



Implementing an Exercise Evidence-Based Guideline for Type 2 Diabetes Mellitus Patients Using a Structured Referral Process

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Abstract

Introduction: Type 2 Diabetes Mellitus (T2DM) is the seventh leading cause of death in the United States and affects 25.8 million Americans. Ninety to ninety-five percent of T2DM is manifested in adults and prevalence increases with age. Type 2 Diabetes Mellitus is a costly chronic disease that causes dysfunction in multiple organs. The incidence rate of T2DM continues to increase despite numerous efforts of by healthcare providers and politicians to halt this epidemic. New emerging research has shown that exercise in older adults is more effective in delaying and preventing negative healthcare outcomes than medications. Recently multiple healthcare associations have brought forth new Evidence-Based Guidelines (EBGs) on exercise for patients with T2DM: healthcare providers have been slow to respond to these current EBGs. The purpose of this project was to embed an EBG prescription for exercise and design a structured exercise referral process that incorporated a healthcare and community delivery system for patients with T2DM.

Methods: The one-group pretest-posttest study design examined the healthcare providers' knowledge, attitudes, and practices of EBGs before and after the implementation of the structured exercise referral process for patients with T2DM.

Results: In this project, an increase in patient referrals was associated with the project's intervention. In addition, 39% of patients who were referred attended structured exercise class and tended to remain involved in ongoing weekly sessions.

Conclusions: Embedding EBGs into the daily clinical process with specific protocols, forms, and staff accountability can increase the likelihood of their use. Further investigation of the impact of structured exercise in older adults on diabetes control is recommended.

Keywords: Exercise; Type 2 diabetes; Exercise referrals; Elder exercise program

Introduction

Type 2 Diabetes Mellitus (T2DM) is defined as a metabolic disorder in which the body either fails to secrete insulin and/or its action fails to properly regulate carbohydrates, fats, and proteins. The improper production of insulin or action results in chronic hyperglycemia. The effects of poorly-controlled T2DM (chronic hyperglycemia) are well documented. Major complications of T2DM are cardiovascular disease, kidney failure, non-traumatic lower extremity amputations, and retinal blindness. Heart disease and stroke are the leading causes of death in people with diabetes [1].

In the United States, T2DM affects close to ten percent of the adult population [1]. Ninety to ninety-five percent of T2DM is

manifested in adults and prevalence increases with age [1]. Close to 34 million Americans, age 45 or older, in 2020 were living with T2DM; of those, 19.5% were 65 years of age or older. The prevalence of diabetes in Mexican-Americans is 15.3% compared to 9.9% in non-Hispanic whites [1]. Of note, new cases of diabetes in adults significantly decreased from 2008 through 2018 while cases increased among youth [1].

Diabetes is the seventh leading cause of death in the U.S. T2DM is a chronic disease, alongside hypertension and hypercholesterolemia; it is responsible for the leading cause of death, cardiovascular disease [1]. Individuals with diabetes are two to four times at higher risk for developing Cardiovascular Disease (CVD), and lose an average of eight years of life [2].

In the last decade, intervention studies for T2DM have focused on diet, exercise, and physiological behaviors. Of these three variables, the most studied and generally practiced seems

to be diet. In an effort to improve T2DM outcomes, researchers have heavily studied the effects and the delivery of lifestyle modification. A plethora of studies have demonstrated that both diet modification and lifestyle changes can reduce the incidence (new cases) of diabetes. For example, The Diabetes Prevention Program (DPP) concluded that lifestyle changes reduced the incidence of diabetes in persons at high risk [3]. In this study, the life-style intervention groups yielded 58% reduction in incidence of T2DM compared to 31% reduction in the metformin group [4]. This and other studies have demonstrated that diet and exercise interventions can produce greater glucose control outcomes than oral medications. However, there are limited studies that separate the effects of diet and exercise on the outcome of glucose control.

There is mounting evidence that exercise improves the body's sensitivity to insulin, and improves glucose regulation. In addition, studies have shown a positive correlation between increased physical activity and weight loss. Other studies have noted a positive relationship between obesity and diabetes; obesity increases an individual's risk of developing T2DM by 20-fold [5]. For decades, aerobic exercise (increase in physical activity), along with diet has been recommended for individuals with T2DM to manage both glucose and weight [6].

The World Health Organization (WHO) defines physical activity/exercise as muscular skeletal body movements that produce energy expenditure, and states that approximately 27% of T2DM results from physical inactivity. Large cohort studies have demonstrated a strong association between low physical activity and an increase in CVD for T2DM patients [3].

Moderate to vigorous exercise is strongly recommended by both the American Diabetes Association (ADA), and the American Heart Association (AHA) to control/reduce T2DM and the cardiovascular complications associated with diabetes. The ADA groups exercise into three categories (aerobic, strength training, and flexibility), and recommends at least 30 minutes a day five times a week of exercise for T2DM patients [7]. The AHA T2DM training guidelines for Class I (A) level of exercise-evidence obtained from various RCT/meta-analysis is beneficial, useful and effective-are: (a) cardiorespiratory exercise of moderate intensity with a duration of 150 minute a week, (b) cardiorespiratory exercise of vigorous intensity with a duration of 90 minutes a week, or (c) resistance exercise of moderate to high intensity with two-four sets of eight-ten repetitions with weight that cannot be lifted more than eight-ten times duration should be equivalent or close to 90 minutes a week. Furthermore, the AHA recommendation is that the exercise be performed at least three times a week with no more than two consecutive days without training [8].

The American Diabetes Association (ADA) and American College of Sports Medicine (ACSM) place a greater emphasis on the intensity of the exercise rather than the type of exercise. The AHA supports its recommendation on exercise by highlighting how high-quality studies that have shown that moderate to vigorous exercise has a significant positive clinical impact on diabetes and CVD. The ADA and ACSM suggest that at least 150

minutes of moderate exercise, or 75 minutes of vigorous exercise a week is needed to reduce/improve glucose control and multiple cardiovascular risk factors. The ADA and ACSM state that prescribing moderate to vigorous exercise far outweighs the risk of injuries from prescribed exercise, and suggest that performing an exercise stress test before prescribing low-moderate exercise is not necessary and "can create a barriers to participation" [7]. However, there is considerable evidence that shows physicians, nurse practitioners, and physician assistants have been slow to follow evidence-based practice on prescribing exercise for glucose control [9].

