEPs to file for reimbursement, referrals must be generated by the physician or the qualified non-physician practitioner managing the individual’s diabetes condition (CMS, 2012). Patients are typically referred to DEPs for the standard issues related to the management of T2D, but doctors often stress the weight loss aspect, as opposed to long-term, overall T2D disease pattern-management (Bozack et al., 2014; CMS, 2012). This may be a strategy by physicians to get patients to follow-through because it often seems that patients are more interested in weight loss especially because, if successful in losing some weight, the severity of many factors related to T2D can be reduced (Bozack et al., 2014; CMS, 2012).

Physician Referrals

Despite the growing evidence of the need for patient education, limited data exist regarding the frequency of referral to DEPs (Hooks-Anderson, et al., 2015). With regard to the prevalence of T2D, physician referrals to DSME programs in parts of the U.S. and Canada are reportedly relatively low, ranging from 14% to 45% (Gucciardi et al., 2011).

There are four critical time points that have been defined to help the physician decide when a patient should be referred for DSME. These include when a patient is newly diagnosed with T2D, as part of an annual maintenance plan toward the prevention of complications, when there is a new complication that can affect one's self-management, and when a significant life transition such as a hospitalization happens (ADA, 2017; Manard et al., 2016; Powers et al., 2015). However, even though DSME is a covered Medicare benefit, only four percent of Medicare beneficiaries participated in DEPs in the years 2011 and 2012 combined (Chomko et al., 2016).

For private insurances, data from the Centers for Disease Control and Prevention show that just under seven percent of newly diagnosed T2D patients received DSME referrals, while 14.2% of diabetes patients who were taking insulin participated in DEP classes during that same period (ADA, 2016b; Chomko et al., 2016; Li, Shrestha, Lipman, Burrows, Kolb, & Rutledge, 2014).

These and other findings demonstrate that DSME is a considerably underused modality, especially with newly diagnosed T2D patients (Li et al., 2014). This is troubling especially because this low rate of participation in DEPs for those T2D patients who are insured highlights the need to identify and address barriers to access and participation, as well as strategies that could help to overcome these barriers (Li et al., 2014). Additionally, it must also be acknowledged that compared patients who were Caucasian, there is a significantly higher predominance of African American patients that were referred to DEPs (Hooks-Anderson, et al., 2015; Winkley et al., 2015). Further research that investigates the referring physician's beliefs and attitudes about race and diabetes education is needed to clarify this association.

Word of Mouth

DSME programs within community centers and clinics can be a way to promote diabetes prevention and education (Chomko et al., 2016). The presence of these programs in community facilities has the potential to engage more of the staff, patients, potential patients, and interested family members, which can assist in the marketing of the program, helping to increase participation (Chomko et al., 2016).

Barriers to Diabetes Education

Despite knowledge of and referrals to DSME, both the referral and attendance rates are poor (Chomko et al., 2016; Li et al., 2014). There are many reasons for low referral and attendance rates, most of which can be addressed and improved.

Barriers for Physicians

Physicians understand that it is important to provide patient education and support to help manage chronic diseases; however, they face several barriers that add to the low rates of referral to and participation in DEPs (Gucciardi et al., 2011). Some of the barriers that physicians face includes increased patient loads, time demands, feeling that they lack the necessary knowledge to adequately support, educate, and manage patients, or even that they may feel additional education beyond what they provide for patients is not necessary (Gucciardi et al., 2011).

Physicians often feel patient reluctance, which can also influence these lower rates of referrals (Gucciardi et al., 2011). Some of these barriers can be mitigated with a referral to a DSME program, a proven modality that helps to support and educate patients with T2D toward the effective management of their symptoms (Davidson, 2009; Eborall et al., 2016; Gucciardi et al., 2011; McGinnis et al., 2014; USDHHS, 2013).

Manard et al (2016) reported that, because of a physician-perceived the lack of patient enthusiasm or stated inconvenience about DSME, less than 50% percent of physicians made referrals to these programs. And, while DEPs are underutilized, there is evidence that these programs have had little impact on the incidence of diabetes or its complications (Cisarik & Smalley, 2016; Horigan et al., 2016). This may be because of either low DEP retention rates, lack of long-term patient compliance or both, but may say more about perceived barriers to self-care and low self-efficacy. Possibly, more frequent patient monitoring and support could help improve long-term compliance (Cisarik & Smalley, 2016).

Barriers for Patients

Despite the significant benefits that a DEP can provide, there is still a significant lack of participation by patients even following a referral by their physician (Horigan et al., 2016; Winkley et al., 2015). Some of the barriers to attending DEPs cited by patients include not understanding the benefits of diabetes education, being unaware of a local DEP, having concerns regarding insurance coverage or reimbursement for DSME services, scheduling or transportation issues, or just that they are not interested in this type of service (ADA, 2016b; Chomko et al., 2016; Horigan et al., 2016).

There is often a misunderstanding on the part of the patients who may feel that the suggestion of attending a DEP is just that, a suggestion (Horigan et al., 2016). Therefore, it is incumbent upon the physician to impress upon the patient the importance of DSME in their long-term disease management. It is also vital that the physician knows the local DSME providers so they can recommend the best program for each patient (Chomko et al., 2016; Horigan et al., 2016). Interestingly, patients also cite their lack of knowledge about diabetes and not understanding the benefits of DSME, as reasons for not attending a DEP (Horigan et al., 2016; Manard et al., 2016; Winkley et al., 2015). There may also be cultural barriers, such as the belief that there is a stigma surrounding one’s participation in a public program or that education regarding a disease such as T2D is something that the physician should provide (Manard et al., 2016; Winkley et al., 2015).

It is important to note that the physician plays a primary role in the referral of patients with T2D to DSME programs, and that the barriers to referral need further investigation (Gucciardi et al., 2011). The barriers that patients face also warrant additional research to identify strategies that would serve to improve the rate of referrals to these educational programs, along with improving the rates of transition of patient referrals to DEPs into active DEP participants (Gucciardi et al., 2011; Horigan et al., 2016).

Summary

Limited evidence exists regarding the long-term effects of CHW-led diabetes management programs on health outcomes and cost-effectiveness, particularly in low-income, ethnic minority populations (Prezio et al., 2014). As well, the adult learner provides a complex range of challenges that need to be addressed to effectively achieve health behavior changes. Guiding the T2D adult toward positive behavior change through ongoing diabetes education is possible, however, especially when the educator possesses the knowledge and skill to effectively deliver the program components using a comprehensive and interdisciplinary approach (North & Palmer, 2014). With this information in mind, the next chapter will review the research setting, design, and overall methodology of this investigation.

Chapter 3: Research Method

Introduction

This chapter will begin by focusing on reviewing the purpose, research design, setting and description of this investigation. Sample characteristics, measures that were taken to protect participants' rights, instruments, data collection, statistical analysis, and summary of the expected social change will also be reviewed. More detailed descriptions of these items will be provided within the appropriate headings of this chapter.

Purpose

The purpose of this retrospective cohort study is twofold; first, to evaluate the effect of two referral sources, self-referred or physician-referred, on the participation in and completion of a DEP, and second, to elucidate the changes in the HbA1c levels of participants with respect to the number of educational sessions they attended in a small senior community center in RI. To date, there has been little research into whether referral sources affect participation in DEPs. This type of research could provide further support for boosting physician referrals or may indicate that a more community-based approach to boosting self-referrals is needed. Furthermore, adding an increased level of understanding to the knowledge base regarding why patients do not often follow through from referral to participation can help the medical staff and diabetes educators develop more effective strategies that could help mitigate patient challenges to participation. From a social change perspective, approaches such as this could help reduce the burden of diabetes. Because of this, the results of this research could support positive social change by providing a greater understanding of the types of patients that need additional help in pursuing education for disease management, and thus leading to the decreased health and financial burden of T2D.

Program Overview

This senior center offers a series of four 2-hour outpatient diabetes education classes, Living Well with Diabetes, for T2D patients on an ongoing basis 5-7 times each year. Many patients are referred to this program by their physician and, as a result, the cost of these sessions is covered by their insurance carriers without any additional copay. Also, because it is a senior community center, the population is predominantly senior adults (>55 years old). In addition to physician referrals, patients with T2D also enter this program by self-referral for participation in this DEP due to their proximity and exposure to participants, educators, and information about this program.

All classes are taught by CDEs that include nurses, dieticians, and pharmacists. Health insurance covers one complete set of four educational sessions. This amounts to eight hours of education, provided in four 2-hour sessions. The goal of this program is to teach patients the skills to successfully self-manage their T2D. This senior community center and its in-house health clinic also offers monthly diabetes support group meetings for patients and their families.

Living Well with Diabetes Program Goals

The Living Well with Diabetes education program has as its main goal for patients with T2D to learn the necessary skills to successfully manage their diabetes, improving their health behaviors and their adherence to the recommended self-management strategies that are presented throughout the program. The curriculum follows the guidelines of the ADA, AADE, and AND. As well, its delivery is rooted in the HBM's self-efficacy construct.

The four categories of topics taught during the Living Well with Diabetes program include: Describing the diabetes disease process and treatment options, incorporating nutrition management and physical activity into lifestyle, pharmacology/medication management, and T2D self-management. A visual depiction of these categories and how they fit into each week's program can be seen in Appendix A. These topics are regularly part of the recommended curriculum taught in comprehensive DEPs, and have demonstrated positive patient outcomes (Haas et al., 2014). These content areas provide a comprehensive approach to a diabetes education and support program. However, the CDEs are continuously adjusting the curriculum to meet the specific needs of the patients who are in the room. This allows for a more individualized approach and ensures that the content covers the needs of those in attendance, specifically regarding health literacy, cultural factors, comorbidities, and daily self-management.

Description of the Living Well with Diabetes Intervention

Assessment. The assessment for each patient is a one-on-one interview with the Living Well with Diabetes program director. The patient is introduced to the program via a program overview by the director. Then they are asked a series of questions regarding their demographics, T2D diagnosis, length of time living with this disease, comorbidities, medications, nutrition, and physical activity. After the completion of this assessment, the patient is then informed of the dates for the four subsequent 2-hour sessions of the DEP.

Week 1: Introductions. During this session, taught by an RN/CDE, patients are introduced to the differences between type 1 and type 2 diabetes, their symptoms, and how they are diagnosed. Causes and treatments of hyperglycemia and hypoglycemia are discussed. There is a presentation on the common T2D complications and comorbidities and their daily management. Patients are also encouraged to consider the outcome goals they anticipate from participation in this program and the long-term goals they have for the management of their disease.

Week 2: Nutrition. This session is taught by a CDE/RD. Patients are introduced to the basics of healthy eating, including meal planning. The timing and spacing of meals and snacks are discussed. In addition, carbohydrates and their effect on blood sugar is reviewed, along with food label-reading, shopping recommendations, and dining in restaurants.

Week 3: Exercise, foot care, sick-day management, and medication management. During this week, the first hour's discussion is led by an RN/CDE who discusses how to incorporate physical activity into daily life, foot care, managing diabetes while sick and during travel, how stress can affect disease symptoms, and stress management. The second hour of this session is taught by a Registered Pharmacist/CDE and is dedicated to reviewing diabetes medications and their applications. Drug interactions, contraindications, sharps management, and safe over-the-counter medications are discussed. In addition, there is time available for each participant to be able to discuss their personal medication protocol and management with this pharmacist.

Week 4: Review and goal-setting. This session is taught by all instructors. All previous topics and standards of care are reviewed. There is a discussion and demonstration of different types (and brands) of blood glucose meters and a review of blood glucose testing. Patients are encouraged to review and revise their goals for T2D disease pattern and lifestyle management. To conclude the program, there is an open panel discussion and time for additional questions that the patients may have.

Research Design

This study used a retrospective cohort design focusing on the sources of program referral and participant outcomes among a cohort of adults with diagnosed T2D in the Living Well with Diabetes program at a community senior center in RI. The use of this retrospective chart review affords the advantage of access to health records within a specific timeframe, thus increasing the number of potential subjects available for study, while also reducing the cost and time burden associated with collecting prospective data (Sedgwick, 2014; Vassar & Holzmann, 2013). This retrospective design is also a favorable quantitative approach because it provides the opportunity to identify factors that may have influenced outcomes and evaluate whether there is a relationship that exists between the variables (Creswell, 2009).

Retrospective designs are a widely-used methodology in multiple healthcare disciplines that provide valuable information that can help assess the effectiveness of ongoing health programs (Vassar & Holzmann, 2013). Understanding the strengths and weaknesses of current programs can help to inform future iterations of the intervention. One advantage of this type of study design is that exposure to risk factors is recorded before the occurrence of the outcome (Sedgwick, 2014). For example, the referral source for each patient was recorded prior to the beginning of the DEP and, therefore, not subject to recall bias.

With this in mind, the combination of an innovative research design, appropriate research questions, and strong methodological decisions will strengthen validity and reliability of these results and thereby increase their impact on public health. Figure 1 depicts the conceptual framework for the *Living Well with Diabetes Program*.

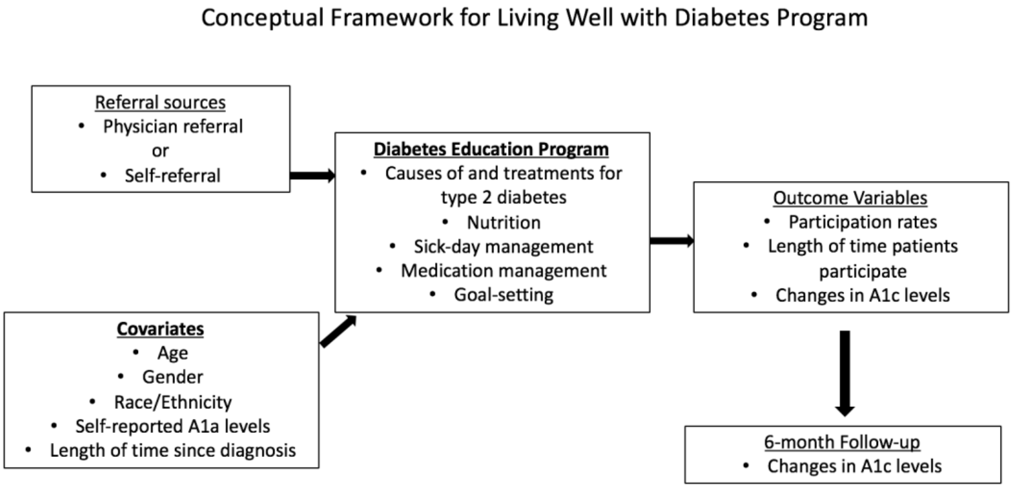

Figure 1. Living Well with Diabetes Conceptual Framework

Research Questions and Hypotheses

The following research questions and hypotheses originate from the literature review regarding referral sources to diabetes education programs and patient participation. The independent variable (IV) was used to predict the dependent variable (DV).

Research Questions

RQ1: While controlling for age, race/ethnicity, gender, the number of years since their type 2 diabetes diagnosis, and their level of education, what is the relationship between the referral source of a Diabetes Education Program (MD-referral or self-referral) and patient participation in the program?

RQ2: While controlling for age, race/ethnicity, gender, the number of years since their type 2 diabetes diagnosis, and their level of education, what is the relationship between the referral source of a Diabetes Education Program (MD-referral or self-referral) and the number of sessions a patient completes?

RQ3: Controlling for age, race/ethnicity, gender, the number of years since their type 2 diabetes diagnosis, and their level of education, how does the number of educational sessions that each patient attends correlate with the change in their Hemoglobin A1c levels?

Study Variables

The variables in any investigation represent the constructs that will be measured (Frankfort-Nachmias & Nachmias, 2008; Glanz et al., 2008). These constructs are grouped, labeled, and measured, and will then help to explain the phenomenon they are investigating (Frankfort-Nachmias & Nachmias, 2008; Glanz et al., 2008). The variable or variables that helps to explain a change that might occur is called the independent, or explanatory variable, while the variable that the researcher is attempting to explain is the dependent variable (Frankfort-Nachmias & Nachmias, 2008). A covariate is a variable that would likely influence the dependent variable and that would need to be accounted for in the statistical analysis; this is done by with additional regression calculations that are used to identify the ways in which the covariates contribute to the variance (Green & Salkind, 2014; Iversen, 2004). Covariates may have potential confounding effects on the independent and dependent variables, so simply omitting the covariates from the study may result in misleading information.

Independent Variables

The independent variables for this investigation are the referral source (MD or self-referred) and the number of educational sessions a patient attended. These are used to help explain, or predict the dependent variable.

Referral source. The program director for the Living Well with Diabetes program is responsible for patient intake. Patients are referred to this outpatient diabetes education program by one of two methods. As part of regular treatment for patients with

T2D, physicians are encouraged to recommend education programs to help the patient learn about this chronic disease and how to best manage their symptoms, treatment, and lifestyle. As a result, patients are referred to the DEP at this senior community center. And, because this program is housed in a senior community center, there are a significant group of patients to hear of this program simply from interacting with friends and acquaintances in this facility. Accordingly, there is a group of patients to this DEP that are then self-referred. Referral source is a nominal (or categorical) variable with two categories, physician-referred and self-referred.

Number of educational sessions. The educational record that is kept for each participant in this DEP details how many sessions each patient attended. This record also details the actual week that they attended, providing information about the topics that were covered during their attendance. Data regarding the number of sessions that each patient attended were recorded from the information on this record in each patient's chart. The number of educational sessions is an ordinal (scale) variable with each level representing the number of sessions each patient attended.

Dependent Variables

The dependent variables for this investigation are; diabetes education program participation, the number of educational sessions a patient attended, and self-reported HbA1c levels.

Diabetes education program participation. Program participation was measured by reviewing weekly attendance sheets for each session of the Living Well with Diabetes program and recording whether or not a patient who was referred to this program attended. This is a categorical variable with two categories, patient did participate or patient did not participate.

Number of educational sessions. The educational record that is kept for each participant in this DEP details how many sessions each patient attended. This record also details the actual week that they attended, providing information about the topics that were covered during their attendance. Data regarding the number of sessions that each patient attended were recorded from the information on this record in each patient's chart. The number of educational sessions is an ordinal (scale) variable with each level representing the number of sessions each patient attended.