Project Problem

In the United States, San Antonio, and at the project site, healthcare providers have been slow to respond to the new EBG for T2DM and exercise. In analyzing the healthcare providers' poor response to the new and emerging EBGs for T2DM and exercise, it was discovered that the healthcare providers were not prescribing exercise to T2DM patients for numerous reasons: (a) lack of knowledge about the EBG, (b) lack of knowledge on how to prescribe exercise, (c) lack of knowledge about community support systems for T2DM and exercise, (d) beliefs about exercise and glucose control, and (e) beliefs about exercise and patient participation. The healthcare providers' lack of knowledge of the guidelines, prescribing exercise, and community support systems are essential to change practice. Therefore, facilitating the healthcare providers with a structured referral process that facilitated and incorporated these three components seemed necessary to start an intervention transformation.

T2DM is complex and involves more than just medical treatment. People with diabetes should take responsibility for their condition, and will require help through interprofessional collaboration on how to manage their disease. For decades, scientists and medical providers have struggled with how to make T2DM patients full participants and active members in the day-to-day management of their condition. There is limited consensus on how best to address the issue of T2DM treatment compliance. In addition, little is known whether medical providers will prescribe evidence-based exercise for glucose control, and if T2DM patients comply and carry out the prescribed regimen? However, there are studies that show when providers write a specific prescription for exercise, patients tend to adhere and comply with the written medical instructions [10]. Exercise is critical for patients with T2DM [11].

It is hypothesized that if healthcare providers adhere to the recommended EBG for exercise and diabetes, patients' adherence and compliance to exercise will increase. Therefore, the purpose of the project was to: (a) assess the knowledge and perceptions of the primary care providers towards the practice of writing exercise referral prescriptions, (b) educate providers on evidence-based guidelines (EBG) of exercise for T2DM, (c) design a referral process to implement EBG of exercise for T2DM, and (d) determine the effectiveness and efficiency of an exercise prescription referral process.

Review of Literature

In moving forward and to discover new knowledge about exercise and its effects on T2DM, an extensive literature review was conducted. One of the greater difficulties in translating research into clinical practice is the complexity and volume of data available. The numerous amounts of scientific data available can be overwhelming for a clinician who is attempting to pursue evidence-based practice. In an attempt to reduce these obstacles, the Academic Center for Evidence-Based Practice (ACE) Star Model was used as a guide for translating evidence summaries [12,13].

The literature search scrutinized both published and unpublished materials (gray literature). A complete review of medical, nursing, and health allied literature was conducted was conducted using the following databases: (a) The Cochrane Library, (b) Medline with MeSh (EBSCO), (c) CINAHL PLUS with Full Text, (d) PsycInfo (EBSCO), and (e) SPORTDiscus with Full Text. Key terms used for article extraction integrated diabetes or EBG with-exercise, interventions referrals, exercise counseling, exercise practices, self-management, chronic care, framework, and prevention. The search review included English language articles only. A manual search from the reference list of original systematic reviews, research papers, and clinical reviews was conducted to retrieve additional articles. Studies from 1990 to 2010 were included in the literature review. Recent studies were considered to be more relevant and useful. Studies that involved children and Type 1 diabetes were excluded.

Articles that identified exercise as an important positive variable to T2DM outcomes were reviewed. First, studies on the mode, intensity and frequency of exercise that produced greater gains of glycemic control were sought out. Second, articles/studies that documented effective ways to implement EBGs into clinical practice were also identified and reviewed.

Research clinicians are not only faced with identifying the most effective intervention for an outcome, but also encounter the difficulty of how to successfully translate that information into relevant outcomes for their practice [14]. For this reason it was not only important to establish the impact exercise had on T2DM, but it was also important to ascertain the impact EBGs had on healthcare providers.

Several major themes that emerged after appraising the existing literature were the positive effects of exercise on T2DM, and the difficulties of translating EBGs into practice. One theme, the positive effects of exercise on T2DM, revealed that exercise was not only important, but its effect on glucose control was tightly related to the frequency, intensity, and duration of exercise. Exercise has been proven to have a significant positive impact on glycemic control. However, there is considerable debate on what type, intensity, and frequency of exercise produce greater health improvements in people with T2DM. Therefore, the first objective for this project was to realize if indeed any type of exercise(s) was superior in improving diabetic healthcare outcomes.

Four RCTs were selected to evaluate the correlation between exercise and glucose control. The interval of the three studies ranged from twelve weeks to nine months. The four studies provided a total of 1,134 participants. The study subjects ranged from 15 to 606 participants. All but one study had a roughly equal number of men and women subjects. There was one study that only included postmenopausal women [15]. The participant's mean age ranged from 51-55 years. All four studies examined the effects of aerobic or resistance exercise on glycemic control, and showed a significant reduction in glucose levels for both the aerobic and resistance group [15-18].

Kang, et al. evaluated the glucose control effect difference between circuit resistance training and walking exercise. The authors concluded that circuit resistance training produced a significant improvement in glycemic control, and walking exercise had a minimal significance in glucose control [15]. Duration/time spent for both the groups was equivalent. However, intensity was not addressed by this study, but it may be assumed that the walking group's level of intensity was low. Therefore, exercise intensity may have played a vital role on the glycemic differences seen between these two groups.

Sigal, et al. conducted a trial to determine the effects of aerobic training alone, resistance training alone, and combined exercise training on glycemic control [18]. The study concluded that both aerobic and resistance exercise were significantly beneficial in improving glycemic control, but greater improvements were seen in the combined exercise group. The authors specify that this RCT was not designed to study the effects of exercise intensity/duration. They also clarify that the superior glucose control effect of the combined exercise group may reflect greater time or intensity this group spent on exercise.

Church, et al. also examined the benefits of aerobic training alone, resistance training alone, and a combination of both on glycemic control. This RCT did control for both intensity and duration of each exercise group. Similarly this study found that the combined aerobic-resistance group had greater mean change in glycemic control even when accounting for both intensity and duration [16].

Balducci, et al. performed a 12-month prospective multicenter randomized clinical trial to examine the effects of 150/min/week of structured exercise on HbA1C reduction. The study randomized 606 T2DM patients at 22 clinical sites [19]. For inclusion in this study participants had to have had a sedentary lifestyle for greater than six month with the ability to walk without assistance, and a BMI of 27-40 kg/m². The subjects were randomized into two groups. Three hundred and three participants were blindly randomized to the mixed (aerobic + resistance) exercise prescription and supervision + exercise counseling group (EXE) and 303 participants to the conventional treatment group (CON), which received exercise counseling only. The primary outcome HgA1C reduction level for the EXC group (-0.30% [-0.49% to -0.10%]; $P < .001$) was statistically significant in comparison with the CON group. This study also demonstrated

the importance and superiority of prescribed structured exercise compared to conventional exercise counseling.

The results of the above studies support the hypothesis that increased physical activity (exercise) rendering energy consumption can improve blood glucose control in T2DM patients. These studies also verified that exercise had a main effect of blood glucose control, and that the intensity/duration of exercise is an important intervention that needs to be employed into clinical practice. Furthermore, The Italian Diabetes and Exercise Study (IDES) demonstrated that prescribed structured exercise is superior to conventional exercise counseling.

The AHA states, “The overall benefits of exercise in T2DM are well recognized with regard to glucose control and multiple CVD risk factors” [8]. With sufficient evidence and statements from AHA, ADA, and American College of Sports Medicine (ACSM) on the importance of exercise for the prevention/management of T2DM, a second literature review was conducted on interventions that improve outpatient referrals in primary care. The statement by the ACSM that exercise is medicine and that more should be done to address physical activity in the primary healthcare setting, enforces the idea that exercise should be treated as a specialty referral. This additional and more complex literature review, the difficulties of translating EBGs into practice, is not unfamiliar to those in the academic and clinical settings. “It is widely known that there is a wide gap in time between the generation of research to the implementation of those findings into practice, or the translation or research into practice” [20]. Therefore, it was no surprise that a multilayered and multidisciplinary approach was a common thread of these studies.

Akbari, et al. conducted a comprehensive Systematic Review (SR) and assessed for the effects of: (a) educational intervention methods for disseminating and implementing referral guidelines, and (b) organizational intervention changes that impacted primary care referral behaviors. Within the context of professional educational interventions, Akbari, et al. found that passive dissemination of referral guidelines were least likely to be embraced by healthcare professionals and had no significant impact on the quantity or quality of the referral process. In contrast, studies that incorporated active multidisciplinary dissemination of EBG showed a significant improvement in guideline adherence. The studies that showed the greatest improvement in referral quantity and quality were those that combined active EBG dissemination and structural organization interventions [21].

Emslie constructed a RCT that evaluated EBG practices and referrals of infertility couples. The objective of the study was to evaluate the dissemination of a guideline tool that was embedded into a management referral sheet in infertility couples [22]. The study concluded that the infertility management package (EBG embedded into a referral sheet) significantly improved the management of infertility couples in general practice and referral time appropriateness.

Thomas, et al. performed a cluster-randomized trial to evaluate the effects of an EBG open access urology referral

process. The practice guidelines (open access) allowed primary healthcare practitioners to refer patients directly to urology via an EBG checklist [23]. The open access guideline intervention resulted in a significant increase in EBG compliance and a decrease in patient visit wait time. The results suggest multidisciplinary dissemination of EBG with a structured process can improve the effectiveness and efficiency of a urology consult.

The above two studies successfully combined the use of educational interventions and organizational interventions to improve the quantity/quality of a referral process. Akbari et al. concluded that: (a) increased specialty involvement in the development and dissemination of EBG, and (b) increased organizational referral processes will produce a greater influence on EBG in clinical practice [21].

Davis stated that Continuing Medical Education (CME) produces a minimal impact on improving professional practice, and suggests that new interventions to improve EBP should be employed [24]. Oxman, et al. conducted a systematic review to establish the effectiveness of different types of interventions in improving healthcare performance/practices. The systematic review concludes that multifaceted interventions improve healthcare professional performance and health outcomes [25]. The review suggests that clinical interventions that best succeed in changing performance and healthcare outcomes are those using practice-embedded strategies. Davis and Oxman highlight the deficiencies and barriers of our current healthcare practices in implementing EBG into clinical practice. They suggest the need to explore new methods of disseminating and integrating EBG into practice [24,25].

Cabana, et al. in a systematic review aimed to identify barriers to physician EBG. The authors looked at factors that could be altered by a clinical intervention. The authors point at three major factors that could limit a provider’s adherence to EBG: knowledge, attitudes, and behaviors. The authors bring forth that the expanding body of research makes it very challenging for any physician to keep abreast with every valid EBG and judiciously apply it to practice [26]. They also expand the notion that even when a medical provider is informed or has easy accessibility to an EBG, there are other internal/external factors that may impede the physician’s adherence to the EBG. Groh and Grimshaw stated that changing a medical behavior is arduous and usually will require a comprehensive approach at the physician, medical team, and external environment level. This implies that it is not feasible to provide primary care providers with an EBG and expect them to automatically implement the EBG into practice. Therefore, a primary care provider simple-prescription approach to exercise training for T2DM may be limiting. To provide an effective EBG exercise referral process for T2DM, a highly multilayered system and multidisciplinary approach with a structured theoretical framework will be needed [27].

Project Theoretical Framework

T2DM is one of the most common chronic disorders in the United States [28]. The Chronic Care Model (CCM) was

developed by The MacColl Institute to promote effective strategies to preventing and managing chronic care illnesses. The CCM provides the theoretical framework for redesigning the delivery of healthcare [29]. This model has gained national recognition for the implementation of EBP to improve the outcomes of chronic care illnesses. Strickland, et al. stated that people with diabetes may benefit when a healthcare team uses the CCM as a framework for guiding practice [30]. The CCM has been shown to increase EBP outcomes whether implemented as whole or in individual components. The six domains of the CCM are: (a) healthcare system-planned measurable goals for improving chronic care, (b) community resources-creating partnerships with community workers and leaders, (c) self-management-places importance of empowering patients to self-manage their care, (d) decision support-integration of EBP guidelines into practice, (e) delivery system design-focuses on teamwork and expanding team members' roles, (f) clinical information systems-creating and implementing information systems relevant to population of interest that allow data gathering (Appendix A). Coleman, Austin, Brach, and Wagner state "the aim of the CCM is to transform the daily care for patients with chronic illnesses from acute and reactive to proactive, planned, and population-based" (p. 75) [31].