Self-reported HbA1c levels. HbA1c measurement provides an indication of one's average blood glucose control over the past several months and is an indication of how well a patient is doing with their overall management of diabetes (ADA, 2014). This is a self-reported number because it a test that is performed two to three times each year by one's physician, with this number being reported back to the patient. During the initial assessment and interview, the patient is asked if they know what their HbA1c number is, and their response is recorded. By the same token during a follow-up interview that takes place approximately six months following the completion of the Living Well with Diabetes program, the patient is asked the same question; again, their answer is recorded. This is an ordinal variable representing the changes in reported HbA1c levels.

Covariates

In this investigation, the covariates are age (ordinal), race/ethnicity (categorical), gender (categorical), length of time since diagnosis, and level of education –both of which are ordinal variables. These variables could possibly be predictive of the outcomes being investigated. Therefore, it is important to take these covariates into consideration because the ability to generalize the results of this research is dependent on several factors that include, sample size, patient knowledge of T2D and self-efficacy regarding disease pattern management, the covariates mentioned, and potential variations in measurements and self-reported data (i.e., error).

Hypotheses

The null hypothesis (H_0) is the hypothesis of no difference (H_0: $\mu_1 = \mu_2$), while the alternate hypothesis (H_A) states that there is a difference between the independent and dependent variables (H_A: $\mu_1 \neq \mu_2$).

RQ1: While controlling for age, race/ethnicity, gender, the number of years since their type 2 diabetes diagnosis, and their level of education, what is the relationship between the referral source of a DEP (MD-referral or self-referral) and patient participation in the program?

> *$H_0$1:* There is no statistically significant difference between the referral source (MD-referral or self-referral) to a DEP and whether or not a patient participates in the program.
>
> *H_A1:* There is a statistically significant difference between the referral source

(MD-referral or self-referral) to a DEP and whether or not a patient participates in the program.

RQ2: While controlling for age, race/ethnicity, gender, the number of years since their type 2 diabetes diagnosis, and their level of education, what is the relationship between the referral source of a DEP (MD-referral or self-referral) and the number of sessions a patient completes?

$H_0$2: There is no statistically significant difference between a patient's source of referral to a DEP and the number of sessions a patient completes.

H_A2: There is a statistically significant difference between a patient's source of referral to a DEP and the number of sessions a patient completes.

RQ3: Controlling for age, race/ethnicity, gender, the number of years since their type 2 diabetes diagnosis, and their level of education, how does the number of educational sessions that each patient attends correlate with the change in their Hemoglobin A1c levels?

$H_0$3: There is no statistically significant association between the number of educational sessions that each patient attends and their self-reported Hemoglobin A1c levels.

H_A3: There is a statistically significant association between the number of educational sessions that each patient attends and their self-reported

Hemoglobin A1c levels.

Study Sample

Sampling and Sampling Procedures

This retrospective analysis examined the association between referral sources and patient participation, along with self-efficacy for adults with T2D who voluntarily participated in a CDE-led diabetes education program (DEP) in a small senior community center in RI for the years 2015 and 2016.

While there are exponentially more adults in RI with T2D, it is clear that not all are referred for outpatient diabetes education. The program in this senior community center is regularly offered 5-7 times each year, each time averaging approximately seven participants.

Enrollment procedures for inclusion into the Living Well with Diabetes education program was by physician or self-referral. All patients, regardless of referral source have been diagnosed with T2D. As a result, a non-randomized, convenience sampling strategy was used. There were no exclusion criteria.

Population and Sampling

The population that was used for this investigation was a local DEP that serves primarily senior adults with T2D. This convenience sampling yielded a sample size of 162 (N=162). The sample was drawn from the total population of patients with T2D that have been referred to the Living Well with Diabetes program for the full calendar years of 2015 and 2016. This method may present limitations, especially with regard to generalizability; however, it is a practical method and is useful when dealing with nonrandomized as well as smaller sample sizes (Vassar & Holzmann, 2013).

Sample size. Because this was a retrospective study, the sample size was not calculated in advance for this investigation, but following the completion of data collection. The total actual number of referrals (both physician- and self-referrals) to the Living Well with Diabetes program for the years 2015-2016 was 162, while the number of the physician-referred sample was 100 ($n = 100$) and the number of self-referred patients was 62 ($n = 62$).

Power. The power of a test is related to the true population, the variance, sample size, and level of significance (Liao, 2004). Statistical power can be defined as the probability of rejecting the null hypothesis while the alternative hypothesis is true. Generally, it is acceptable to have an 80% chance of finding a true statistically significant difference when there is one, or a 20% chance of not finding it (Field, 2013; Olbricht & Wang, 2005). So, the desired power should be equal to or greater than 0.8 (Frankfort-Nachmias & Nachmias, 2008).

Power is positively correlated with sample size and the distribution of the parameter to be estimated, meaning that in general, the larger the sample size, the greater power (Field, 2013; Frankfort-Nachmias & Nachmias, 2008; Olbricht & Wang, 2005).

This investigation was a retrospective study that included patients who participated in a local DEP during the years 2015 and 2016, so the sample size was determined from existing patient data and not known until after data collection was complete. Therefore, using a power analysis retrospectively helped to interpret the results and describe why differences were, or were not detected, as opposed to being used to recommend the optimal sample size.

Power Analysis. A power analysis can only be carried out once all of the following information is known: The type of statistical analysis that will be used, the desired level of significance (α), the size of the sample, and the effect size (Cohen, 1992).

Statistical tests. Statistical tests that were used to analyze the collected data were descriptive statistics, Chi-Square, multiple logistic regression, and multiple linear regression. Characteristics of these analyses are discussed in the section on *Analytical Strategies*, beginning on page 72.

Significance level. The significance criterion (α) for all statistical analyses was .05 (α = .05). This established a confidence interval (CI) of 95% ± 2-5%.

It is customary in most social science research to set the alpha level at .05, which effectively means that there will only be a five percent chance of arriving at an incorrect conclusion (Burkholder, 2009; Cohen, 1992). In other words, with alpha (α) set at .05, there is a 95% chance of arriving at the correct conclusion (Burkholder, 2009).

Sample size. This retrospective study was able to identify the sample size following the completion of data collection. The total actual number of referrals for the years 2015-2016 was 162, while the number of the physician-referred sample was 100 (*n*=100) and the number of self-referred patients was 62 (*n*=62).

Effect size. The effect size (*d*) characterizes the degree to which the null hypothesis can be expected to be false and offers an indication of how "large" an effect is or how "strong" a relationship is (Burkholder, 2009; Cohen, 1988; Cohen, 1992).

Each statistical test has their own indicator of effect size, with the general operational definition of small, medium, and large effect sizes and Cohen (1988). As an example, when comparing two groups, a conventional effect size of $d < .50$ would indicate a small effect, $d = .50$ a medium effect, and $d >.80$ a large effect (Burkholder, 2009; Cohen, 1988). If an intervention has, and subsequent analysis indicates a large effect, a smaller sample size could be used to detect this effect (Burkholder, 2009; Cohen, 1992). Conversely, if there is a smaller effect, a larger sample would be needed to detect an effect (Burkholder, 2009; Cohen, 1992).

To summarize this discussion on power, it was only following data collection for this retrospective analysis that the sample size ($N = 162$) was known. A power analysis was subsequently carried out using *G*Power* software. It is important to keep in mind that this retrospective power analysis was used to help explain the results of this investigation, especially with regard to the appropriateness of the sample size.

As discussed above, it would be desirable to find a power level equal to or greater than 0.8, indicating an 80% chance of finding a true statistically significant difference when there is one, or a 20% chance of not finding it (Field, 2013; Frankfort-Nachmias & Nachmias, 2008; Olbricht & Wang, 2005). In addition to helping to explain the results of an investigation, the results of a retrospective power analysis may be even more valuable for use in estimating power and sample size for future investigations.

These calculations can be quite complicated, so Buchner, Faul, & Erdfelder's (n.d.) *G*Power* software was helpful in this endeavor. *G*Power* is a power analysis program designed to be used for many statistical analysis procedures that are often used in the social, behavioral, and biomedical sciences (Faul, Erdfelder, Buchner, & Lang, 2009). The results of this power analysis can be found in Chapter 4 in the Chi-square results section.

Limitations

A limitation of the Living Well with Diabetes program was that enrollment is somewhat limited because participants are enrolled after a formal recommendation and prescription from their physician, or by self-referral. As a retrospective study, there was no way to know the sample size prior to data collection. Also, all patients with T2D are not referred to DEPs, nor do all patients who are referred to these programs follow through on that recommendation. Regardless of the referral source, it is the patient who makes their own appointment for their initial assessment. It is not uncommon for patients to be referred and never make this initial appointment.

An additional limitation was that the information gathered by the program director during the initial assessment was that all responses, and therefore, all data was self-reported. Therefore, all responses were subject to the recall and health literacy of each patient. However, the assumption was made that the information provided by each patient was accurate and devoid of bias.

Procedures for Data Collection

Measurements and Data Sources

The initial assessment, as described above, was gathered and documented by the Living Well with Diabetes program director by hand on a four-page assessment form (see Appendix B). There is also an education record that is filled out for each patient after each session that they participate in (see Appendix C). At about the 6-month mark after the completion of each program, a follow-up phone call is made to each patient to document their current health status, and any lifestyle changes that they have been able to make (see Appendix D).

Data Sources

Secondary data was used for this investigation. Chart reviews of pre- and post-diabetes education program assessment questionnaires were used for the collection of demographic, health behavior, dietary intake, health risk, and outcomes data. These assessments have been administered by CDEs to the patients in the intervention group.

Data Collection

All patient records were in existence at the time of my IRB submission and approval. Patient information pertaining to their participation in the Living Well with Diabetes program during the timeframe January 2015-December 2016 was obtained and recorded by the investigator in a manner in which the patients cannot be identified. The investigator of this project was granted legitimate access to this medical information (see Appendix E), which was not available until after receiving final approval from Walden University's Institution Review Board (IRB).

Access to medical records was in an enclosed room located within the health office of this senior center. The data was manually extracted and the necessary information was obtained from the appropriate medical records. This information was then entered into a password protected Microsoft Excel file. After the cohort was identified, a list was created in which a numeric identifier was assigned to each subject as their information was added to this Excel file. Following this data extraction, there were no personal identifiers associated with any of the data, thus each subject was identified only a randomly assigned and anonymous numeric identifier for import into SPSS. A hard copy was subsequently produced, and is in a locked in a filing cabinet in the Director's office. In addition, an electronic copy of this data is in a separate, locked filing cabinet.

Protection of Participants' Rights

Upon becoming a patient of this senior community health center, patients are each given a copy of the pamphlet East Providence Senior Center Notice of Privacy Practices (Appendix F). This document contains information that describes how medical information about patients may be used. This includes a statement of patient confidentiality and information pertaining to the potential use of their information. Also, each patient has signed a form acknowledging the receipt of these privacy practices, which is filed in the patient's medical record (Appendix G).

Permission

Permission to use data was granted by the Director of this senior community center (see Appendix E).

Institutional Review Board

The function of the IRB is to review and monitor research that involves human subjects and has the power to approve, require modifications of proposals, or disapprove research (Food and Drug Administration [FDA, 2014). This function is an important step in assuring that the rights and welfare of human subjects who are participating in research are protected (FDA, 2014). The IRB helps to ensure that the risks of an investigation are minimal in relation to both the anticipated benefits of participating and the importance of the information that may be produced (Klitzman, 2013).

The IRB serves to benefit the study's subjects and the researcher while limiting the risk to the subjects, the university, and the stakeholders (Walden University, n.d.-k). Permission from the Walden University IRB was pursued and granted. Following this approval from the IRB, data collection was undertaken. The IRB approval number for this study is 05-23-17-0423563.

Analytical Strategies

The goal of this data analysis was to evaluate the effect that being either physician-referred or self-referred has on the participation in and completion of a DEP.

An additional purpose of this analysis was to elucidate the changes in the HbA1c levels of participants with respect to the number of educational sessions they attended in a small Senior Community Center in RI.

Nature of the Variables

Four levels of measurement are commonly used by researchers -nominal, ordinal, interval, and ratio. The lowest level of measurement, referred to as categorical (nominal), and uses numbers to categorize variables (Frankfort-Nachmias & Nachmias, 2008; Liao, 2004). The next level of measurement is ordinal (scale), in which the variables have qualities that are ordered (ranked) and, also that reflect some type of relative association, such as consuming *more fruits and vegetables* or *more or less than* (Frankfort-Nachmias & Nachmias, 2008; Liao, 2004). The interval level of measurement commands ranking and constant distancing between each level (Frankfort-Nachmias & Nachmias, 2008; Liao, 2004). Ratio is the highest level of measurement and has a fixed, natural zero point; time and water temperature are examples (Frankfort-Nachmias & Nachmias, 2008; Liao, 2004).

It is advantageous to use a higher level of measurement rather than a lower one, because moving from one level of measurement to the next (nominal, ordinal, interval, ratio) involves an increasing number of assumptions that are reflective of their hierarchy, (Liao, 2004). Lower levels of measurement might not be as restrictive and provide significant information in the way of descriptive statistics, each additional level of measurement contains supplementary qualities, always adding something new as each level of measurement includes all of the qualities of each level below it (Frankfort-Nachmias & Nachmias, 2008).

Due to the nature of the data and the research questions in this investigation, both categorical (nominal) and scale (ordinal) variables used. The independent variables, DEP referral source (MD or self-referred) and whether or not a patient participated in the Living Well with Diabetes Program, are categorical variables. Self-reported HbA1c levels and the number of sessions a patient attended are ordinal variables.

The covariables are also a combination of categorical and ordinal levels of measurement. Gender and race/ethnicity are categorical, while age, length of time since diagnosis and level of education are ordinal.

Statistical Analysis

Descriptive statistics, measures of central tendency, Chi-Square, multiple logistic regression, and multiple linear regression were used to analyze the collected data and examine possible associations present among the variables (Frankfort-Nachmias & Nachmias, 2008; Trochim, 2006).

Descriptive statistics, including measures of central tendency, were reported for all ordinal variables. Since there is no statistical mean for categorical variables, frequencies and distributions were recorded for these. The Chi-square analysis is designed to assess whether the difference between the observed versus the expected frequencies is statistically significant. This test is generally used when two categorical variables are cross-classified using a bivariate table (Frankfort-Nachmias & Nachmias, 2008).

Multiple logistic regression enables the researcher to estimate the effect of an independent variable on the dependent variable, while helping to control for the effect of other variables, including the covariates (Frankfort-Nachmias & Nachmias, 2008). In addition, this strategy will allow for discovering the best fit of the model and to determine the amount of variability that can be accounted for by each independent variable (Forthofer, Lee, & Hernandez, 2007).

The final statistical analysis that was conducted was multiple linear regression. The objective of a regression-type of analysis is to help to describe the nature of a relationship between two variables using a linear function (Frankfort-Nachmias & Nachmias, 2008; Walden University, n.d.). Bivariate linear regression is the simplest linear regression procedure as it examines the linear relationship (only) between just two variables (Green & Salkind, 2014; Lewis-Beck, 2004). Multiple linear regression is an extension of regression analysis that allows the assessment of the association between two or more independent variables and a single continuous dependent variable (Sullivan, 2012).

Assumptions

While statistics are used to help organize and make sense of collected data, the use of each statistical procedure makes several basic assumptions. Using the statistical test Chi-square assumes that only an approximate *p*-value will be produced (Frankfort-

Nachmias & Nachmias, 2008). In addition, there is also the assumption of independence, which states that the values of each dependent variable are independent of each other (Berk & Freedman, 2003; Green & Salkind, 2014; Laureate, 2009).

There are several assumptions of multiple logistic regression. The first assumption is that the dependent variable is normally distributed for each of the populations (Frankfort-Nachmias & Nachmias, 2008; Green & Salkind, 2014; Park, 2008). Another assumption is that the population variances of the dependent variable are the same for all cells, or homoscadasticity (Frankfort-Nachmias & Nachmias, 2008; Green & Salkind, 2014; Laureate, 2009; Park, 2008). In addition, there is the assumption of a linear relationship between the independent and dependent variables and the assumption of reliability (Frankfort-Nachmias & Nachmias, 2008; Green & Salkind, 2014).

In addition to the assumptions of correct sampling and hypothesis testing, there are several assumptions for multiple linear regression. It is assumed that all subgroups are similar, that relevant variables are included, those that are irrelevant are excluded, there is no measurement error, or no error term problems (Green & Salkind, 2014; Lewis-Beck, 2004). In addition, there is the assumption that the effect of the independent variables is linear. Finally, as with multiple logistic regression, it was assumed that there would be an absence of perfect multicollinearity between the independent variables (Green & Salkind, 2014; Lewis-Beck, 2004).

Statistical Software

Data was analyzed using the latest version of the IBM Statistical Package for the Social Sciences (SPSS) predictive analytics software. SPSS is an often-used statistical analysis software that allows researchers to manage missing data, to transform data as necessary, and to recode variables into new dummy variables (if needed) in order to properly represent the variables' subgroups (IBM SPSS Statistics [BM], 2017). SPSS is licensed to Walden University and was used by the investigator in agreement with the university policies and guidelines.

Summary of Expected Social Change

This investigation has the potential to provide a significant impact on how physicians and diabetes educators approach the importance of diabetes education to long-term quality of life with patients.

Despite the longer lifespan that Americans enjoy, chronic lifestyle diseases such as T2D and several comorbidities such as CVD and hypertension have created an increasing disease burden on the health of the population (APHA, 2016).

Since there has not been any formal research reported that has attempted to measure how referrals (including the source of referral) to DEPs translate into attendance, the results of this research may serve as a starting point to improve the conversation surrounding diabetes education. Best practices recommend that physicians refer all patients with T2D to education programs in order to help the patient establish healthier disease pattern management and improved quality of life (ADA, 2016a; Adejoh, 2014;

Kemppainen et al., 2013; Krousel-Wood, et al., 2012; Noordman et al., 2012; Powers et al., 2015; Willard-Grace et al., 2015). These goals can only be attained if patients actually attend DEPs, so understanding the differing levels of success between physician-referred or self-referred patients can inform the development of promotional material and strategies aimed at those in need of this type of education. Getting a higher proportion of patients with T2D to participate in DEPs will help to encourage healthier long-term diabetes self-management and, thus, the potential avoidance of debilitating complications that can accompany T2D (Eborall et al., 2016; HP2020, 2016; Matte & Velonakis, 2014; Powers et al., 2015). In addition, this approach can potentially bolster two of the basic tenets of public health, namely the prevention of disease (in this case preventing additional long-term chronic diseases), and the improvement of lifestyles that are more wellness-focused (APHA, 2016).