The American Association of Diabetic Educators (AADE) endorses the use of the CCM to assist healthcare professionals to integrate a multicenter and multidisciplinary approach to diabetic care. The CCM and its six domains reinforce AADE's thought that the seven self-care behaviors of AADE7™, which includes physical activity, are achievable and sustainable. The CCM's healthcare system, community resources, self-management, decision support, and delivery system domains are extremely vital in implementing a social and behavior component of diabetes self-management care [32].

The CCM is an optimal framework for guiding evaluation of the effects of exercise on Type 2 diabetes, because diabetes is a chronic condition and exercise is a behavior/lifestyle (self-management). Lemay, Beagen, Ferguson, and Hagraves incorporated the CCM as the theoretical framework for a diabetic Community Health Center (CHC) study. They concluded CHCs are effective settings for delivering and improving diabetes care to the disenfranchised low-income patient [33]. However, current CHCs need to change their current delivery system to engage patients in self-management goals, improve healthcare provider knowledge of best scientific care, and ultimately create a productive interaction [29,34,35].

Bearing in mind that promoting EBG, prescribing exercise, and creating a referral process for T2DM is complex and would require the healthcare providers, patients, and communities' support, the CCM was selected to guide this project. Other factors that influenced the selection of CCM for this project were: (a) the clinical project site currently uses the CCM as a framework, (b) its endorsement by the AADE, and (c) its recognition for a multicenter and multidisciplinary approach. A schematic model depicting the application of the theoretical framework to the scope of this project is provided in the appendices (Appendix

A). The investigator selected the CCM to guide the project based on its potential contribution as a specific theoretical foundation (Appendix B).

The heart of the project was to design an exercise referral process for patients with T2DM that could be supported by community resources. In order to design such a delivery system the investigator understood that all six domains of the CCM would be needed. Therefore, the investigator used all six domains of the CCM to facilitate the structure and flow of how patients with T2DM would be referred for community exercise [36,37].

Project Questions

The project questions generated for this project were:

1. Will the availability of an exercise evidence-based guideline for T2DM using a structured referral process, increase the knowledge, attitudes, and practices of healthcare providers (physicians, nurse practitioners, and physician assistants)?
2. Will provider use of a structured exercise referral process result in referral adherence and attendance in an exercise class?

Project Objectives

The objectives of the project were to: (a) educate primary healthcare providers on EBG of exercise for T2DM, (b) design a referral process, tailored for WellMed, to implement EBG of exercise for T2DM, (c) determine the effectiveness of an exercise prescription referral process, and (d) assess the knowledge and perceptions of the primary care providers towards the practice of writing exercise referral prescriptions to a community structure exercise class.

Project Design

A one-group pretest-posttest pilot study design (Appendix C) was conducted to determine the impact of implementing a Structured Exercise Referral Process (SERP) for T2DM patients. A clinical site within the WellMed Medical Group® volunteered to implement and evaluate this SERP for T2DM patients. Eligible criteria included primary care providers who were licensed to treat and prescribe interventions for T2DM patients [38].

Project Intervention

The structured exercise referral process was developed by the investigator to assist the study participants in referring T2DM patients for exercise. Nationally recognized exercise EBG for T2DM (ACSM, ADA, and AHA) patients were used to develop the project's SERP. Consistent with the CCM, the investigator: (a) created referral policies and procedures, (b) used the clinic's support system to implement the SERP, and (c) sought community resources to execute this pilot project. A color-coded policy and procedure was developed to assist the participant's medical office staff in identifying and determining if T2DM patients were candidates for structured exercise per established exercise guidelines (Appendix D). The Recommended Exercise Prescription (Appendix E) was developed and embedded into the structured

referral process to facilitate the participants in prescribing EBG exercise for T2DM patients without having to actively engage in a search or thought process of the current ACSM/ADA and AHA current recommended EBG. After determining that a patient with T2DM was a candidate for desired referral, the participants selected the level of exercise desired.

With an optimal healthcare system change the investigator extended to ensure community support that provided the participants with the confidence to refer T2DM for exercise. In addition to the color-coded policy/procedure and recommended exercise prescription, a tracking referral tool was developed and implemented to support the participants and their staff with identifying the progress of referred patients.

An established and nationally recognized structured exercise program, Silver Sneakers®, was identified for the project. WellMed® and SilverSneakers® (a structured exercise program for older adults) had an established contract that granted “free” exercise membership to patients of WellMed®. However, with the assistance of SilverSneakers®, current patient referrals of the chosen project’s clinical site were identified. The investigator made referrals to SilverSneakers® program an integral part of the SERP (Appendix F). The final step of this structured referral process was to create a reliable transportation system for referred patients. During the course of this study, the participants were given transportation vouchers (Appendix G). The vouchers were to be used and distributed by the participants if they felt transportation was a referral barrier. Presa Community Center agreed to provide round-trip transportation to for each referral to SilverSneaker® at no cost [39].

Orientation Session

An educational session was developed to orientate the participants and their staff to the project. The educational session consisted of a onetime group conference to inform the participants and their staff of: (a) the most recent exercise EBGs for T2DM, (b) the importance of exercise for T2DM, and (c) an overview of the structured referral process. The educational session provided the participants with the most current exercise EBG for T2DM form both the ACSM/ADA and AHA. The participants received a presentation by the SilverSneakers® local director and certified SilverSneakers® trainer about structured exercise for T2DM older adults. See appendices for the power point presentation included during the educational session (Appendix H).

In addition to the orientation session several follow-up contacts by the investigator were conducted to answer any questions about the structured referral process and provide literature on exercise EBG for T2DM patients. During the course of the five (5) month data collection period, the investigator provided the participants with reminders of the importance of exercise to improve glucose control and reduce complications associated with T2DM.

At the end of the orientation conference and at each individual follow-up contact the participants were encouraged to prescribe

EBG exercise for T2DM patients and refer them to a structured exercise program (SilverSneakers®). The participants and their staff received small tokens of appreciation for their participation in this structured referral process at several intervals of this project (i.e. snacks) [40].

Brief Exercise Questionnaire

The participants completed the ten-item Brief Exercise Questionnaire (BEQ) before the educational session and at the completion of this pilot study. The EBQ was designed to measure the participants’ knowledge, attitudes, and practice of exercise for T2DM patients (Appendix I).

Population and Sample

Population

The population for this project was all WellMed Medical Group® (WMG) healthcare providers (physicians, nurse practitioners, and physician assistants) who saw patients with T2DM and were eligible for exercise at SilverSneakers®. WellMed Medical Group® is a physician owned and operated healthcare delivery system, which primarily delivers care to chronically ill older adults [41].

Sample

The goal of the this study was to recruit participants who provided healthcare to a large number of T2DM patients in need of exercise, who were able to access SilverSneakers®. The approach in selecting the sample involved identifying: (a) a clinic within the WellMed® system, which would provide a larger number of providers (b) participants who saw a large number of T2DM patients, (c) participants with vast knowledge of the CCM, and (d) participants who were interested in improving T2DM quality measures through community-based preventive care (i.e. improve active lifestyles) [42].

WellMed® Ingram Clinic meet all of the above requirements. The project setting was located in San Antonio, Texas at a primary care WellMed® clinic located in San Antonio, Texas. Ingram Clinic is open Monday through Friday during the hours of eight to five. The four physicians who participated in this study were primarily responsible for seeing the chronic care patients. Each provider saw approximately 300 patients per month during the course of this study.

Secure-Horizons is the primary payer source for this clinic. Secure-Horizons is a capitated Medicare Advantage plan offered by UnitedHealth Insurance Company [43]. Secure-Horizon members have the added benefit of “free” membership to an exercise facility that offers SilverSneakers® (a structured exercise program).

With an exceptional long history of implementing successful community-based programs, the sample was encouraged to prescribe and refer T2DM patients to SilverSneakers® in accordance to the project’s objectives and their company’s vision/mission statement.

Measurement Method

The investigator collected the measures for this project during the course of the study. Measures included the Brief Exercise Questionnaire and the Standardized Referral Form. The data measures included: (a) the participants' change in knowledge, attitudes, and practice, of exercise EBG for T2DM patients after the implementation of the SERP, (b) the volume of referrals to SilverSneakers, (c) the volume of referrals who attended SilverSneakers, (d) the reason why the referred patients did not keep appointment to SilverSneakers, and (e) volume of referrals monthly visits.

Brief Exercise Questionnaire

The Brief Exercise Questionnaire for T2DM (BEQ) was adapted from a similar exercise survey questionnaire that was previously developed by Willford, Barfield, Lazenby, and Olson [36]. Willford et al. constructed a nine-question survey with the aid of a validity panel of physicians, nurses, and exercise physiologist [36]. The questionnaire was tested-retested for reliability, and rendered highly reliable with scores ranging from 0.95 to 0.98. The first five (5) questions from this original questionnaire were selected and tailored to incorporate T2DM. Two questions were modified to determine the provider's familiarity with the current ACSM/ADA and AHA recommendations of exercise for T2DM. The last three questions were constructed to determine the provider's current: (a) familiarity with SilverSneakers®, (b) believe that patents that would attend SilverSneakers®, and (c) believe about exercise barriers.

The 10-item BEQ also included a brief demographic section-participants' sex, ethnicity, type of provider, and number of years practicing. Question five on the BEQ had six additional responses, which were labeled a-f (Appendix I). Items one through nine were assessed on a Likert-type scale with an increase in the score indicating a positive response change. Item ten regarding barriers was reverse scored so that a higher score represented a more positive view.

The following items were formulated to measure the participants' knowledge, attitudes, and practices of exercise for T2DM patients: (a) items seven and eight measured knowledge (b) items one, two, nine, and ten measured attitude, and (c) items three-five measured practice. Items one and two measured the participants' attitude and were rated on a one to four (very important-not important) response score. Items three and four measured the frequency of encouraging and prescribing exercise for T2DM, respectively. These items on the BEQ were rated on a one to five (always-never) response score. Item five measured the participants' percentage frequency in referring T2DM patients to a specific specialty on a one to five (0-20 to 81-100) response score. Items six, seven, and eight questions were measured on a one to four (very familiar-not familiar) response score. Items six and seven rated the participants' familiarity with exercise EBG for T2DM patients, and item eight measure the participants' familiarity with the SilverSneakers® program. Item eight on the BEQ was

a one to five (0-20 to 81-100) sore response and measured the participants' believe of patients with T2DM that would participate in a structured exercise program. The last question (item ten) on the BEQ measured that participants' believes of barriers to exercise. Specifics of the ten -tem BEQ can be found in the appendices (Appendix I) [44].

Structured Exercise Referral Process to Silver Sneakers

At baseline, the volume of T2DM patients' referrals to SilverSneakers from the clinic was assessed retrospectively though the assistance of a SilverSneakers representative. Of note, no process existed at the clinic to refer patients for exercise. The amount of structured exercise referrals to SilverSneakers was prospectively evaluated through the use of the Recommended Exercise Prescription (Appendix E). The Tracking Referral Form (TRF) and measurement tool was developed by the investigator to assist the participants' staff in documenting and tracking referrals to SilverSneakers. The clinics' medical director and coordinator reviewed the TRF for accuracy and ease of use.

The Tracking Referral Form provided the following information: (a) date of referral, (b) date of appointment of referral, (c) transportation requirement to SilverSneakers®, (d) date staff confirmed if referred patient kept appointment, (e) date of second referral made-if first appointment was not kept, (f) reason referred patient did not keep appointment, and (g) number of visits the referral patient attended exercise class by month. The TRF also provided the structure to the participants' medical assistants to follow up in a uniform way all T2DM patients who were referred for exercise to SilverSneakers (Appendix F) [45].

Data Collection Plan

The investigator obtained a letter of support and collaboration from the Medical Director of WellMed at Ingram Park. The project was approved by the University of Texas Arlington Institutional Review Board (UTA IRB).

At the initiation of the project, all six qualifying participants (four physicians and two physician assistants) were informed and invited to participate. However two participants (both Physician Assistants) declined to enroll in this pilot project. The remaining four participants voluntarily agreed and signed the informed consent.