Finally, because marginalized populations are often at the greatest risk for T2D and its complications, identifying strategies that result in better attendance for DEPs, is imperative. Public health clinics, especially when they are housed within community centers, such as the one that is currently running the Living Well with Diabetes program, will be able to better address the individual, community, and population burden that T2D currently presents.

This chapter reviewed the purpose, research design, setting and description of this investigation. The specific characteristics of the sample, measures that were taken to protect participants' rights, the instruments used, methods for data collection, and a review of the tests that were used for statistical analysis were discussed. Finally, a summary of the expected social change was presented.

The following chapter, Chapter 4, will present and discuss the results from the statistical analysis. Then, Chapter 5 will present a review and discussion of the results, their significance, recommendations for further research, and implications for social change.

Chapter 4: Results

Introduction

The purpose of this retrospective analysis was to examine, for the 2-year time-period 2015-2016, the records of patients who were referred to a CDE-led DEP, Living Well with Diabetes, in a senior community center in RI, primarily to determine if the source of referral influences whether or not a patient attends and/or completes this educational program. There were three research questions asked pertaining to the source of referral to this DEP, actual patient participation in this program, how many sessions patients completed, and reported changes in their Hemoglobin A1c levels.

The primary research question was whether there was a significant difference in DEP participation between patients referred to this program by their physician, or those who were self-referred, while controlling for age, race/ethnicity, gender, number of years since T2D diagnosis, and level of education. The null hypothesis for this research question was that there was no statistically significant difference between the referral source to this program and whether or not a patient participated in the program. The alternative hypothesis stated that there was a statistically significant difference between the referral source and whether or not a patient participated in the program.

The secondary research question was: While controlling for the covariates' age, race/ethnicity, gender, number of years since T2D diagnosis, and level of education, what was the relationship between a patient's referral source to this DEP and the number of sessions that the patient completed? The null hypothesis stated that there is there is no statistically significant difference between a patient's referral source to a DEP and the number of sessions of this program they completed. Conversely, the alternative hypothesis stated that there is a statistically significant difference between a patient's referral source to a DEP and the number of sessions of this program they completed.

There was one final research question that this study investigated, which was how does the number of diabetes education program sessions that each patient attended correlate with the change in their HbA1c levels? As with the first two questions discussed above, this third question was investigated while controlling for the covariates age, race/ethnicity, gender, number of years since T2D diagnosis, and level of education. The null hypothesis stated that there would be no statistically significant association between the number of educational sessions that each patient attended and their self-reported HbA1c levels; whereas the alternate hypothesis suggested that there would be a statistically significant association between the number of educational sessions that each patient attends and their self-reported HbA1c levels.

This chapter will provide an explanation of the results of the data analysis that was conducted to address the research questions and hypotheses described above using SPSS. This chapter will be organized into data collection, results, and summary. The data collection section includes discussions on the inclusion of covariates, the treatment of missing values, a description of the DEP study sample, and summary statistics for DEP variables. The results include discussions of the statistical assumptions, and the findings of the statistical analysis. These are organized by research questions and hypothesis.

Tables that provide additional detail and visual depictions of all data are also contained in this chapter.

Using this software package, descriptive statistics, Chi-Square, multiple logistic regression, and linear regression was performed to analyze the collected data for possible associations that were present among the variables mentioned above. A summary that explains the demographics of the study population will be presented, along with frequencies for participation, referral source, and number of sessions that patients participated in. This will help to describe the characteristics of the study population. Following this, and to address each of the research questions, the results of the Chi-Square, multiple logistic regression, and linear regression tests will be presented, along with the results of the retrospectively computed *G*Power* analysis for the Chi-square analysis, which will be carried out to help explain the results of this investigation. This chapter will conclude with a summary of the answers to each of the research questions, along with a short preview of Chapter 5 where these results will be further discussed.

Data Collection

Data collection procedures that have been detailed above were followed as the investigator performed chart reviews for patients that were referred to the DEP Living Well with Diabetes program for the calendar years 2015 and 2016. The information that was collected included the following variables: Age, race/ethnicity, gender, number of years since T2D diagnosis, level of education, and Hemoglobin A1c and fasting blood sugar levels.

The actual data collection process took place over a period of 9 days. The essential information was entered into a password protected Microsoft Excel file and each patient was assigned a numeric identifier so there was no chance of personal information being associated with any of the data. This data was then entered into the SPSS software program, and the variables were classified and the appropriate numeric dummy variables were created in preparation for the regression analysis to properly represent the subgroups for each of the variables.

One hundred sixty-two patients were identified as having been referred to this outpatient DEP. In addition to the initially proposed independent and dependent variables and covariates, data for the additional covariates, level of education and fasting blood glucose levels, was extracted from the data source. These items are a standard part of the pre- and post-diabetes education program assessment questionnaires used in this program and are potentially covariables that may be influential to the research questions. Therefore, the addition of these to the list of items that will be controlled for in the statistical analysis may help to clarify the results.

Inclusion of Covariates

Since the presence of covariates has the potential to influence the independent and dependent variables and may be predictive of the outcomes, it was important to consider these in the analysis in order to decrease the chance of misleading results. The ability to generalize the results of this investigation depends on a variety of factors that include sample size, patient knowledge of T2D and self-efficacy regarding disease pattern management, and variations in self-reported data (i.e., error), along with the covariates age, race/ethnicity, gender, length of time since diagnosis, and level of education. Therefore, to improve the ability to generalize these research results, it was important to take these covariates into consideration when performing each of the statistical tests.

Treatment of Missing Values

As there were some missing values in a few categories, it is prudent to mention how they were treated. There were missing values for the variables years since T2D diagnosis ($n = 40$), level of education ($n = 44$), and age ($n = 5$). For each statistical test, missing values were handled by their deletion from the analysis. This data was seemingly missing at random, as these missing variables are associated with the characteristics of each subject, and the rates of this missing data are not associated with any of the other variables and did not correlate with any of the research questions.

When using regression analyses, the most common treatment approach to missing data is listwise deletion; this is also known as casewise deletion (Howell, 2007). SPSS has the ability to drop cases with missing values from the analysis, and listwise deletion is generally carried out by default (Howell, 2007; IBM, 2017). Deleting cases with missing data leaves a set of cases that now all have complete data, allowing the analysis to be run without difficulty, and providing a genuine correlation matrix (Allison, 2004). A limitation of listwise deletion is that by removing cases from the analysis, the power of the test is then decreased (Howell, 2007). However, because of the small sample size, this was the preferred means of managing the missing data for this investigation, and there was no evidence of a significant effect on the power.

Description of DEP Study Sample

Univariate analysis yielded descriptive statistics for the demographic make-up of the participant pool. Variables include gender, race/ethnicity, and the number of years since T2D diagnosis (Table 1). Demographic summary statistics showed that the total number of participants that were referred to the Living Well with Diabetes DEP included 162 patients who had been diagnosed with T2D. Included in the study sample were 54.3% (*n* = 88) females and 45.7% (*n* = 74) males. The racial/ethnic make-up of the sample did not show a great deal of diversity with 83.1% (*n* = 133) identifying as Caucasian and 17.9% identifying either as Asian (*n* = 1), African-American (*n* = 12), Did not know (*n* = 2), Hispanic (*n* = 5), or other (*n* = 9). Collectively, this sample reported that their initial T2D diagnosis was between less than one year and 56 years ago. The largest subset of this group was represented by the 45.7% (*n* = 74) who had been diagnosed from between less than one year and 9.9 years ago. Following this group, and in descending order of frequency were those who had been diagnosed with T2D 10-19.9 years ago (17.9%, *n* = 29), 20-29.9 years ago (7.4%, *n* = 12), 30-39.9 years ago (2.5%, *n* = 4), 40-49.9 years ago (1.2%, *n* = 2), and 50-59.9 years ago (0.6%, *n* = 1).

Table 1

Summary Statistics for Demographic Variables

Variables	Frequency	% of variable	Observations
Gender			162
Female	88	54.3	
Male	74	45.7	
Race/Ethnicity			162
Total Minority	29	17.9	
Asian	1	.6	
African-American	12	7.4	
Do not know	2	1.2	
Hispanic	5	3.1	
Other	9	5.6	
Caucasian	133	83.1	
Years since dx			
<1 year – 59.9	122	75.3	122
<1year – 9.9	74	45.7	
10 – 19.9	29	17.9	
20.0 – 29.9	12	7.4	
30 – 39.9	4	2.5	
40 – 49.9	2	1.2	
50 – 59.9	1	.6	
Missing values	40		

The age distribution for this sample ranged from 27 to 98 years old with a mean age of 67.8 years (Table 2). The majority of this group, 55.6% fell in the 60- to 79-year-old age group (n=90), while the 50-59 and 80-89 age groups representing 15.3% (n=25) and 14.9% (n=24) respectively. The reported educational level for each DEP participant ranged from the completion of the third grade to obtaining a master's degree (Table 3). The majority of participants, 59.3% (n=96) completed high school or higher, while 13.5%

(n=22) completed less than a high school diploma. Details on frequencies for each level of education are shown in Table 3.

Table 2

Summary Statistics for Age of DEP Participants

Variable	Frequency	% of variable	Observations	Mean	Median	Mode
DEP subject age			157	67.77	69.0	72[a]
<30	1	.6				
30-39	3	1.8				
40-49	10	6.0				
50-59	25	15.3				
60-69	43	26.6				
70-79	47	29.0				
80-89	24	14.9				
>90	4	2.4				
Missing values	5	3.1				

a = Multiple modes exist

Table 3

Summary Statistics for Education –Last Grade Completed

Variable	Frequency	% of variable	Mean	Median	Mode
3	1	.6	12.66	12.00	12
8	3	1.9			
9	3	1.9			
10	8	4.9			
11	7	4.3			
12	45	27.8			
13	15	9.3			
14	18	11.1			
16	14	8.6			
18	4	2.5			
Total	118	72.8			
Missing	44	27.2			

Summary Statistics for DEP Variables

This analysis also generated descriptive statistics for the DEP variables for each year of the program, the referral source, DEP participation, and number of sessions attended (Table 4). For the combined years 2015-2016, there were 162 patients with T2D that were referred to this DEP, 51.2% (n=83) in 2015 and 48.8% (n=79) in 2016. Over half (61.7%, n=100) of these referrals were from physicians, while 38.3% (n=62) were self-referrals. Slightly more than half (54.3%) (n=88) participated in the DEP. The majority of those who did participate (35.2%, n=57) completed all four sessions, with 8% (n=13) completing three sessions, and 5.6% (n=9) participating in either one or two sessions.

Table 4

Summary Statistics for DEP Variables

Variables	Frequency	% of variable	Observations
DEP Years			162
2015	83	51.2	
2016	79	48.8	
Referral source			162
Physician	100	61.7	
Self	62	38.3	
DEP Participation			162
No	74	45.7	
Yes	88	54.3	
No. sessions attended			162
0	74	45.7	
1	9	5.6	
2	9	5.6	
3	13	8.0	
4	57	35.2	

Results of Statistical Analysis

Prior to the analyses, the data were reviewed to ensure that the assumptions for the Chi-Square, multiple logistic and multiple linear regressions had been met. Then, each research question and null hypothesis was tested using these statistical methods in SPSS. The results of these follows; each question will be addressed in numerical order.

Research Question 1

The first research question states: While controlling for age, race/ethnicity, the number of years since their type 2 diabetes diagnosis, and level of education, what is the relationship between the referral source of a Diabetes Education Program and patient participation in the program?

The null hypothesis for this question (H_01) specifies that patient participation in a DEP (as measured by whether or not they attended at least one (1) educational session) did not differ between referral sources (MD- or self-referred).

From Table 4 above, we know that 162 patients were referred to this DEP for the two-year span of 2015-2016. Well over half of these referrals (61.7%, n=100) were from physicians, while 38.3% (n=62) of these patients were self-referred. Of the 162 total patient referrals, slightly more than half (54.3%) (n=88) participated in at least one educational session of the DEP.

To help answer this first research question and assess the relationship between the referral source and participation (of at least one session) in the DEP a chi-square test was performed. Table 5 displays the results of the cross-tabulation for the independent variable referral source and dependent variable DEP participation. Of the patients who were referred to the Living Well with Diabetes education program, the proportion of physician-referred patients who did not participate in the DEP was .32 (n=52), while .30 (n=48) did. Conversely the proportion of self-referred patients who did not participate in the DEP was .14 (n=22), while .25 (n=40) did participate. The proportion of combined physician- and self-referred patients who did participate in at least one of the four sessions of this program was 54.3% (n=88).

Table 5

*Referral Source * DEP Participation DV Cross-tabulation*

			DEP Participation DV		Total
			No	Yes	
Referral Source	physician	Count	52	48	100
		% within Referral Source	52.0%	48.0%	100.0%
		% within DEP Participation DV	70.3%	54.5%	61.7%
		% of Total	32.1%	29.6%	61.7%
	self	Count	22	40	62
		% within Referral Source	35.5%	64.5%	100.0%
		% within DEP Participation DV	29.7%	45.5%	38.3%
		% of Total	13.6%	24.7%	38.3%
Total		Count	74	88	162
		% within Referral Source	45.7%	54.3%	100.0%
		% within DEP Participation DV	100.0%	100.0%	100.0%
		% of Total	45.7%	54.3%	100.0%

A Pearson chi-square test was performed and found that there is a relationship between the two categorical variables, physician- or self-referral, to a DEP and participation in a DEP, $\chi 2$ (1, N = 162) = 4.2, $p < .05$ (see Table 6). This significance level, $p = .04$, indicates that were more likely to participate in the DEP if they were self-referred.

Effect size. The effect size illustrates the degree to which the null hypothesis can be expected to be false and offers an indication of how strong or weak an association is (Burkholder, 2009; Cohen, 1988; Cohen, 1992). In conjunction with the chi-square analysis, Cramer's V was used to measure the strength of this association (Cramer's V = .16), the results of which can be seen in Table 7. While the chi-square analysis indicates a statistical significance, Cramer's V (.16) represents a weak association (Zaiontz, 2014).

Table 6

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.207[a]	1	.040		
Continuity Correction[b]	3.568	1	.059		
Likelihood Ratio	4.250	1	.039		
Fisher's Exact Test				.051	.029
N of Valid Cases	162				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 28.32.

b. Computed only for a 2x2 table

Table 7

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	.161	.040
	Cramer's V	.161	.040
N of Valid Cases		162	

It was also important to take the covariates into consideration by measuring their effect on the outcome variable. To control the effects of the covariates (age, gender, race/ethnicity, the number of years since their type 2 diabetes diagnosis, and level of education), multiple logistic regression was used to help estimate the effect of the independent variable (referral source) on the dependent variable (DEP participation). The results from this logistic regression, shown in Table 8, indicate that none of the covariates had a significant effect with regard to DEP participation over and above the referral source.

Table 8

Logistic Regression DEP Participation

		B	*S.E.*	*Wald*	*df*	*p*	*OR*
Step 1[a]	Age	.029	.019	2.200	1	.138	1.029
	Minority_DV	-.011	.589	.000	1	.986	.990
	Female_DV	-.125	.460	.074	1	.786	.882
	Time Since Dx (years)	-.025	.021	1.384	1	.239	.975
	Education-last grade completed	.087	.099	.769	1	.380	1.091
	Constant	-1.784	1.759	1.029	1	.310	.168

a. Variable(s) entered on step 1: Age, Minority_DV, Female_DV, Time Since Dx (years), Education-last grade completed.

After controlling for the covariates age, gender, race/ethnicity, the number of years since their type 2 diabetes diagnosis, and level of education, the results of the regression equation showing only the dependent variable, self-referral, are displayed in Table 9. There is a significant *p*-value for self-referral, 0.04 (< 0.05). In addition, both values of the confidence interval (CI) for the OR are greater than 1, so we can say that the odds of a patient who is self-referred participating in a DEP are 1.97 times higher than those of a patient who physician-referred, with a 95% CI that spans 1.02 to 3.78.

Table 9

Logistic Regression Model Predicting DEP Participation for Self-referred

								95% CI for OR	
		B	Std. Error	Wald	df	p	OR	Lower	Upper
Step 1[a]	Self-Referral DV	.678	.332	4.158	1	.041	1.970	1.027	3.779
	Constant	-.080	.200	.160	1	.689	.923	Constant	-.080

a. Variable(s) entered on step 1: Self-Referral DV.

Using both chi-square and logistic regression analyses to test this first research question, and controlling for age, race/ethnicity, the number of years since their type 2 diabetes diagnosis, and level of education the null hypothesis was rejected, indicating that the referral source to a DEP does have an effect on DEP participation rates. In addition, the results of a post hoc *G*Power* analysis followed the chi-square analysis revealed the statistical power for this analysis to be .83. A finding of a power level equal to or greater than 0.8 is more than adequate to find a true statistically significant difference when there is one, or a 20% chance of not finding it (Field, 2013; Frankfort-Nachmias & Nachmias, 2008; Olbricht & Wang, 2005).

Research Question 2

The second research question states: While controlling for age, race/ethnicity, the number of years since their type 2 diabetes diagnosis, and level of education, what is the relationship between the referral source of a Diabetes Education Program (MD-referral or self-referral) and the number of sessions a patient completes?

The null hypothesis for this question (H_02) specifies that number of sessions of a DEP that a patient completed did not differ between the referral source of a Diabetes Education Program (MD-referral or self-referral).

The dependent variable, the number of sessions of the DEP that a patient completes, is a continuous variable so, to test the relationship between the referral source (MD-referral or self-referral) and the number of sessions completed, multiple linear regression analysis was conducted. This analysis helped to define the linear relationship between the two independent referral sources (physician-referred or self-referred) and the four (4) levels of the dependent variable, number of sessions (1, 2, 3, or 4) completed. This analysis was completed while controlling for the potential effects of the covariates (age, gender, race/ethnicity, the number of years since their type 2 diabetes diagnosis, and level of education).