During the duration of this pilot project only the investigator collected data that was relevant to the study. The investigator collected the informed consents and the pre Brief Exercise Questionnaire for T2DM (Appendix L and Appendix I) from the participants prior to commencing the educational session and SERP. At the end of the educational session data that was relevant to the project's analysis and findings were entered into Microsoft Excel and secured. During the intervention phase of this project the investigator visited the clinical site on a routine basis to check on the projects status and collect any data that was generated by the medical assistants as part of their normal procedure for tracking patient referrals.

Due to lack of referrals during the first few weeks of the study, the entire referral process was reviewed with the participants and medical assistants to answer any questions and to seek suggestions regarding any difficult or unnecessary steps. Based on their feedback, some modifications were made to the initial design of the referral process including referral tracking to simplify the steps. After these changes were made to simplify the referral process, the project was able to launch and generate referrals to SilverSneakers®. At project completion, the participants' completed the BEQ posttest and TRF data were obtained.

The director of this clinical site provided the investigator with the general demographic (age, sex, and race/ethnicity) of the referral patients. All data the investigator received and reviewed for this project was deidentified though the use of a coded number. The investigator was blinded to all sensitive information about patients throughout the duration of this project. It is critical to note that the participants for this project were the healthcare providers, and no patient contact by the investigator occurred during the project.

Data Analysis Plan

Data were analyzed with Microsoft Excel. The investigator analyzed all data using descriptive statistics. The investigator used descriptive statistics to describe, organize, and present raw data. The four participant general demographics included age, sex, ethnicity, type of provider, and years of practice. Due to the small sample size, this data was summarized in the result section. The pre and post BEQ items one to ten was analyzed for: (a) ordinal rank item change, (b) frequency distribution of participants change score, number of changed score, and changes among all participants, and (c) value range. Item number five of the BEQ was eliminated due to an order ranking error and was not included in analysis. Pre and post BEQ items one to four and six to ten were stratified, tabulated, graphed and assessed for total of number change, mean item change response, and mean percent value change (Tables 1 and 2) (Appendix J-K).

	Item 1		Item 2		Item 3		Item 4		Item 6		Item 7		Item 8		Item 9		Item 10	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Per	Post	Pre	Post
A	4	4	4	4	5	5	1	5	2	3	2	2	2	3	2	2	4	3
B	4	4	3	4	5	5	1	4	2	3	2	4	3	4	2	2	4	4
C	4	4	4	4	5	5	2	2	2	4	3	3	3	3	3	2	4	3
D	4	4	4	4	4	5	3	3	2	3	2	3	3	4	3	2	4	3
Total	16	16	15	16	19	20	7	14	8	13	9	12	11	14	10	8	16	13
Avg.	4	4	3.75	4	4.75	5	1.75	3.5	2	3.35	2.25	3	2.75	3.5	2.5	2	4	3.25

Note: A, B, C, and D were the four participants who partook in the study. Item correlates with the the question on the BEQ (Appendix xxx). Nine questions (i.e. Item 1, Item 2, Item 3...) were used to assess the participants' change response of the BEQ. Refer to measurement section for details of item scoring. Pre: Pre questionnaire and Post: Post Questionnaire.

Table 1: Comparison of mean pre and post questions one to four and six to ten mean score.

Item Number	Item Type	Brief Description	Mean Summary Change		
			Pre	Post	Value % Change
Q1	K	Importance of Exercise	4	4	0%
Q2	K	Exercise as Important as Diet	3.75	4	7%
Q3	P	Encourage to Exercise	4.75	5	5%
Q4	P	Write Exercise Rx	1.75	3.5	100%
Q6	K	EBG ACSM/ADA	2	3.25	63%

Q7	K	EBG AHA	2.25	3	33%
Q8	K	Silver Sneakers® Program	2.75	3.5	27%
Q9	A	Patients Will Participate	2.5	2	20%
Q10	A	Barriers to Exercise	4	3.25	19%
Note: Q: Question, K: Knowledge, A: Attitudes, P: Practice					

Table 2: Calculated mean percent values pre and post questions one to four and six to ten.

The investigator used a histogram to display the number of referrals generated during the intervention of this project (Figure 1). The investigator used frequency distribution to summarize and compress the total number of referrals by participant and month (Figures 2 and 3). The number of referrals by provider graphs displays the mean and percent number of referrals [46].

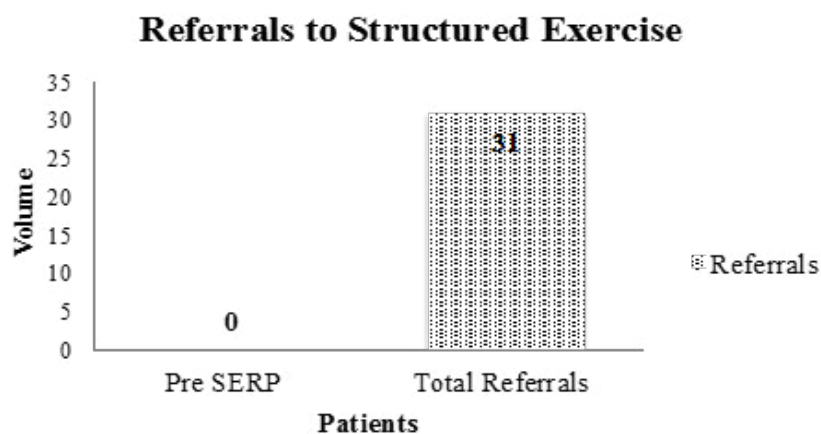


Figure 1: Volume of referred patient for exercise.

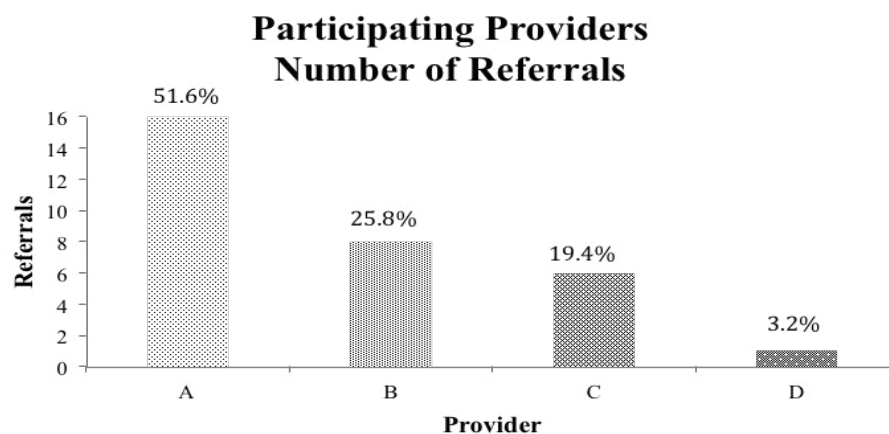


Figure 2: Participating provider's number of referrals.

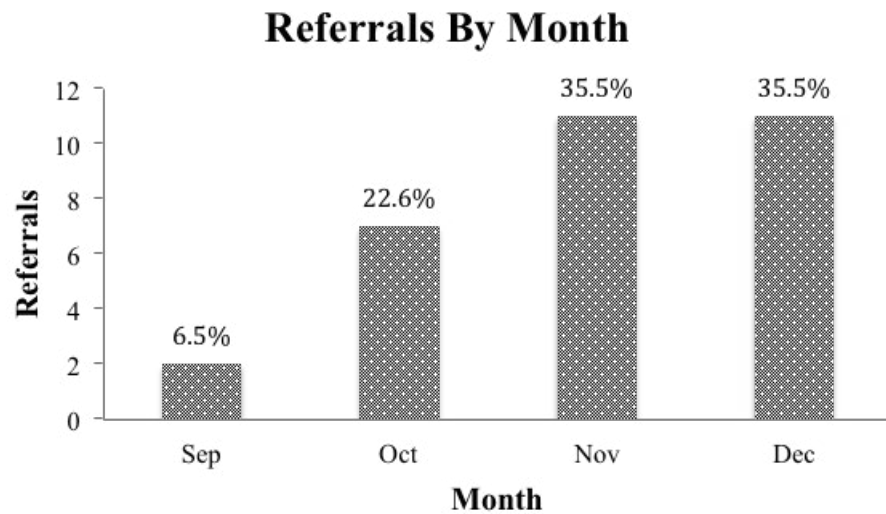


Figure 3: Referrals by month.

The mean referral participation for SilverSneakers® was measured at month one and two (Table 3). The total referral participation for SilverSneakers® was measured against the total number of the participants' referrals to SilverSneakers® (Table 4). The mean demographics of the referred patients to SilverSneakers® included age, sex, and ethnicity (Table 5, Figure 4). The referrals response for attending or not attending SilverSneakers® was graphed and assessed using mean and percentages (Figures 5 and 6). This data was stratified and graphically displayed by the number of referrals who attended SilverSneakers® on the first and second attempt. Because of the small sample size of this pilot project no statistical correlation tests were applied [47].

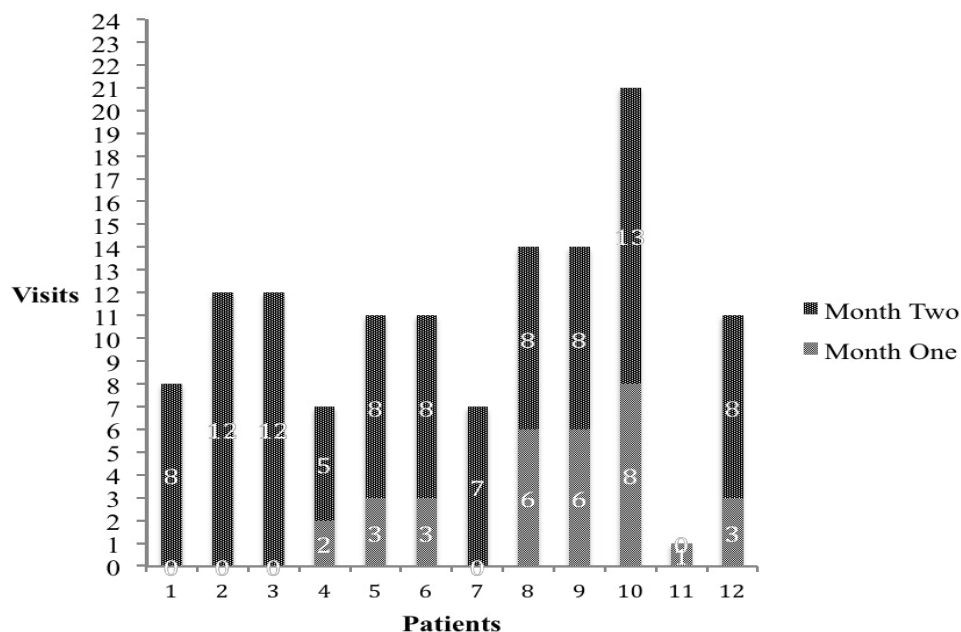


Figure 4: Patient exercise participation by month.

Participant	2nd Referral Needed	Month One Attendance	Month Two Attendance
1	Yes	0	8
2	Yes	0	12
3	Yes	0	12
4	No	2	5
5	No	3	8
6	No	3	8
7	Yes	0	7
8	No	6	8
9	No	6	8
10	No	8	13
11	No	1	0
12	No	3	8
		Mean 2.6	Mean 8.1

Note: No second referral was needed if participant went at month one. Four participants were captured at second referral.

Table 3: Referral that participated in structured exercise.

Patients' Reason For Not Going The First Time To Structured Exercise

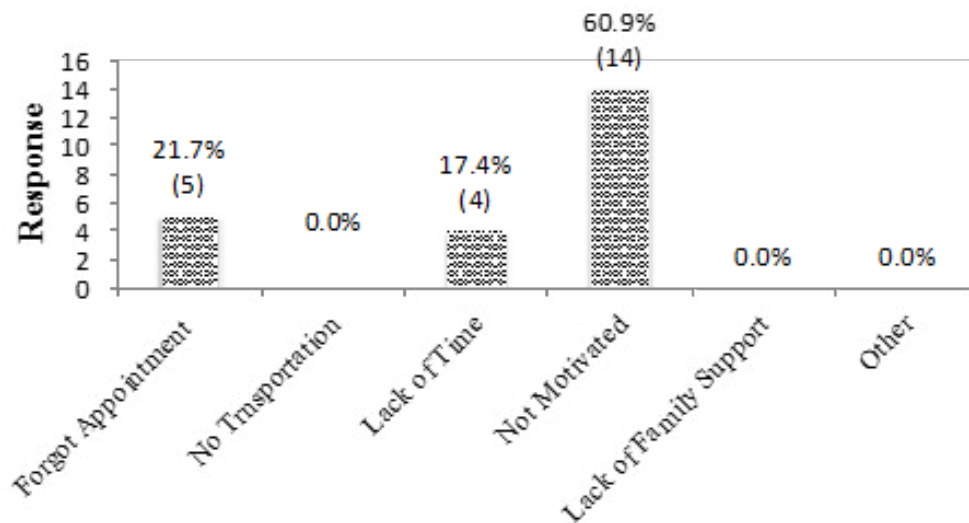


Figure 5: Patients' reason for not going the first time to structured exercise.