The results of this regression, shown in Table 10, indicate that none of the covariates had a significant effect with regard to DEP participation over and above the referral source. Using linear regression, $r = .295$, demonstrates a weak positive correlation between DEP program referral source and the number of sessions completed, while taking into account the combined effects of the covariates (Table 10). The coefficient of determination, or $r^2 = 0.087$. This means that 8.7% of the variability in the number of DEP sessions completed can be explained by regression on the covariates. Looking at the *p*-value of the regression $p = .085$, which is not a statistically significant finding (Table 11).

The coefficients are displayed in Table 12, with the results of the *p*-values for each predictor showing that age contributes to the model, but race/ethnicity, gender, the number of years since their type 2 diabetes diagnosis, and level of education do not. The *p*-value for age was statistically significant $p = .02$, while the *p*-values for race/ethnicity ($p = .086$), gender ($p = .028$), the number of years since their type 2 diabetes diagnosis ($p = .18$), and level of education ($p = .29$) were not significant.

Table 10

Linear Regression -Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.295[a]	.087	.043	1.706

a. Predictors: (Constant), Education-last grade completed, Time Since Dx (years), Minority_DV, Female_DV, Age

Table 11

Linear Regression Output -ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	*p*
1	Regression	29.059	5	5.812	1.997	.085[b]
	Residual	305.500	105	2.910		
	Total	334.559	110			

a. Dependent Variable: No. of Sessions Attended

b. Predictors: (Constant), Education-last grade completed, Time Since Dx (years), Minority_DV, Female_DV, Age

Table 12

Linear Regression Outputs -Coefficients^a

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	*p*
1	(Constant)	-.999	1.351		-.740	.461
	Age	.035	.015	.242	2.365	.020
	Minority_DV	.076	.444	.016	.171	.864
	Female_DV	.376	.345	.108	1.090	.278
	Time Since Dx (years)	-.023	.017	-.134	-1.346	.181
	Education-last grade completed	.080	.074	.102	1.074	.285

a. Dependent Variable: No. of Sessions Attended

The above results indicate that age appears to have an effect on the number of sessions completed, so a simple linear regression was then performed to predict the effect of age (independent variable) on this dependent variable.

In this linear regression analysis, $r = .295$, demonstrating a weak positive correlation between DEP program referral source and the number of sessions completed, while taking into account the effect of the covariate age (Table 13). The coefficient of determination, or $r^2 = 0.087$, meaning that 8.7% of the variability in the number of DEP sessions completed can be explained by regression on the covariate age. Table 14 displays the *p*-value of the regression, $p = .001$, which is a statistically significant finding. Finally, the coefficients are displayed in Table 15, displaying the results of the *p*-value for the predictor, *p* = .03. Overall, this regression suggests that age does contributes to the model and has a predictive effect, though a mild one, on the dependent variable.

Table 13

Age Linear Regression -Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.295[a]	.087	.075	1.767

a. Predictors: (Constant), Self-Referral DV, Age

Table 14

Age Linear Regression Output -ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	*p*
1	Regression	45.919	2	22.960	7.351	.001[b]
	Residual	480.998	154	3.123		
	Total	526.917	156			

a. Dependent Variable: No. of Sessions Attended

b. Predictors: (Constant), Self-Referral DV, Age

Table 15

Age Linear Regression Output -Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	*p*
1	(Constant)	-.164	.768		-.213	.831
	Age	.026	.012	.181	2.254	.026
	Self-Referral DV	.706	.304	.187	2.320	.022

a. Dependent Variable: No. of Sessions Attended

Using multiple linear regression analyses to test the second research question, and controlling for age, race/ethnicity, the number of years since their type 2 diabetes diagnosis, and level of education, the null hypothesis is accepted. However, the coefficient table of the multiple linear regression output (Table 12) shows that age contributes to the model, while the other covariates do not. So, in applying simple linear regression analysis using the singular covariate, age, the results show statistical significance (Table 14). Therefore, using simple linear regression the null hypothesis was rejected; indicating that age appears to be a significant predictive effect on DEP participation rates.

Research Question 3

The final research question states: While controlling for age, race/ethnicity, gender, the number of years since their type 2 diabetes diagnosis, and level of education, how does the number of educational sessions that each patient attends correlate with the change in their Hemoglobin A1c levels?

The null hypothesis for this question ($H_0$3) specifies that there is not a statistically significant association between the number of educational sessions that each patient attends and their self-reported HbA1c levels.

Both the independent variable, the number of sessions of the DEP that a patient completes, and the dependent variable are continuous variables so, to answer this question linear regression analysis was conducted. This analysis helped to define the linear relationship between the four levels of the independent variable, number of sessions (1, 2, 3, or 4) completed (see Table 16) and the observed changes in HbA1c levels. This analysis was completed while controlling for the potential effects of the remaining covariates (age, gender, race/ethnicity, the number of years since their T2D diagnosis, and level of education).

There were nine patients reporting both pre-DEP and post-DEP Hemoglobin A1c levels. Seven of these completed all four sessions of the DEP, all reporting positive changes (lower HbA1c levels). Table 17 displays the cross-tabulation for HbA1c change and the number of sessions attended. All of these patients were white, so the covariate, minority, was removed from this analysis. The results of this regression, shown in Table 18, indicate that none of the remaining covariates had a significant effect with regard to the number of sessions completed and changes in HbA1c. Using linear regression, $r = .611$, demonstrates a strong positive correlation between the number of sessions completed and positive changes in HbA1c levels, while taking into account the combined effects of the remaining covariates. The coefficient of determination, or $r^2 = 0.373$. This means that 37.3% of the variability of the changes in HbA1c levels be explained by regression on the covariates. Looking at the *p*-value of the regression, $p = .69$, which is not a statistically significant finding (Table 19).

The coefficients are displayed in Table 20, with the results of the *p*-values for each predictor showing that none of the covariates contributed to the model. The *p*-value for each of the covariates were age ($p = .96$), gender ($p = .078$), the number of years since their type 2 diabetes diagnosis ($p = .51$), and level of education ($p = .26$).

Table 16

No. of Sessions Attended

		Frequency	%	Valid Percent	Cumulative Percent
Valid	0	74	45.7	45.7	45.7
	1	9	5.6	5.6	51.2
	2	9	5.6	5.6	56.8
	3	13	8.0	8.0	64.8
	4	57	35.2	35.2	100.0
Total	162	100.0	100.0		

Table 17

*A1c Change*No. of Sessions Attended Cross-tabulation Count*

		No. of Sessions Attended			
		1	3	4	Total
A1c Change	.10	0	0	1	1
	.20	0	0	1	1
	.50	0	0	3	3
	.60	1	0	0	1
	.90	0	1	0	1
	3.30	0	0	1	1
	4.20	1	0	1	1
Total		1	1	7	9

Table 18

Hb A1c Linear Regression -Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.611[a]	.373	-.254	1.65799

a. Predictors: (Constant), Education-last grade completed, Age, Time Since Dx (years), Female_DV

Table 19

Hb A1c Linear Regression Output -ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	*p.*
1	Regression	6.544	4	1.636	.595	.686[b]
	Residual	10.996	4	2.749		
	Total	17.540	8			

a. Dependent Variable: A1C_Change

b. Predictors: (Constant), Education-last grade completed, Age, Time Since Dx (years), Female_DV

Table 20

Hb A1c Linear Regression Output -Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	*p*
1	(Constant)	5.011	7.551		.664	.543
	Age	.007	.106	.026	.062	.953
	Female_DV	-.461	1.544	-.156	-.299	.780
	Time Since Dx (years)	-.034	.047	-.343	-.723	.509
	Education-last grade completed	-.291	.218	-.804	-1.335	.253

a. Dependent Variable: A1C_Change

When collecting data, there were many patients reporting FBG levels, so out of curiosity, a linear regression analysis was completed using the independent variable, the number of sessions of the DEP that a patient completes, and the dependent variable FBG. This analysis helped to define the relationship between the independent variable, number of sessions completed (see Table 16) and the observed changes in FBG levels.

There were 25 patients who reported both pre-DEP and post-DEP FBG levels, 20 of whom completed all four DEP sessions. Table 21 displays the cross-tabulation for FBG change and the number of sessions attended. All but one of these reported positive changes (lower FBG levels). As was the case with the pre-and post-HbA1c levels, all of these patients were white. This analysis was completed while controlling for the potential effects of the remaining covariates (age, gender, race/ethnicity, the number of years since their type 2 diabetes diagnosis, and level of education).

Table 21

*FBG_Change * No. of Sessions Attended Cross-tabulation Count*

		No. of Sessions Attended			
		2	3	4	Total
FBG Change	-15.00	0	1	0	1
	4.00	0	0	1	1
	15.00	0	0	1	1
	20.00	1	0	1	1
	31.00	0	0	2	2
	33.00	0	0	2	2
	34.00	0	0	1	1
	37.00	0	0	1	1
	40.00	0	0	1	1
	42.00	0	0	1	1
	51.00	0	0	1	1
	56.00	1	0	0	1
	58.00	0	0	1	1
	67.00	0	0	1	1
	68.00	1	0	0	1
	71.00	1	0	1	2
	81.00	0	0	2	2
	92.00	0	1	1	2
	100.00	0	0	1	1
	121.00	0	0	1	1
Total		3	2	20	25

The results of this regression, shown in Table 22, indicate that none of the remaining covariates had a significant effect with regard to the number of sessions completed and changes in FBG levels. Using linear regression, r = .471, demonstrates a moderate, but positive correlation between the number of sessions completed and positive changes in FBG levels. The coefficient of determination, or r^2 = .222. This means that

22.2% of the variability of the changes in FBG levels be explained by the regression equation. Looking at the *p*-value of the regression, *p* = .31 is not a statistically significant finding (Table 23).

The coefficients are displayed in Table 24, with the results of the *p*-values for each predictor showing that none of the covariates contributed to the model. The *p*-value for each of the covariates were age (*p* = .51), gender (*p* = .12), the number of years since their type 2 diabetes diagnosis (*p* = .94), and level of education (*p* = .34) were not significant.

Table 22

FBG Linear Regression -Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.471[a]	.222	.003	31.60279

a. Predictors: (Constant), Age, Time Since Dx (years), Education-last grade completed, Female_DV

Table 23

FBG Linear Regression Output -ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	*p*
1	Regression	4888.312	4	1222.078	1.283	.313[b]
	Residual	17145.340	18	952.519		
	Total	22033.652	22			

a. Dependent Variable: FBG_Change

b. Predictors: (Constant), Age, Time Since Dx (years), Education-last grade completed, Female_DV

Table 24

FBG Linear Regression Output -Coefficients[a]

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	*p*
1	(Constant)	-37.193	101.163		-.368	.717
	Female_DV	-23.023	14.131	-.372	-1.629	.121
	Time Since Dx (years)	-.054	.678	-.018	-.079	.938
	Education-last grade completed	4.224	4.296	.242	.983	.339
	Age	.614	.908	.170	.676	.507

a. Dependent Variable: FBG_Change

Using multiple linear regression analyses to test the third research question, and controlling for age, race/ethnicity, the number of years since their type 2 diabetes diagnosis, and level of education, the null hypothesis is accepted; there is not a statistically significant association between the number of educational sessions that each patient attends and their self-reported HbA1c levels. Also, because there was data representing FBG levels, a regression analysis was applied using the same covariates, with the results showing no statistical significance. Therefore, using linear regression to test this research question, the null hypothesis is accepted indicating that the number of sessions of a DEP that a patient completes does not appear to be predictive of changes in HbA1c or FBG levels. Keep in mind, however, that a major limitation of this analysis was the small sample size.

Summary

The Living Well with Diabetes program strives to provide the outpatient diabetes self-management education to patients with T2D necessary to be better at managing their disease. The primary research question focused on whether there was a significant difference in DEP participation between patients referred to this program by their physician, or those who were self-referred, while controlling for age, race/ethnicity, gender, number of years since T2D diagnosis, and level of education. Using chi-square and logistic regression analyses and controlling for the covariates the null hypothesis was rejected, indicating that the referral source to a DEP does have an effect on DEP participation rates. These results were supported with the post hoc *G*Power* analysis that revealed the statistical power for this chi-square analysis to be .83, which supports the rejection of H_01.

The secondary research question focused on the relationship between a patient's referral source to this DEP and the number of sessions that the patient completed.

Controlling for the covariates, multiple linear regression analyses yielded a finding that was not statistically significant, therefore accepting $H_0$2. In addition, the coefficient table for this multiple linear regression showed that the covariate age was the only covariate that contributed to this model. So, a simple linear regression analysis was applied using the singular covariate, resulting a statistically significant finding, thus allowing the null hypothesis was rejected, which indicated that age appears to be predictive of DEP participation rates.

The final research question was used to determine how the number of DEP sessions that each patient completed correlated with the change in their Hemoglobin A1c levels. Multiple linear regression analysis was used to test this third question, and controlling for the covariates, null hypothesis is accepted, indicating that there is not significant association between the number of educational sessions that each patient attends and their self-reported HbA1c levels. In addition, using FBG data that was available, a regression analysis was applied using the same covariates, with the results showing no statistical significance. Therefore, using linear regression to test this research question, the null hypothesis ($H_0$3) is accepted indicating that the number of sessions of a DEP that a patient completes does not appear to be predictive of changes in HbA1c or FBG levels.

These results, which partially supported the research questions and the Living Well with Diabetes program, are indicative of the need for more comprehensive strategies for obtaining referrals to this DEP, converting referred patients to actual DEP participants, and designing strategies to enhance patient compliance, both with completing the four-session program and in their T2D self-pattern management.

The following chapter will include a discussion on key research findings, an interpretation of these findings, their significance, recommendations for further research, and implications for social change. In addition, recommendations for more comprehensive program strategies, including converting patient referrals to DEP participants for the Living Well with Diabetes Program will be discussed.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The goal of the Living Well with Diabetes program is to provide outpatient diabetes self-management education to patients with T2D toward the goal of helping patients to become better at managing their disease. This final chapter will review the purpose and nature of this investigation, include a discussion on the interpretation of the research findings and their significance, and provide recommendations for further research. This chapter will then conclude with a discussion about the implications for social change that this project offers, including recommendations for more comprehensive DEP strategies, including converting patient referrals into program participants.

T2D is a chronic disease that responds well to healthy lifestyle changes, something that can be achieved through outpatient education interventions. Whether the source of referral to DEPs ultimately has an effect on patient participation in these programs has not yet been elucidated in the research. With this in mind, the purpose of this retrospective cohort study was to evaluate the effect that being either self-referred or physician-referred had on the participation in and completion of the Living Well with Diabetes program. An additional purpose was to clarify any changes in the HbA1c levels of participants with respect to the number of educational sessions they attended in this senior community center.

This retrospective analysis was a chart review that compared the patient records of adults with T2D who were referred to this program in RI. The patients were either self-referred (*n* = 62) or referred by their physician (*n* = 100). This design offered the investigator the advantage of having access to all of the records for these patients during the timeframe spanning the years 2015 and 2016.

Summary of Key Findings

Research Question 1: Source of Patient Referral to DEPs

The first research question asked if there was a significant difference in the DEP participation rates between physician-referred patients and those who were self-referred. The results of the Chi-square (*p* = .04) and logistic regression analyses (*p* = .04) indicate that the referral source to a DEP does have an effect on DEP participation rates. Logistic regression also indicated that the odds of a patient who is self-referred participating in a DEP are 1.97 times higher than those of a patient who is physician-referred. Tables 6 and Table 9 include additional information pertaining to these analyses. The results of the cross-tabulation (see Table 5) more specifically highlight the assertion that patients with T2D were more likely to participate in the DEP if they were self-referred; of the patients who were self-referred to the Living Well with Diabetes intervention, 64.5% were actual participants in the program. Comparatively, of the patients who were physician-referred to the Living Well with Diabetes intervention, 48% were actual participants in the program.

Research Question 2: Number of Sessions Patients Attended

The second research question focused on the relationship between a patient's referral source to this DEP and the number of sessions that the patient completed. When controlling for all of the covariates, multiple linear regression yielded a finding that was not statistically significant, therefore accepting H_02, and suggesting that when taken together, age, race/ethnicity, gender, number of years since T2D diagnosis, and level of education did not have any effect on the number of sessions that a patient attends over and above the referral source.

However, the results for each individual covariate (see Table 12) showed that age, by itself, does contribute to the model ($p = .02$). Subsequently, using this singular covariate, a simple linear regression ($p = .026$) indicated that age does appears to be predictive of DEP participation rates. For the Living Well with Diabetes program, patients who are older tend to participate in more sessions than those patients who are younger.

Research Question 3: Changes in Hemoglobin A1c Levels

The third research question attempted to determine if the number of DEP sessions that a patient completed was related to the reported changes in their HbA1c levels. Multiple linear regression indicated that there was not a significant association between the number of educational sessions that each patient attended and their self-reported HbA1c levels. In Table 17, there were nine patients who reported both pre- and post-

Living Well with Diabetes program HbA1c levels; for those who completed all four sessions of this DEP (*n* = 7), all reported lower HbA1c levels.

This analysis was repeated using self-reported FBG data that patients also provided in initial assessment and subsequent follow-ups, with the same results; there was no statistical significance between the number of educational sessions that each patient attended and their self-reported FBG levels. It is pertinent, however, to also look at the information depicted in Table 21, showing the cross-tabulation of changes in FBG levels as compared with the number of Living Well with Diabetes sessions that patients attended. Of the 25 patients who reported both pre- and post-Living Well with Diabetes program FBG levels, 20 completed all four DEP sessions, and all but one of these participants reported lower FBG levels.

Interpretation of the Findings

Source of Patient Referral to DEPs

For the first research question, the analysis indicated that there was a significant difference in the rates of participation to a DEP based on the source of patient referral. However, being able to record the rates of participation in DEPs is subject to recording the actual number of referrals to these programs which, to date, is not always done. And, despite the evidence that speaks to the benefits that DEPs provide for T2D patients toward helping them improve their diabetes self-management, actual participation rates in these programs remain far too low to truly ease the overall burden of T2D (Gucciardi et al., 2011).

Based on the current recommendations for standards of practice and the national guidelines for medical personnel for patient management of T2D, all patients with T2D, especially those who are newly diagnosed, should be referred to DEPs for education-related self-care management and ongoing support (ADA, 2016c; Hooks-Anderson, Crannage, Salas, & Scherrer, 2015; Powers et al., 2015). However, just under 7% of newly diagnosed T2D patients received referrals to outpatient DEPs (ADA, 2016b; Chomko et al., 2016; Li et al., 2014). Physician referrals to DEP programs in parts of the U.S. and Canada are relatively low, ranging from 14% to 45% and, while diabetes education is a collaborative process that is (or should be) supported by the entire healthcare team, only approximately 33% of all patients with T2D throughout the U.S. and Canada attend these programs (Chomko et al., 2016; Gucciardi et al., 2011). And, while DSME is a covered Medicare benefit, only 4% of those covered by Medicare participated in DEPs between 2011 and 2012 (Chomko et al., 2016).

Quantitative research that compares actual rates of physician-referrals to self-referrals, as well as the conversion of these referrals to actual patient participation, is currently lacking. This investigation and its results provide information about both, which adds to the knowledge base in this discipline. This investigation provides an example of a local DEP who receives both physician-referrals and self-referrals, and is able to ultimately track the number of participants in their Living Well with Diabetes program.

This program is housed within an active and comprehensive senior community center. There are community center members in this facility on a daily basis taking advantage of numerous programs and services. Because of the openness of the staff, there is the opportunity for these community center members to interact with the health office staff when they have questions about their health issues and the available educational programs. In addition, the interaction between community center members often includes discussions between with those who are thinking about participating in the Living Well with Diabetes program and those who have already participated in the program. Certainly, this is extremely conducive to DEP self-referrals. For the years 2015-2016, 64.5% of the patients who were self-referred to the Living Well with Diabetes program were actual participants in the program. The source of referral to DEP appears to be an important factor for eventual participation in these programs. This can possibly be explained by the HBM constructs of perceived severity and perceived benefits. The social nature of the community center along with the willingness of the staff to discuss the benefits of the Living Well with Diabetes program may serve as cues, helping to move self-referred patient to action. In turn, the external support provided by the program educational modules further serves to support healthy behavior changes, leading to an enhance self-efficacy (Gucciardi et al., 2011).

The Living Well with Diabetes director is also the director of the Health Office within this senior center. As such, she has a professional, collaborative relationship with several groups of local physicians, including a group of who specialize in diabetes care and endocrinology; a large portion of DEP patients who are physician-referred are referred from this physician group (M. J. Milner, personal communication, April 11, 2016). As compared to those who were self-referred, for the years 2015-2016, 48% of the patients who were physician-referred to the Living Well with Diabetes were actual participants in the program (see Table 5).

The information gleaned from attempting to answer the first research question about whether there was a significant difference in the DEP participation rates between physician-referred patients and those who were self-referred has provided some insightful information. In addition, there are also ideas for future research that have come to light. These will be addressed further later in this chapter.

Number of Sessions Patients Attended

The second research question focused on the relationship between a patient's referral source to the Living Well with Diabetes program and the number of sessions the patient completed. Testing this question with linear regression while controlling for all of the covariates (age, race/ethnicity, the number of years since their type 2 diabetes diagnosis, and level of education), there was no difference, so the null hypothesis was accepted. However, using the coefficient output for this regression (see Table 12) showed that the covariate, age, does contribute to the model, but none of the other covariates did. So, using this singular covariate, age, a simple linear regression analysis showed that age is a statistically significant ($p = .026$) predictor of the number of DEP sessions that patients participate in (Table 14).

From the literature review, we know that in spite of the knowledge of DEPs and any referrals to DSME, both physician referral rates and patient attendance rates continue to be poor (Chomko et al., 2016; Li et al., 2014).

Barriers to DEP referral and participation. Both physicians and patients often face barriers when deciding what the next step is. Reluctance on the part of the physician regarding a patient's level of interest, as well as a lack of understanding on the part of the patient are common barriers to DEP referral and participation (Gucciardi et al., 2011; Horigan et al., 2016).

Physician barriers to DEP referral. As stated above, the current recommended standard of practice is that all patients with diagnosed T2D should receive a referral to an outpatient DEP (ADA, 2016c; Hooks-Anderson, Crannage, Salas, & Scherrer, 2015; Powers et al., 2015). Education is a crucial step toward helping patients develop lifestyle habits that are conducive to long-term disease pattern self-management and healthier outcomes (ADA, 2016c; Hooks-Anderson et al., 2015; Powers et al., 2015). However, evidence shows that this does not happen (ADA, 2016b; Chomko et al., 2016; Gucciardi et al., 2011; Li et al., 2014). This fact, along with the research by Gucciardi et al. (2011) and Manard et al. (2016) showing that if a physician feels that a patient might be reluctant to attend outpatient education, they may not refer them at all, tends to keep these rates of referral lower than they should be.

This investigation showed that 48% of T2D patients that were referred to the Living Well with Diabetes intervention by their physician were indeed DEP participants

(Table 5). It stands to reason then, that even if a physician perceives a lack of patient enthusiasm for an outpatient DEP, they should still recommend this course of action for because it is the recommended standard practice, and because approximately one out of two patients referred to a DEP will become participants. Indeed, this lack of physician-referrals to DEP programs only adds to the barriers-to-participation that patients face.

Patient barriers to DEP participation. Some of the barriers that patients face to attending DEPs include a lack of understanding the benefits of diabetes education, being unaware of a local DEP, or having insurance coverage or reimbursement concerns (ADA, 2016b; Chomko et al., 2016; Horigan et al., 2016). Even following a physician-referral to outpatient diabetes education there is a continued lack of participation by patients; a finding supported by this current investigation showing that, even with a physician-referral to the Living Well with Diabetes program, 52% of patients did not follow through (Horigan et al., 2016; Winkley et al., 2015).

It seems that there may be a misunderstanding on both sides; physicians may feel that their patients lack enthusiasm for outpatient education while patients may feel that a DEP is merely a suggestion (Horigan et al., 2016). However, of the many reasons that patients may have for not attending DEPs, their lack of knowledge about both T2D and the benefits of DSME should not be reasons for not attending these programs (Horigan et al., 2016; Manard et al., 2016; Winkley et al., 2015). It remains incumbent upon the physician to understand the importance of these programs in helping patients manage their disease, and vital that the physician knows (and recommends) the local DSME providers (Chomko et al., 2016; Horigan et al., 2016).

The information that has been gathered while answering the second research question that focused on the relationship between a patient’s referral source to the Living Well with Diabetes program and the number of sessions the patient completed has also provided some useful information. With this question, we are now able to understand that as one gets older, they tend to have higher DEP participation rates.

In addition, while there was no information related to self-referred patients to these types of programs, this investigation was able to explain this relationship a bit. For the Living Well with Diabetes program, 64.5% of the patients who were self-referred participated in one or more sessions. According to M. J. Milner, having this DEP housed in a senior community center seems to be advantageous because of the daily interaction between of the DEP staff and participants, both current and former (personal communication, May 11, 2017). This may speak to the importance of education in advance of the formal DEP to help referred patients better understand the risk of not taking action, along with the benefits of taking action. So, the constructs of the HBM can be also be used by the CDEs to guide these daily interactions. This is important because this interaction provides a degree of enthusiasm, along with information about benefits of the DEP that seems to be lacking from the physicians. Given the 64.5% participation rate for those who were self-referred, this interaction and enthusiasm seems to lead to an increased conversion of referrals into participants. This knowledge provides ideas for additional study, which will be addressed later in this chapter. (M. J. Milner, personal communication, May 11, 2017).

Changes in Hemoglobin A1c Levels

To answer the third research question, to determine if the number of DEP sessions patients completed was related to their reported changes in HbA1c levels, multiple linear regression showed that there was not a statistically significant association between the number of educational sessions that each patient attends and their self-reported HbA1c levels, even while controlling for all of the covariates. This was repeated using self-reported FBG levels and the same findings resulted.

The above findings for this current investigation are not supported by the literature. In fact, it is reasonable to assume that the more education and support a patient has, the better they will be at managing their disease. By attending DEPs, patients' knowledge tends to improve and, subsequently, so do their lifestyle behaviors (Chomko, Odegard, & Evert, 2016). They experience a decrease diabetes-related complications, lower levels of depression, and reduced hospitalizations, all evidence that improved knowledge enhances daily T2D pattern-management and quality of life (Chomko, Odegard, & Evert, 2016; Jalilian et al., 2014).

The cross-tabulation counts, however, do display actual improvement in patients' self-reported HbA1c and FBG levels. Of all the patients who did report post-Living Well with Diabetes HbA1c and FBG levels, there was only one that did not report an improvement in one of these. These improvements in HbA1c and FBG are indications of improvements in the HBM construct of self-efficacy, or better compliance with new, healthier behaviors. However, the size of the sample that was used to answer this research question most likely has a limiting effect on these results. This will be discussed further when the limitations of this current investigation are discussed in the next section.

Limitations of the Study

With all research, no matter how tightly controlled the researchers' intentions and practices are, there are always underlying issues that may influence research outcomes (Price & Murnan, 2004). It is always important to report and discuss the limitations that may be present and their potential effect on the interpretation of a study's findings (Price & Murnan, 2004). This investigation presented a couple of limitations including the research design itself, and the sample size of the study group.

Limitations of the Retrospective Design

The retrospective design present limitations, especially with regard to generalizability, however, it is a practical method and is useful when dealing with nonrandomized as well as smaller sample sizes (Vassar & Holzmann, 2013). In addition, the ability to use secondary data from existing, local public health interventions can aid in both evaluating and updating current programs.

Unlike the classic clinical trial that allows for randomization, the retrospective cohort design is limited to secondary data, which limits the ability to generalize the results (Vassar & Holzmann, 2013). Randomization, such as in the clinical trial, places subjects into control and experimental groups, which helps to improve the internal validity of the investigation, as well as its ability to generalize. As well, there are several additional inherent limitations of the retrospective design including the ability to access the data, and the way in which the data was collected (Frankfort-Nachmias & Nachmias, 2008).

Generalizability. Given the nature of archived data, there was not the ability to randomize, so the ability to generalize these results to the population may be limited (Rudestam & Newton, 2007). This limited ability to generalize the results is also true for any of the correlations or relationships that were brought to light as the result of the statistical analyses. However, these investigations provide the opportunity to investigate multiple outcomes, as well as to help identify more specific means by which to study the outcome variables, which was the case for this current research. In light of this, and in order to investigate the research questions that were addressed here, a retrospective design was necessary (Frankfort-Nachmias & Nachmias, 2008).

The researcher of this current investigation understands this challenge to generalizability, but also feels that this study will provide valuable information that is immediately usable to this specific, and on-going, Living Well with Diabetes program. As Vassar & Holzmann (2013) discussed, even with these issues related to generalizability, using this design can provide valuable information that can help assess the effectiveness of health programs that are currently ongoing. In particular, these results may serve as an evaluation of the current DEP by providing information that can serve to inform the design and implementation of future iterations of this program. In addition, the current director of the Living Well with Diabetes program has stated that their main challenges are twofold; converting more patients (both physician-referred and self-referred) into DEP participants, and having physicians refer more of their T2D patients to this program (M. J. Milner, personal communication, May 11, 2017). The information gained from this current study will be helpful in creating strategies to mitigate these challenges.

Access to Data. Gaining physical access to the data can often be challenging, especially with larger data files. This data may be a large data set such as is the case with national surveys and disease surveillance. Also, data that includes patient information may be difficult to access, especially if this information is contained actual hard-copy patient files. Often, after a certain number of years, these files are stored on a site other than the clinic/facility being studied.

For this current investigation, the physical data was still located on-site, and permission to access and use this data was granted by the Director of this Senior Community Center (Appendix E).

Data collection. Gaining access to secondary data can provide a relatively simple way of studying several outcome variables at the same time. Because of this, it can be difficult to find a dataset that contains the appropriate outcome variables, in relation to the current research questions of the investigator (Frankfort-Nachmias & Nachmias, 2008). For this study, the stated goals of the Living Well with Diabetes program and the dataset itself, matched the research questions.

As well, the researcher often wants to study a specific time-frame (such was the case here). In a retrospective study, the data is already collected and the sample, though unknown prior to data collection, is predetermined. This helps to reduce the cost and time burden that can accompany the use of prospective data (Sedgwick, 2014; Vassar & Holzmann, 2013). Again, the available dataset was a perfect match for the research questions.

An additional consideration when using a set of secondary data is that the information was collected by someone other than the researcher, so reliability may be an issue (Frankfort-Nachmias & Nachmias, 2008). This information is vital when attempting to determine potential sources of bias, errors, or issues with both internal and external validity (Frankfort-Nachmias & Nachmias, 2008). For this current investigation, all data was collected by the same team. More importantly, and as pointed out by M. J. Milner, the vast majority of the data was gathered during the initial assessment by the same person –a nurse and the Living Well with Diabetes program director (personal communication, May 11, 2017).

Taken together, these limitations of the retrospective design, being able to identify and address them, has proven to be advantageous to this investigation. In addition, as Creswell (2009) articulated, this design provided the opportunity to identify issues that may have affected the outcomes, while at the same time, being able to identify and evaluate relationships that existed among them.

Sample Size of the Study Group

The Living Well with Diabetes program obtains its participants only after a referral from their physician, or from self-referrals. Current and historical information showed that the program enrolled 5-10 participants each time it was offered; and, this program is regularly offered 5-7 times each year. So, for the two-year span that this investigation studied, one could expect between 25-70 participants per year. In actuality, the data yielded a total population of 162 (*N* = 162) for the combined years 2015-2016. Given the reality that there are significantly more adults in RI with T2D than are referred for outpatient diabetes education, 162 total referrals exceeded expectations.

Power is a critical part of a research study and is positively correlated with sample size. If a study has sufficient power, it is easier to generalize the results to the overall population (Faber & Fonseca, 2014). In general, then, the larger the sample size, the greater power (Field, 2013; Frankfort-Nachmias & Nachmias, 2008; Olbricht & Wang, 2005). Typically, the power of a statistical test is considered to be adequate at .80. A power of .80 means that the investigator is accepting an 80% chance of finding a statistically significant difference when it actually does exist (Faber & Fonseca, 2014; Sullivan, 2012). It is also important to note, however, that the researcher is also accepting a 20% chance of a Type II error, which is failing to reject the null hypothesis when the null hypothesis is, in fact, false (Faber & Fonseca, 2014; Sullivan, 2012).

Power analysis cannot be run prior to data collection for a retrospective study, because the sample could not be known until following data collection from the existing patient data. So, to address this sample size limitation, post hoc power was calculated for the main research question, which asked whether there was a significant difference in DEP participation between patients referred to this program by their physician, or those who were self-referred, while controlling for the covariates. As discussed in Chapter 4, a post hoc *G*Power* analysis was conducted following the chi-square test that was used to answer this main question and revealed a statistical power of .83. An 83% level of power is more than adequate to find a true statistically significant difference when there is one, or a 20% chance of not finding it (Field, 2013; Frankfort-Nachmias & Nachmias, 2008; Olbricht & Wang, 2005). The power analysis revealed the statistical power of 83% for this chi-square analysis supports the rejection of $H_0 1$.

This investigation presented a couple of key limitations including the research design and the sample size of the study group, which may limit its external validity. However, these results may serve as useful information for this local DEP as they continue to strive to mitigate their current challenges regarding patient referrals and program participation.

Recommendations

Dissemination and Recommendations for Action

Although there are effective treatments for T2D that can lead to improved patient self-management, DEPs are still not offered to all patients who have been diagnosed with diabetes. The following recommendations for action are based on the interpretation of the results of this study and are primarily related to the dissemination of these findings.

This current research project and its findings will serve as a starting point for the evaluation, and re-design of the methods by which this local Senior Community Center, and its stakeholders, markets its Living Well with Diabetes program to physicians and potential participants. The primary stakeholders of the Living Well with Diabetes program are the Senior Community Center, the health clinic staff and CDEs, referring physicians, current program participants, patients who have been referred to this program, and the senior adults who use this community center or various programs and services. As such, the goal of this initial dissemination plan was to review the research study and its results, and to identify the current effectiveness of the Living Well with Diabetes program in helping its participants to achieve improved T2D self-management habits. In addition, the summary statistics for patient demographic variables, referral sources, results and implications of the statistical analyses, patient participation and attrition rates, and program outcomes (changes in HbA1c and FBG levels) were presented and discussed.

This discussion resulted in a plan of action that will be ongoing and focused on getting more referrals (both physician- and self-referrals) to the Living Well with Diabetes program, to convert more of these referrals into actual DEP participants, and to have more participants complete the entire four-session program. Also, there is a plan to continue to improve and supplement the existing Living Well with Diabetes educational materials, including information that includes reminders of the positive health outcomes that can be achieved with continued participation in all four sessions.

In addition, participants will continue to be reminded that there are additional opportunities for individual nutrition counseling, one-on-one discussions with a pharmacist/CDE, to review medication management, and ongoing opportunities for scheduled appointments and walk-in discussions with the Living Well with Diabetes and Health Office director. This Senior Community Center is open daily and the health clinic staff is available to answer questions and provide counseling in a private setting during their open hours.

The results and implications of this study have been incorporated appropriately into the initial Living Well with Diabetes program informational forms that are given to patients to inquire about this program or who have been referred but have not yet committed to attending (M. J. Milner, personal communication July 18th, 2017). This is an initiative of primary importance, and will be an ongoing effort. Along with this, the DEP staff is working on developing strategies to help patients make the commitment to participate in the Living Well with Diabetes program, another step toward the goal of converting more referrals to actual participants (M. J. Milner, personal communication July 18th, 2017).

Lastly, additional dissemination will continue to occur in this Senior Community Center on a daily, and weekly, basis through educational (promotional) materials and weekly or monthly informational sessions that stress the importance of diabetes education. This information will be available, on an ongoing basis, to all senior adults who use this community center for various programs and services on a daily basis (M. J.

Milner, personal communication July 18th, 2017). This community center has historically yielded a consistent number of self-referrals to the Living Well with Diabetes program, and it is reasonable to think that there potentially more participants from this group.

The success of this plan and each of these activities will be evident if there is an increase in both physician- and self-referrals and actual participants to the Living Well with Diabetes program. Both sources of referrals will continue to be tracked as has been done previously. In addition, successful dissemination results will show an increase in the number of session each patient attends. This type of information is, and will continue to be, collected by the Living Well with Diabetes program director (M. J. Milner, personal communication July 18th, 2017).

Recommendations for Future Research

Outpatient diabetes education is an essential tool in helping patients to understand their disease and how changing, or refining, a few lifestyle and disease management habits can improve their outcomes and quality of life and, at the same time, decrease their chances of additional complications (APHA, 2016; Eborall et al., 2016; Gill et al., 2012; Laws, St. George, Rychetnik, & Bauman, 2012; North & Palmer, 2015; USDHHS, 2013).

As with most research, in attempting to answer the current research questions, additional questions, and gaps in the research arise. In this light, there are a few areas for additional research that can be recommended here. It is important to keep in mind, however, that these suggestions address the gaps and challenges identified while doing the literature review and in the process of attempting to answer the currently identified research questions. This is by no means a comprehensive list of the current research possibilities that exist for T2D outpatient education, referral and attrition rates, and health outcomes as a result of DEP participation.

In addition to the promising patient outcomes from as little as one DEP session, evidence shows that physicians should be referring all patients with diagnosed T2D to DEPs (ADA, 2016b; ADA, 2016c; Hooks-Anderson, Crannage, Salas, & Scherrer, 2015; Powers et al., 2015). From the literature review, however, it is known that referral rates to these programs continue to be poor, though it is not known how many T2D patients are actually referred to DEPs (ADA, 2016b; Chomko et al., 2016; Gucciardi et al., 2011; Li et al., 2014). This has been done locally and regionally for various projects, such as program evaluations. To date, however, there is no database that tracks national incidence rates of DEP referral and participation, which is how the first research question for this current investigation came about. With this in mind, a future investigation that tracked the incidence rates of T2D, as compared to the rates of physician referrals to DEPs would help to provide a more accurate understanding of current physician practices. In turn, this would help to identify any gaps in the current practice recommendations.

Even if referral rates to outpatient DEPs were known, as discussed above, what still remains unknown is the number of sessions that patients attended, or program attrition rates. In this current investigation, the CDEs used an online database to track referrals and initial evaluation information. However, attendance records were kept, by hand, on paper charts. This worked well for this small-scale investigation. However, in order to track national DEP participation, attendance, and attrition rates, there needs to be a commitment from a number of parties in order to gather and integrate this type of data. So, a recommendation for future research along these lines would include several elements including, research to compile a database of currently running DEPs, the types of tracking software or systems that are being used, and the possibilities that may exist to compile the incidence of referrals to DEPs and rates of attendance gathered from these databases. This information, added to the knowledge base, could serve to better support standard practice guidelines, and give physicians the research support that is currently lacking along these lines.

Evidence exists that a structured educational approach can be effective for helping T2D patients gain the knowledge and motivation needed to develop healthier lifestyle and disease management habits (Pipe-Thomas, 2012; Powers et al., 2015). This, in turn, can result in improved health outcomes, including HbA1c and FBG levels, enhanced self-efficacy, a reduction of diabetes complications, and an improvement in quality of life (ADA, 2016a; Adejoh, 2014; Kemppainen et al., 2013; Krousel-Wood, et al., 2012; Noordman et al., 2012; Powers et al., 2015; Willard-Grace et al., 2015). However, lack of referral and participation, along with attrition rates, limits the impact of these positive outcomes to a small percentage of T2D patients.

Some of these reasons include barriers faced by both physicians and patients. Barriers that physicians report for lower-than-desired referral rates to DEPs include increased patient load and time demands, the lack of required knowledge to confidently educate patients and, even sometimes, the lack of understanding of the benefits that outpatient education can provide to T2D patients (Gucciardi et al., 2011).

Some of the reported barriers that patients face include a lack of understanding about the nature and benefits DEPs, not knowing where there is a locally available DEP, and concerns about out-of-pocket costs or the possibility of insurance coverage for DSME services (ADA, 2016b; Chomko et al., 2016; Horigan et al., 2016). Also, there are additional barriers for patients such as scheduling and transportation issues (ADA, 2016b; Chomko et al., 2016; Horigan et al., 2016).

Some, or all of these barriers can be mitigated if appropriately addressed with supporting knowledge that addresses each of the concerns listed above (Davidson, 2009; Eborall et al., 2016; Gucciardi et al., 2011; McGinnis et al., 2014; USDHHS, 2013). So, it would be interesting to further investigate the exact nature and origin of these barriers, along with possibilities for overcoming them, using the HBM to guide the design of this research. In fact, it may be a worthwhile endeavor to design a mixed-methods investigation that uses qualitative methodology to further investigate the perceived barriers previously identified and potential strategies to mitigate these barriers, and quantitative methods to track referral, participation, and participation-persistence rates.

Finally, the results of this current small-scale investigation indicate that the Living Well with Diabetes program, along with its referral sources, and the ability of the staff to follow-up with patients can result in beneficial outcomes for its participants. This may speak to the HBM constructs of perceived barriers, and patients subsequently taking action. To corroborate these results, and support the suggested practice of referring every patient who has been diagnosed with T2D to an outpatient DEP, it is recommend that this investigation be repeated using a larger sample size. This recommendation would include several physician practices and DEPs, as opposed to just one. Since this local community center model provided the infrastructure, staffing, and social atmosphere that proved beneficial to help convert self-referred patients to participants in their Living Well with Diabetes program, it might be wise to locate similar programs in the state and include them in future investigations. And, given the possibilities that may exist in the near future with more comprehensive databases, repeating this investigation across an entire state or region is plausible.

Implications for Social Change

This quantitative, retrospective investigation examined the associations present between the source of referral to an outpatient DEP, the number of sessions patients attended, and changes in their HbA1c levels. The potential for positive social change implications are significant with this investigation for several reasons. First, this investigation has the potential to provide a significant positive impact on how physicians and diabetes educators approach the importance of diabetes education to long-term quality of life with patients.

Secondly, since there has not been any large-scale research that has attempted to quantify how the source of patient referral to DEPs translate into attendance, persistence, and an improved quality of life. The results of this small-scale investigation can serve as a starting point for physicians, with the hope of improving their belief in the importance of outpatient diabetes education toward healthier outcomes for T2D patients. After all, best practices do suggest that all patients with T2D be referred to outpatient education programs for the purpose of helping patients to establish improved, and more consistent, disease pattern management habits (ADA, 2016a; Adejoh, 2014; Kemppainen et al., 2013; Krousel-Wood, et al., 2012; Noordman et al., 2012; Powers et al., 2015; Willard-Grace et al., 2015).

Of course, the goals of improved disease pattern management and better outcomes, with fewer complications can only be achieved if patients are both referred to, and actually attend these programs. So, a better understanding the differing levels of success and/or motivation between physician-referred or self-referred patients can help to inform the development of marketing and educational materials, along with policies targeted toward those most in need of this type of education.

Ultimately, when a higher proportion of patients with T2D participate in DEPs, the potential for improved and more consistent long-term diabetes self-management will help decrease the incidence of debilitating complications that can accompany T2D (Eborall et al., 2016; HP2020, 2016; Matte & Velonakis, 2014; Powers et al., 2015). In addition, this approach can potentially bolster two of the basic tenets of public health, namely the prevention of disease, and the improvement of lifestyles that are more wellness-focused (APHA, 2016). Taken together, these implications for social change are a vital aspect of the initial motivation of this current research –to decrease the overall burden of T2D on the individual, community, and population levels.

Finally, this investigation can provide a means for contributing to positive social change by serving as a blueprint for outreach to marginalized populations. Marginalized populations often have a higher risk for T2D and its complications, so the use of this information to identify strategies that can result in better attendance for DEPs, is imperative. As an example, if a participant in the Living Well with Diabetes program is having transportation issues, they can arrange for a vehicle from the community center to pick them up. Outpatient DEPs, especially when they are housed within community centers such as this, are often able to more successfully address the individual, community, and population burden that T2D currently presents.

Conclusion

The predominant goal of this investigation was to explore the records of patients who were referred to the Living Well with Diabetes program in a small Senior Community Center in RI, with the goal of understanding whether the different referral sources to this program had an effect on patient participation and attendance rates. The results suggest that the source of referral to this DEP does have an effect on patient participation rates. Those who are self-referred appear to have a little more initial motivation to learn about improving their T2D self-management and lifestyle habits. Also, as one gets older, they tend to have higher participation and attendance rates

Also, because this DEP intervention is rooted in the tenets of the HBM, additional consideration sought to determine if there was an association between patient participation and their HbA1c levels. Since HbA1c levels are a several-month marker of blood sugar levels, an improved HbA1c level would be an indication of improved compliance with healthier behaviors, a marker of self-efficacy. However, while there was not a statistically significant association between the number of sessions that patients attended and their self-reported HbA1c or FBG levels, it was clear that those who did show up consistently achieved positive results. This, in particular, speaks to one of the main limitations of having a small sample size, as small sample sizes can undermine both the internal and external validity of an investigation. The recommendation to repeat this investigation with a larger sample size would decrease the chances of finding a false hypothesis to be true.

The ongoing intention of the Living Well with Diabetes program is to improve the ability for T2D patients to understand how to better their disease management habits on a consistent and on-going basis. While small in scale, this was among the first investigations to look at the effects of different referral sources with regard to participation rates, program attrition, and the resulting blood sugar control outcomes. And, the fact that this program is housed and administered from within an active senior community center sheds even more light on the importance of community interaction, ongoing education and support, and easy access to medical staff, diabetes educators, and dietitians.

These results could be used inform the design of future DEP interventions, provide strategies for the physician to more frequently refer T2D patients to outpatient education, and to offer approaches for the director of these programs to help those patients who have been referred to a DEP to become actual participants. In designing future DEP interventions, or even in the design of marketing strategies that would be used to increase both physician- and self-referral rates, using strategies that are informed by the HBM may prove to be beneficial, especially regarding perceived barriers to participation and health-related behavior change.

The Living Well with Diabetes curriculum, approach, and implementation, utilized elements of the HBM including the benefits of –and barriers to- health behavior change, cues to action, and self-efficacy. Patient participation and ultimately, their participation-persistence, and outcomes reflected the strategies are essential determinants of patient outcomes. The ultimate goal of diabetes education is to increase referrals, participation, and persistence in order to educate T2D patients in a manner that will lead to improved overall disease pattern management. This may be a paradigm shift (Community Center Model that supports self-referral and self-efficacy) in disease management practices, but it is one worth considering, especially from the standpoint of finding ways to address the challenges, or barriers, to outpatient education and self-management that have been discussed here. The use of the HBM can be particularly helpful in this regard. Moving in this direction will help to mitigate the incidence of debilitating complications that can accompany T2D, an approach that can lessen the overall burden of T2D, help to support public health toward the goals of disease prevention (by avoiding additional chronic diseases) and the improvement lifestyle habits that are more focused on achieving overall wellness.

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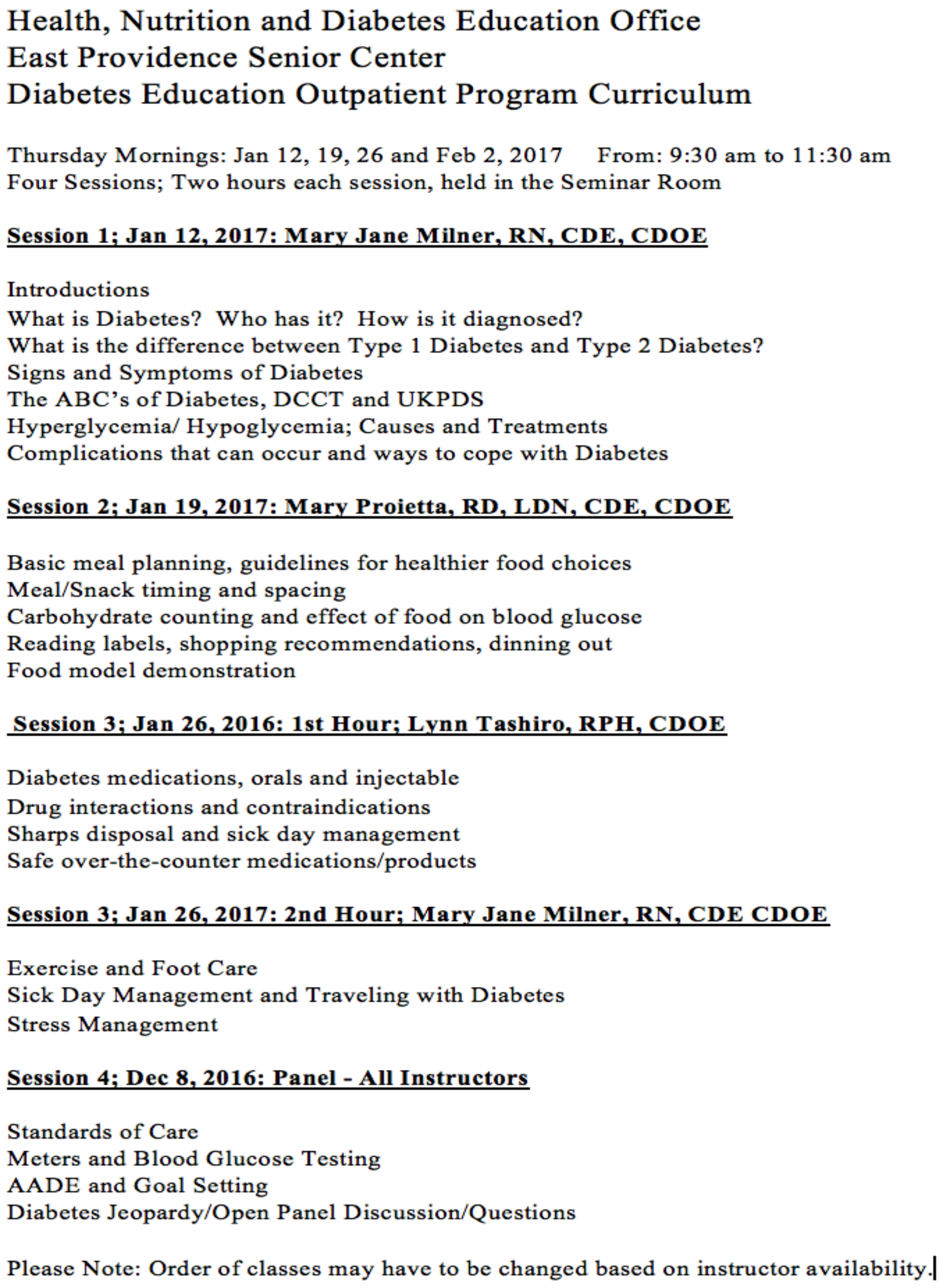
Appendix A -Categories and Schedule of Topics



Health, Nutrition and Diabetes Education Office
East Providence Senior Center
Diabetes Education Outpatient Program Curriculum

Thursday Mornings: Jan 12, 19, 26 and Feb 2, 2017 From: 9:30 am to 11:30 am
Four Sessions; Two hours each session, held in the Seminar Room

Session 1; Jan 12, 2017: Mary Jane Milner, RN, CDE, CDOE

Introductions
What is Diabetes? Who has it? How is it diagnosed?
What is the difference between Type 1 Diabetes and Type 2 Diabetes?
Signs and Symptoms of Diabetes
The ABC's of Diabetes, DCCT and UKPDS
Hyperglycemia/ Hypoglycemia; Causes and Treatments
Complications that can occur and ways to cope with Diabetes

Session 2; Jan 19, 2017: Mary Proietta, RD, LDN, CDE, CDOE

Basic meal planning, guidelines for healthier food choices
Meal/Snack timing and spacing
Carbohydrate counting and effect of food on blood glucose
Reading labels, shopping recommendations, dinning out
Food model demonstration

Session 3; Jan 26, 2016: 1st Hour; Lynn Tashiro, RPH, CDOE

Diabetes medications, orals and injectable
Drug interactions and contraindications
Sharps disposal and sick day management
Safe over-the-counter medications/products

Session 3; Jan 26, 2017: 2nd Hour; Mary Jane Milner, RN, CDE CDOE

Exercise and Foot Care
Sick Day Management and Traveling with Diabetes
Stress Management

Session 4; Dec 8, 2016: Panel - All Instructors

Standards of Care
Meters and Blood Glucose Testing
AADE and Goal Setting
Diabetes Jeopardy/Open Panel Discussion/Questions

Please Note: Order of classes may have to be changed based on instructor availability.

Appendix B: Patient Assessment

Health, Nutrition and Diabetes Education Office
East Providence Senior Center

Diabetes Education Patient Information – Assessment

Name ___________________________________ Date of Birth________________________

Patient Phone:___________________________PCP Name:_____________________________
Patient Address:_________________________ PCP Phone:_____________________________
______________________________________ PCP Fax: _______________________________
______________________________________ PCP NPI #______________________________

1. Gender: F☐ M☐ Caucasian ☐ African American/Black ☐ Asian ☐ Hispanic ☐
   Portuguese ☐ Other ☐ Language preference ______________________
2. What type of diabetes do you have? ☐ Type 1 ☐ Type 2 ☐ Gestational ☐Unknown
3. How long have you had diabetes? __________________
4. Any family members with diabetes?____
5. Do you take diabetes medications? Y☐ N☐ If yes, please list under **Medications**.
   ☐Diabetes pills ☐Insulin Other Injectable ☐ _________________________________
6. Do you take any other medications? Y☐ N☐ Please list under **Medications**.
7. Do you ever forget to take your medications? Y☐ N☐
8. Do you have any other medical conditions? Y☐ N☐ Please list under **Medical Conditions**.
9. What is your last grade of school completed? ____________________
10. Are you currently employed? _______ What is your occupation? ___________________
11. How many people live in your household? _____How are they related to you? __________
12. Who helps you with your diabetes? ☐Family ☐Friend or Co-workers ☐No-one
13. Ht.___________ Current weight.________ Desired weight.__________
14. Do you follow a meal plan? Y☐ N☐ Do you read and use food labels? Y☐ N☐
    Do you count Carbohydrates? Y☐ N☐
    Do you have any diet restrictions: ☐Salt ☐Fat ☐Fluid ☐ Other_______________
    Reason for diet restrictions:____
    ____

Health, Nutrition and Diabetes Education Office
East Providence Senior Center

Diabetes Education Patient Information – Assessment

Name ______________________________________ Date of Birth__________________________

Patient Phone:_____________________________PCP Name:_______________________________
Patient Address:___________________________ PCP Phone:_______________________________
____ PCP Fax: _________________________________
____ PCP NPI #_________________________________

1. Gender: F☐ M☐ Caucasian ☐ African American/Black ☐ Asian ☐ Hispanic ☐ Portuguese ☐ Other ☐ Language preference ________________________

2. What type of diabetes do you have? ☐ Type 1 ☐ Type 2 ☐ Gestational ☐Unknown

3. How long have you had diabetes? ___________________

4. Any family members with diabetes?____

5. Do you take diabetes medications? Y☐ N☐ If yes, please list under **Medications**.
   ☐Diabetes pills ☐Insulin Other Injectable ☐ ____________________________________

6. Do you take any other medications? Y☐ N☐ Please list under **Medications**.

7. Do you ever forget to take your medications? Y☐ N☐

8. Do you have any other medical conditions? Y☐ N☐ Please list under **Medical Conditions**.

9. What is your last grade of school completed? ____________________

10. Are you currently employed? _______ What is your occupation? ____________________

11. How many people live in your household? _____How are they related to you? __________

12. Who helps you with your diabetes? ☐Family ☐Friend or Co-workers ☐ No-one

13. Ht.___________ Current weight.________ Desired weight.__________

14. Do you follow a meal plan? Y☐ N☐ Do you read and use food labels? Y☐ N☐
    Do you count Carbohydrates? Y☐ N☐
    Do you have any diet restrictions: ☐Salt ☐Fat ☐Fluid ☐ Other_______________
    Reason for diet restrictions:____
    ____

<u>Please give a sample of your meals for a typical day</u>:

Breakfast Time:
____

Lunch Time:
____

Dinner Time:
____

Snacks Time: ____

15. Do you do your own food shopping? Y☐ N☐ Do you cook your own meals? Y☐ N☐

16. Do you drink alcohol? Y☐ N☐ Type:_________ How many per day____ per wk____

17. Do you use tobacco? Y☐ N☐ ☐Cigarettes ☐Pipe ☐Cigars ☐ Chewing ☐Quit

18. Do you use any recreational drugs? Y☐ N☐ Type:____________ How often: ___________

19. Do you do exercise regularly? Y☐ N☐ Type:____________ How often: ______________

20. How many hours a night do you sleep?________

21. Do you test your blood sugars? Y☐ N☐ How often do you test? ______-___times a day.
    What is your pre meal blood sugar goal? _________ Post meal blood sugar goal? _________
    When do you test? ☐ Fasting ☐ Before meals ☐ 2 hours after meals ☐ Before bed

22. In the past month, how often have you had a low blood sugar? ☐ Never or _______times.

23. Can you tell when your blood sugar is too high? Y☐ N☐

24. Check all of the following that you have had in the past 12 months.
    ☐ Dilated eye exam ☐ Urine test for protein ☐ Foot exam ☐ A1c test
    ☐ Dental exam ☐ Pneumonia shot ☐ Flu shot ☐ Cholesterol

25. In the past 6 months, have you been admitted to the hospital? Y☐ N☐

Used emergency room services? Y☐ N☐
Were these visits related to diabetes? Y☐ N☐

21. Please check all that apply:
☐Eye problems ☐Kidney problems ☐Numbness/tingling of feet
☐Dental problems ☐High cholesterol ☐High blood pressure
☐Depression ☐Sexual problems

22. Have you had instruction on how to care for your diabetes? Y☐ N☐
When? ________

23. In your own words, what is diabetes? How do you feel about having diabetes?
____

24. How do you learn best? ☐Listening ☐Reading ☐Seeing ☐Doing

25. Do you have any difficulty ☐Hearing ☐Reading ☐Seeing ☐ Speaking

26. Do you observe any special cultural or religious practices?____________________________

27. Please indicate your feeling regarding the following statements:

I feel good about my general health: ☐Agree ☐Neutral ☐ Disagree
My diabetes interferes with my life: ☐Agree ☐Neutral ☐ Disagree
I have some control over whether I get Diabetes complications: ☐Agree ☐Neutral ☐ Disagree
My level of stress is high: ☐Agree ☐Neutral ☐ Disagree

Stress Scale: rate your stress on an average day
1 2 3 4 5 6 7 8 9 10

28. How do you handle stress?
____

29. What areas of diabetes are you most interested in learning about?

Medications – Please list diabetes medicines first Date Started

1.____

2.____

3.____

4.____

5.____

6.____

7.____

8.____

9.____

10.____

Allergies:____

Medical Conditions: Date of
Diagnosis

1.____

2.____

3.____

4.____

5.____

6.____

7. ____

For Women Only

30. Pregnancy and Fertility

Are you pregnant? Y☐ N
☐

Are you planning on becoming pregnant? Y☐ N
☐

Are you aware of the effects of diabetes on pregnancy? Y☐ N
☐

Are you currently using birth control? Y☐ N☐

Are you: ☐Pre-menopausal ☐Menopausal ☐Post-menopausal

Please do not write below this line

Clinical Assessment: (Weight) __________ (BMI) __________
See Attached

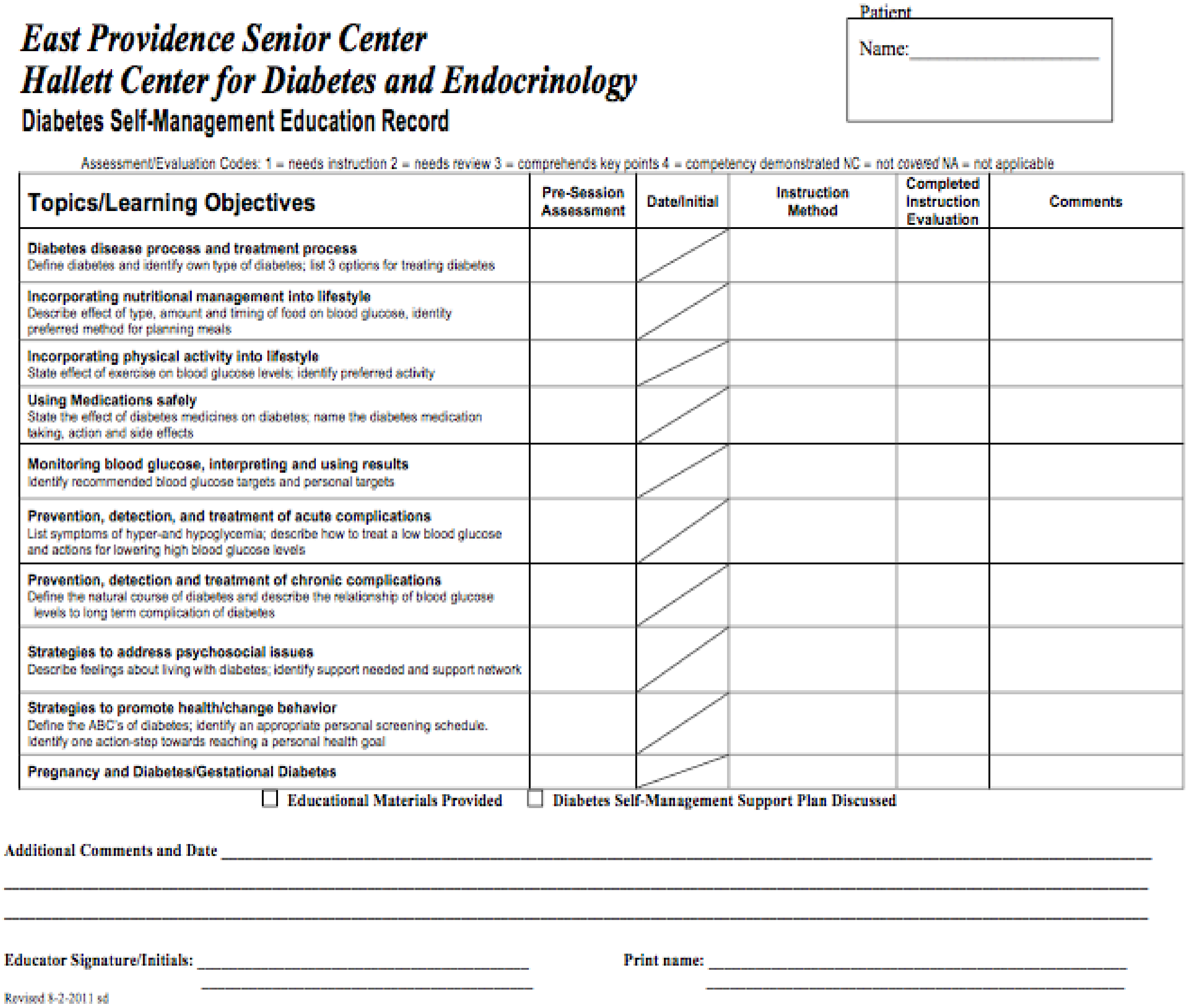
Education Plan:

☐Disease process
☐Glucose monitoring
☐Physical activity
☐Oral medications
☐Diabetes Self Management Support
☐Nutrition fundamentals
☐Carbohydrate counting
☐Behavior change strategies
☐Adjustment
☐Injectables
☐Acute complications
☐Chronic complications
☐Pregnancy

Clinician Signature:______________________________________
Date:____________________
Print name:_______________________________________

Revised 1/26/16 MJM

Appendix C: Diabetes Self-Management Education Record



East Providence Senior Center
Hallett Center for Diabetes and Endocrinology
Diabetes Self-Management Education Record

Patient
Name:________________

Assessment/Evaluation Codes: 1 = needs instruction 2 = needs review 3 = comprehends key points 4 = competency demonstrated NC = not covered NA = not applicable

Topics/Learning Objectives	Pre-Session Assessment	Date/Initial	Instruction Method	Completed Instruction Evaluation	Comments
Diabetes disease process and treatment process Define diabetes and identify own type of diabetes; list 3 options for treating diabetes					
Incorporating nutritional management into lifestyle Describe effect of type, amount and timing of food on blood glucose, identify preferred method for planning meals					
Incorporating physical activity into lifestyle State effect of exercise on blood glucose levels; identify preferred activity					
Using Medications safely State the effect of diabetes medicines on diabetes; name the diabetes medication taking, action and side effects					
Monitoring blood glucose, interpreting and using results Identify recommended blood glucose targets and personal targets					
Prevention, detection, and treatment of acute complications List symptoms of hyper-and hypoglycemia; describe how to treat a low blood glucose and actions for lowering high blood glucose levels					
Prevention, detection and treatment of chronic complications Define the natural course of diabetes and describe the relationship of blood glucose levels to long term complication of diabetes					
Strategies to address psychosocial issues Describe feelings about living with diabetes; identify support needed and support network					
Strategies to promote health/change behavior Define the ABC's of diabetes; identify an appropriate personal screening schedule. Identify one action-step towards reaching a personal health goal					
Pregnancy and Diabetes/Gestational Diabetes					

☐ **Educational Materials Provided** ☐ **Diabetes Self-Management Support Plan Discussed**

Additional Comments and Date ____

____

____

Educator Signature/Initials: ____________________ **Print name:** ____________________

Revised 8-2-2011 sd

Appendix D: Patient Follow-up

East Providence Senior Center
Hallett Center for Diabetes and Endocrinology
A program of Rhode Island Hospital, A Lifespan partner

Patient Name: ___________________________ DOB: ____________Date:____________

Diabetes referral date______________ Person filling out this form ___________________

"You had diabetes education at the EPSC with_________________________. We need to follow up on your experience. Would you mind answering a few questions? It should take no longer than three minutes.

1. Regarding Healthy Eating

Have you changed your eating habits since seeing your educator?

- ○ Yes
- ○ No

Please name one thing you are doing:____

What percentage of time you are doing it.
100% - 75% - 50% - 25% - 0%

2. Regarding Being Active

Have you increase your level of activity since having diabetes education?

- ○ Yes
- ○ No

Please name one thing you are doing:____

What percentage of time you are doing it.
100% - 75% - 50% - 25% - 0%

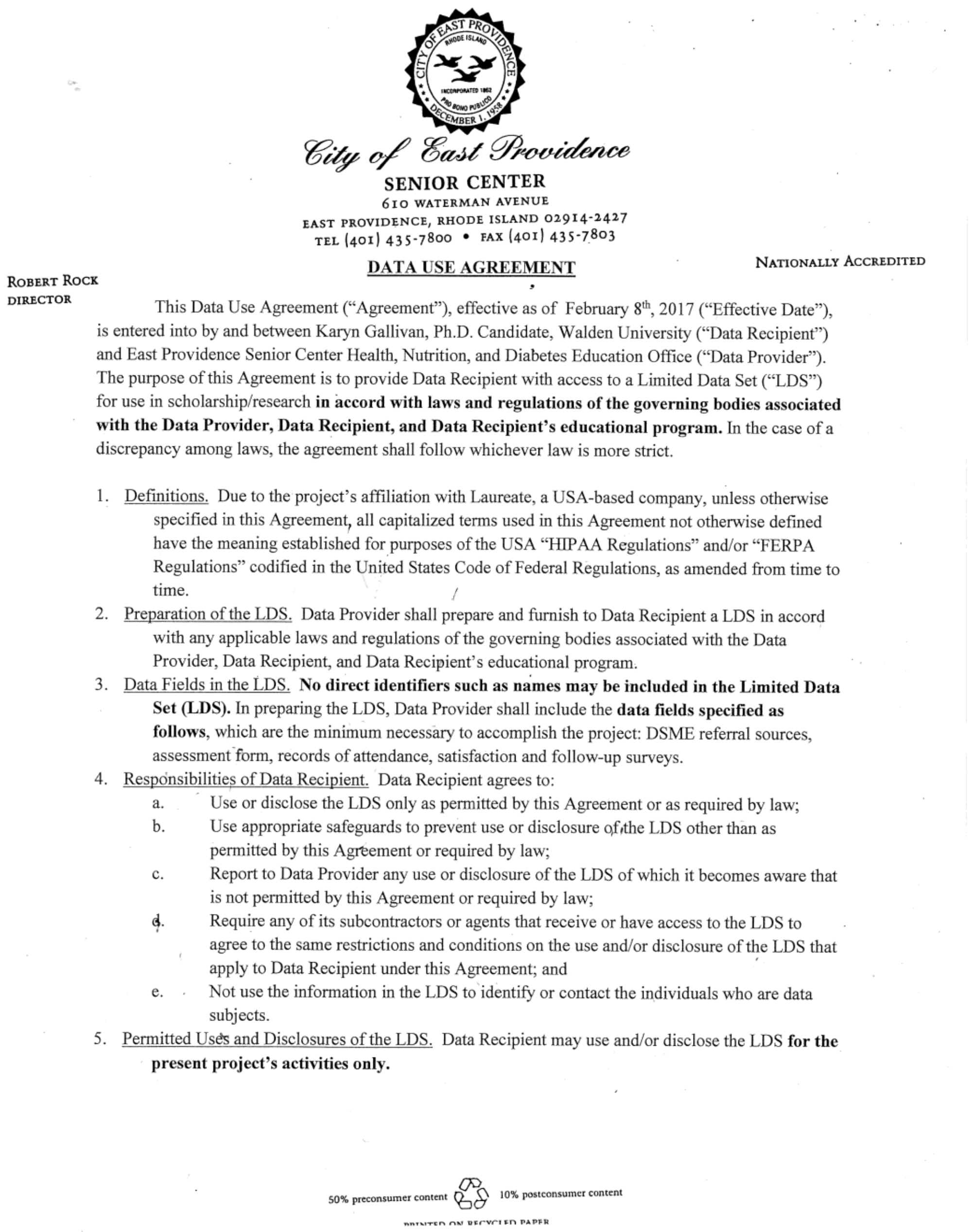
3. How often are your Fasting Blood Glucose readings are between 90-130 mg/dl:

100% - 75% - 50% - 25% - 0%

4. Do you know your current A1C level? ___________ Date last drawn;___________

5. Do you have any questions that you would like answered?
____

Appendix E -Permission for Use of Data



City of East Providence
SENIOR CENTER
610 WATERMAN AVENUE
EAST PROVIDENCE, RHODE ISLAND 02914-2427
TEL (401) 435-7800 • FAX (401) 435-7803

ROBERT ROCK
DIRECTOR

NATIONALLY ACCREDITED

DATA USE AGREEMENT

This Data Use Agreement ("Agreement"), effective as of February 8th, 2017 ("Effective Date"), is entered into by and between Karyn Gallivan, Ph.D. Candidate, Walden University ("Data Recipient") and East Providence Senior Center Health, Nutrition, and Diabetes Education Office ("Data Provider"). The purpose of this Agreement is to provide Data Recipient with access to a Limited Data Set ("LDS") for use in scholarship/research **in accord with laws and regulations of the governing bodies associated with the Data Provider, Data Recipient, and Data Recipient's educational program.** In the case of a discrepancy among laws, the agreement shall follow whichever law is more strict.

1. Definitions. Due to the project's affiliation with Laureate, a USA-based company, unless otherwise specified in this Agreement, all capitalized terms used in this Agreement not otherwise defined have the meaning established for purposes of the USA "HIPAA Regulations" and/or "FERPA Regulations" codified in the United States Code of Federal Regulations, as amended from time to time.
2. Preparation of the LDS. Data Provider shall prepare and furnish to Data Recipient a LDS in accord with any applicable laws and regulations of the governing bodies associated with the Data Provider, Data Recipient, and Data Recipient's educational program.
3. Data Fields in the LDS. **No direct identifiers such as names may be included in the Limited Data Set (LDS).** In preparing the LDS, Data Provider shall include the **data fields specified as follows**, which are the minimum necessary to accomplish the project: DSME referral sources, assessment form, records of attendance, satisfaction and follow-up surveys.
4. Responsibilities of Data Recipient. Data Recipient agrees to:
    a. Use or disclose the LDS only as permitted by this Agreement or as required by law;
    b. Use appropriate safeguards to prevent use or disclosure of the LDS other than as permitted by this Agreement or required by law;
    c. Report to Data Provider any use or disclosure of the LDS of which it becomes aware that is not permitted by this Agreement or required by law;
    d. Require any of its subcontractors or agents that receive or have access to the LDS to agree to the same restrictions and conditions on the use and/or disclosure of the LDS that apply to Data Recipient under this Agreement; and
    e. Not use the information in the LDS to identify or contact the individuals who are data subjects.
5. Permitted Uses and Disclosures of the LDS. Data Recipient may use and/or disclose the LDS **for the present project's activities only.**

50% preconsumer content ♲ 10% postconsumer content
PRINTED ON RECYCLED PAPER

6. Term and Termination.
    a. Term. The term of this Agreement shall commence as of the Effective Date and shall continue for so long as Data Recipient retains the LDS, unless sooner terminated as set forth in this Agreement.
    b. Termination by Data Recipient. Data Recipient may terminate this agreement at any time by notifying the Data Provider and returning or destroying the LDS.
    c. Termination by Data Provider. Data Provider may terminate this agreement at any time by providing thirty (30) days prior written notice to Data Recipient.
    d. For Breach. Data Provider shall provide written notice to Data Recipient within ten (10) days of any determination that Data Recipient has breached a material term of this Agreement. Data Provider shall afford Data Recipient an opportunity to cure said alleged material breach upon mutually agreeable terms. Failure to agree on mutually agreeable terms for cure within thirty (30) days shall be grounds for the immediate termination of this Agreement by Data Provider.
    e. Effect of Termination. Sections 1, 4, 5, 6(e) and 7 of this Agreement shall survive any termination of this Agreement under subsections c or d.
7. Miscellaneous.
    a. Change in Law. The parties agree to negotiate in good faith to amend this Agreement to comport with changes in federal law that materially alter either or both parties' obligations under this Agreement. Provided however, that if the parties are unable to agree to mutually acceptable amendment(s) by the compliance date of the change in applicable law or regulations, either Party may terminate this Agreement as provided in section 6.
    b. Construction of Terms. The terms of this Agreement shall be construed to give effect to applicable federal interpretative guidance regarding the HIPAA Regulations.
    c. No Third Party Beneficiaries. Nothing in this Agreement shall confer upon any person other than the parties and their respective successors or assigns, any rights, remedies, obligations, or liabilities whatsoever.
    d. Counterparts. This Agreement may be executed in one or more counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument.
    e. Headings. The headings and other captions in this Agreement are for convenience and reference only and shall not be used in interpreting, construing or enforcing any of the provisions of this Agreement.

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

DATA PROVIDER

Signed: ______________________

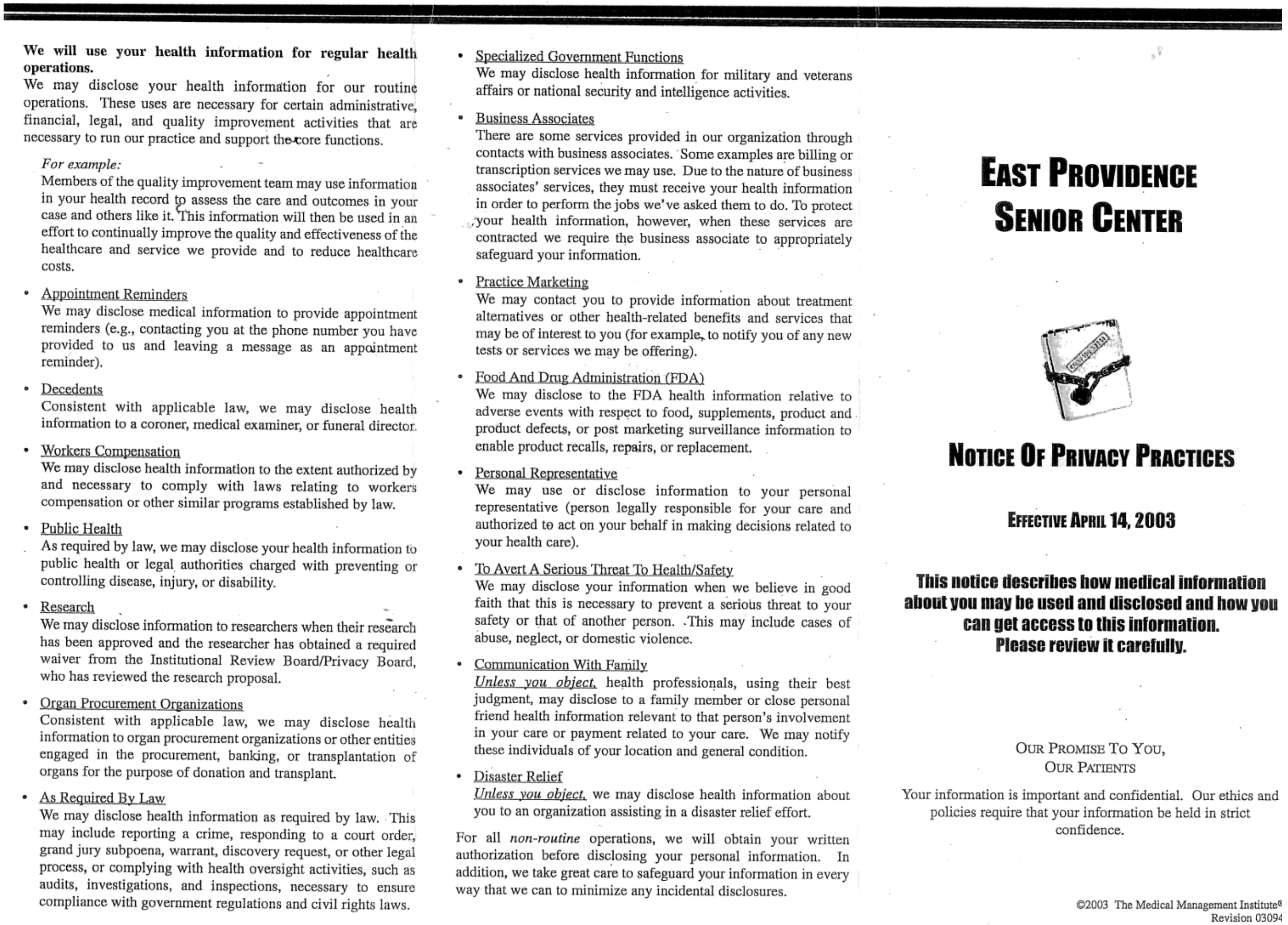
Print Name: ROBERT ROCK

DATA RECIPIENT

Signed: ______________________

Print Name: Karyn Gallivan

Appendix F: EPSC Notice of Privacy Practices



We will use your health information for regular health operations.
We may disclose your health information for our routine operations. These uses are necessary for certain administrative, financial, legal, and quality improvement activities that are necessary to run our practice and support the core functions.

For example:
Members of the quality improvement team may use information in your health record to assess the care and outcomes in your case and others like it. This information will then be used in an effort to continually improve the quality and effectiveness of the healthcare and service we provide and to reduce healthcare costs.

- Appointment Reminders
  We may disclose medical information to provide appointment reminders (e.g., contacting you at the phone number you have provided to us and leaving a message as an appointment reminder).
- Decedents
  Consistent with applicable law, we may disclose health information to a coroner, medical examiner, or funeral director.
- Workers Compensation
  We may disclose health information to the extent authorized by and necessary to comply with laws relating to workers compensation or other similar programs established by law.
- Public Health
  As required by law, we may disclose your health information to public health or legal authorities charged with preventing or controlling disease, injury, or disability.
- Research
  We may disclose information to researchers when their research has been approved and the researcher has obtained a required waiver from the Institutional Review Board/Privacy Board, who has reviewed the research proposal.
- Organ Procurement Organizations
  Consistent with applicable law, we may disclose health information to organ procurement organizations or other entities engaged in the procurement, banking, or transplantation of organs for the purpose of donation and transplant.
- As Required By Law
  We may disclose health information as required by law. This may include reporting a crime, responding to a court order, grand jury subpoena, warrant, discovery request, or other legal process, or complying with health oversight activities, such as audits, investigations, and inspections, necessary to ensure compliance with government regulations and civil rights laws.
- Specialized Government Functions
  We may disclose health information for military and veterans affairs or national security and intelligence activities.
- Business Associates
  There are some services provided in our organization through contacts with business associates. Some examples are billing or transcription services we may use. Due to the nature of business associates' services, they must receive your health information in order to perform the jobs we've asked them to do. To protect your health information, however, when these services are contracted we require the business associate to appropriately safeguard your information.
- Practice Marketing
  We may contact you to provide information about treatment alternatives or other health-related benefits and services that may be of interest to you (for example, to notify you of any new tests or services we may be offering).
- Food And Drug Administration (FDA)
  We may disclose to the FDA health information relative to adverse events with respect to food, supplements, product and product defects, or post marketing surveillance information to enable product recalls, repairs, or replacement.
- Personal Representative
  We may use or disclose information to your personal representative (person legally responsible for your care and authorized to act on your behalf in making decisions related to your health care).
- To Avert A Serious Threat To Health/Safety
  We may disclose your information when we believe in good faith that this is necessary to prevent a serious threat to your safety or that of another person. This may include cases of abuse, neglect, or domestic violence.
- Communication With Family
  Unless you object, health professionals, using their best judgment, may disclose to a family member or close personal friend health information relevant to that person's involvement in your care or payment related to your care. We may notify these individuals of your location and general condition.
- Disaster Relief
  Unless you object, we may disclose health information about you to an organization assisting in a disaster relief effort.

For all *non-routine* operations, we will obtain your written authorization before disclosing your personal information. In addition, we take great care to safeguard your information in every way that we can to minimize any incidental disclosures.

EAST PROVIDENCE SENIOR CENTER

NOTICE OF PRIVACY PRACTICES

EFFECTIVE APRIL 14, 2003

This notice describes how medical information about you may be used and disclosed and how you can get access to this information. Please review it carefully.

OUR PROMISE TO YOU,
OUR PATIENTS

Your information is important and confidential. Our ethics and policies require that your information be held in strict confidence.

Introduction

We maintain protocols to ensure the security and confidentiality of your personal information. We have physical security in our building, passwords to protect databases, compliance audits, and virus/intrusion detection software. Within our practice, access to your information is limited to those who need it to perform their jobs.

At the offices of East Providence Senior Center, we are committed to treating and using protected health information about you responsibly. This Notice of Privacy Policies describes the personal information we collect, and how and when we use or disclose that information. It also describes your rights as they relate to your protected health information. This Notice is effective April 14, 2003, and applies to all protected health information as defined by federal regulations.

Understanding Your Health Record

Each time you visit East Providence Senior Center, a record of your visit is made. Typically, this record contains your symptoms, examination and test results, diagnoses, treatment, and a plan for future care or treatment. This information, often referred to as your health or medical record, serves as a:

- Basis for planning your care and treatment,
- Means of communication among the many health professionals who contribute to your care,
- Legal document describing the care you received,
- Means by which you or a third-party payer can verify that services billed were actually provided,
- Tool in educating health professionals,
- Source of data for medical research,
- Source of information for public health officials charged to improve the health of the state and nation,
- Source of data for our planning and marketing, and
- Tool by which we can assess and continually work to improve the care we render and outcomes we achieve.

Understanding what is in your record and how your health information is used helps you to: ensure its accuracy; better understand who, what, when, where, and why others may access your health information; and make more informed decisions when authorizing disclosure to others.

Your Health Information Rights

Although your health record is the physical property of East Providence Senior Center, the information belongs to you. You have the right to:

- Obtain a paper copy of this notice of privacy policies upon request,
- Inspect and obtain a copy of your health record as provided by 45 CFR 164.524 (reasonable copy fees apply in accordance with state law),
- Amend your health record as provided by 45 CFR 164.526,
- Obtain an accounting of disclosures of your health information as provided by 45 CFR 164.528,
- Request confidential communications of your health information as provided by 45 CFR 164.522(b), and
- Request a restriction on certain uses and disclosures of your information as provided by 45 CFR 164.522(a) (however, we are not required by law to agree to a requested restriction).

Our Responsibilities

Our practice is required to:

- Maintain the privacy of your health information,
- Provide you with this notice as to our legal duties and privacy practices with respect to information we collect and maintain about you,
- Abide by the terms of this notice,
- Notify you if we are unable to agree to a requested restriction, and
- Accommodate reasonable requests you may have to communicate your health information.

We reserve the right to change our practices and to make the new provisions effective for all protected health information we maintain. We will keep a posted copy of the most current notice in our facility containing the effective date in the top, right-hand corner. In addition, each time you visit our facility for treatment, you may obtain a copy of the current notice in effect upon request.

We will not use or disclose your health information in a manner other than described in the section regarding Examples Of Disclosures For Treatment, Payment, And Health Operations, without your written authorization, which you may revoke as provided by 45 CFR 164.508(b)(5), except to the extent that action has already been taken.

For More Information Or To Report A Problem

If you have questions and would like additional information, you may contact our practice's Privacy Officer:

Rob Rock, at (401) 435-7800

If you believe your privacy rights have been violated, you can either file a complaint with Rob Rock, or with the Office for Civil Rights, U.S. Department of Health and Human Services (OCR). There will be no retaliation for filing a complaint with either our practice or the OCR. The address for the OCR regional office for Rhode Island is as follows:

Office for Civil Rights
U.S. Department of Health and Human Services
Government Center
J.F. Kennedy Federal Building – Room 1875
Boston, MA 02203

Examples Of Disclosures For Treatment, Payment, And Health Operations

We will use your health information for treatment.
We may provide medical information about you to health care providers, our practice personnel, or third parties who are involved in the provision, management, or coordination of your care.

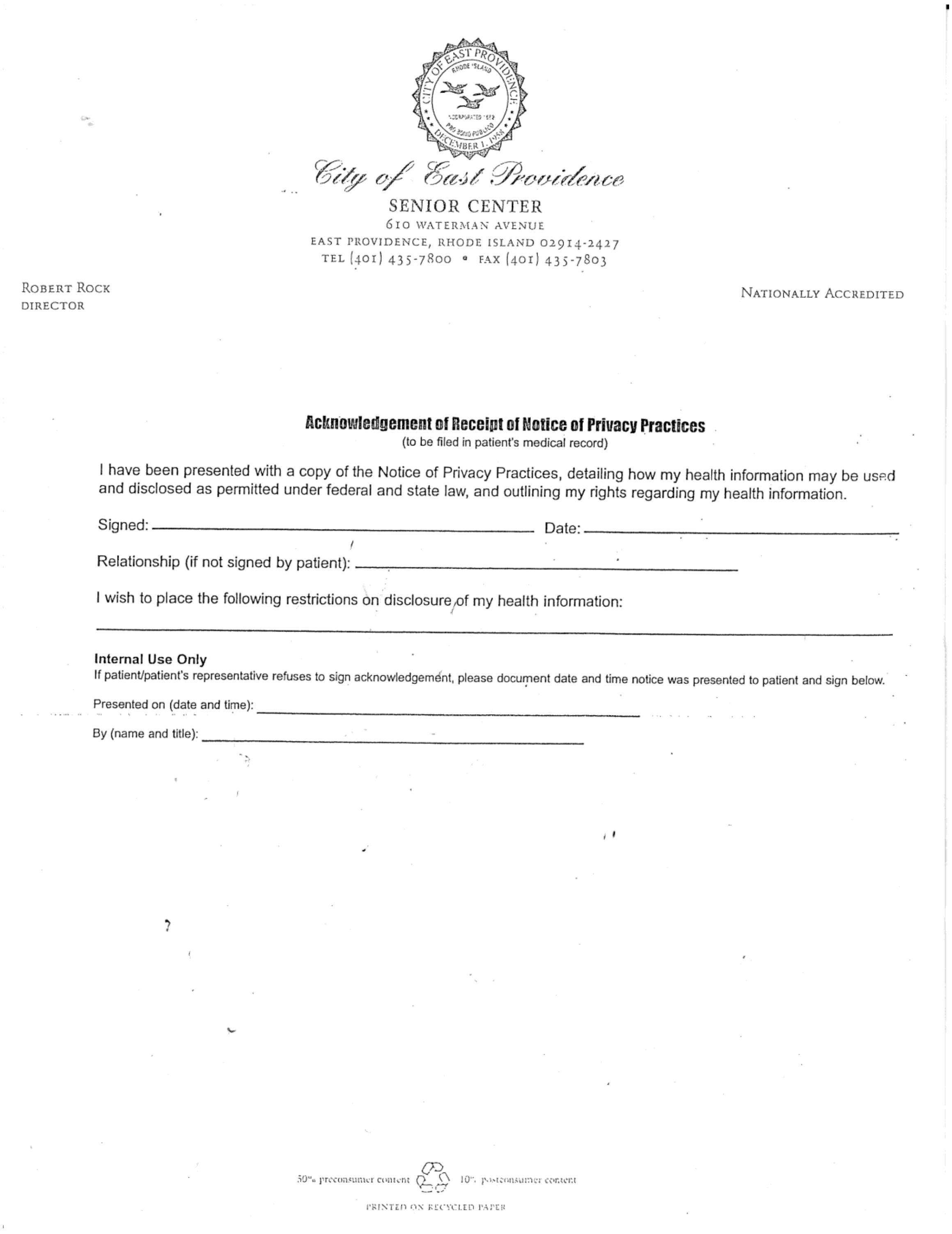
For example:
Information obtained by a nurse, physician, or other member of your health care team will be recorded in your record and used to determine the course of treatment that should work best for you. Your medical information will be shared among health care professionals involved in your care.

We will also provide your other physician(s) or subsequent health care provider(s) (when applicable) with copies of various reports that should assist them in treating you.

We will use your health information for payment.
We may disclose your information so that we can collect or make payment for the health care services you receive.

For example:
If you participate in a health insurance plan, we will disclose necessary information to that plan to obtain payment for your care.

Appendix G: Patient Acknowledgment



City of East Providence
SENIOR CENTER
610 WATERMAN AVENUE
EAST PROVIDENCE, RHODE ISLAND 02914-2427
TEL (401) 435-7800 • FAX (401) 435-7803

ROBERT ROCK
DIRECTOR

NATIONALLY ACCREDITED

Acknowledgement of Receipt of Notice of Privacy Practices
(to be filed in patient's medical record)

I have been presented with a copy of the Notice of Privacy Practices, detailing how my health information may be used and disclosed as permitted under federal and state law, and outlining my rights regarding my health information.

Signed: ______________________ Date: ______________________

Relationship (if not signed by patient): ______________________

I wish to place the following restrictions on disclosure of my health information:

____

Internal Use Only
If patient/patient's representative refuses to sign acknowledgement, please document date and time notice was presented to patient and sign below.

Presented on (date and time): ______________________

By (name and title): ______________________