Total referrals	Referrals went at 1 st attempt	Referrals went at 2 nd attempt	Total referrals that went to SE
31	8	4	12
Note: 39 % of total referrals participated attended Silver Sneakers®			

Table 4: Number of referral participation.

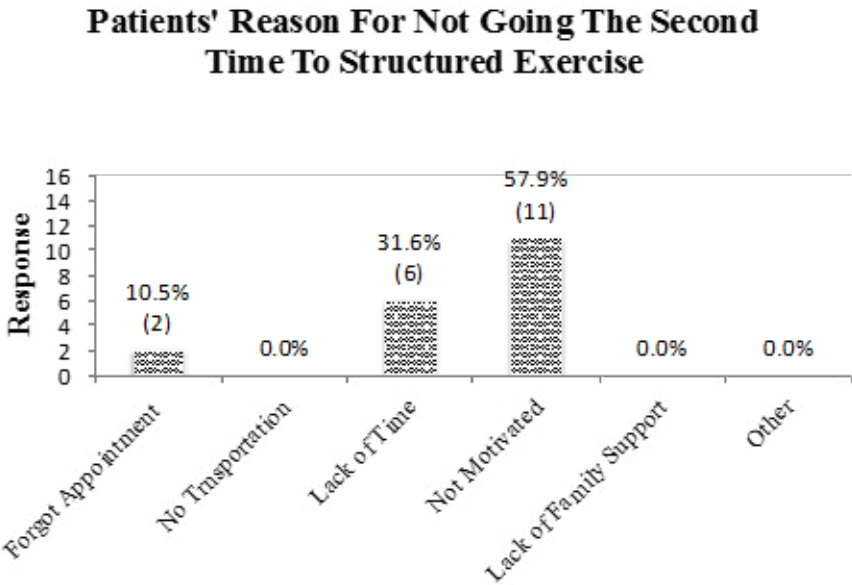


Figure 6: Patients’ reason for not going the second time to structured exercise.

Participants’ Referral							Patients That Attended Silver Sneakers®						
N	Age Mean	Age Range	Gender		Race/Ethnicity		N	Age Mean	Age Range	Gender		Race/Ethnicity	
			M	F	W	H				M	F	W	H
31	67	42-88	14 45%	17 55%	5 16%	26 84%	12	65	52-75	6 50%	6 50%	1 8%	11 92%
Note: N: Number													

Table 5: Providers’ referrals who attended exercise.

Project Limitations

Limitations of the project were no comparison group with its associated threats to study validity such as mortality, history, testing, and self-report bias. Prior to this project, there was no process for referring patients with T2DM for exercise. This resulted in the inability to establish a comparison group. However, common practice of not referring patients for exercise was established. During the implementation of the project, two participants (healthcare providers) were lost, which potentially diminished the number of T2DM patients referred to a structured exercise facility, and created the inability to assess the differences between the physician assistants and other healthcare providers knowledge, attitudes, and practices on exercise EBGs for patients with T2DM. The healthcare providers’ motivation and participation were less than anticipated. Due to the newness of the referral process for patients with T2DM to a structured

exercise facility, the healthcare provider had to be frequently reminded and educated about the EBGs and intervention. Thus, the healthcare providers were contently being reminded that they were being studied and may have affected their post-test performance. The small number of participants will limit generalization of the study findings.

In compliance with the Health Insurance Portability and Accountability Act (HIPAA), the project relied on healthcare providers (participants) self-reporting the number of times the referred patients attended a structured exercise class. Therefore, the patients that the healthcare provider referred to a structured exercise facility can be assessed by the actual signed prescription, but the number of visits the referred patients made cannot be assessed, and should be viewed with caution.

Results and Findings

Results to address the two major research questions in this study are presented in two major sections: (a) Participant knowledge, attitudes, and practices regarding use of EBG and structured exercise referral process, and (b) Patient participation in a structured exercise referral process [48].

Research Question One

Participant demographics. As seen in Table 6, a total of four participants was assessed during the pilot project. Three participants were White and ethnically Hispanic. One participant was a Black American female. The three White Hispanic participants were all male. All four participants were medical doctors. The participants’ years of experience ranged from zero to greater than fifteen.

Participant	Gender	Race	Ethnicity	Provider Type	Number of year Practicing
A	Male	White	Hispanic	M.D.	0-4
B	Male	White	Hispanic	M.D.	5-9
C	Female	Non-White	Black	M.D.	10-14
D	Male	White	Hispanic	M.D.	>15

Note: A, B, C, D: Represents the four providers, MD: Medical Doctor

Table 6: Participant demographics.

Brief exercise questionnaire. After the intervention phase of the study the BEQ results were examined for changes and commonalties with regards to the participants’ changes in knowledge, attitudes and practices of exercise for T2DM patients. The BEQ was also examined and linked with the participants’ number of referrals to SilverSneakers® to assess if there was a relation between the participants’ change in the BEQ and the number of referrals generated to SERP.

The investigator primary interest was to assess for changes in the participant: (a) knowledge of the EBGs for prescribing T2DM patients exercise, and (b) practice of prescribing and referring T2DM patients to structured exercise. Furthermore, the investigator had a particular interest in reviewing Participants A and B individual score change, because these two participants referred the most patients to SilverSneakers® (Figure 2). Participants A and B had a modest positive score change on their knowledge of EBG for prescribing T2DM patients exercise and an exponential growth change in prescription writing. Provider A who had the highest practice change for writing prescriptions responded from never writing prescriptions to always. This indicated that Participant A

had a 400%, increase in his practice of writing exercise prescription for patients with T2DM, and Participant B had a 300% increase. Unlike participants A and B, participants C and D had no change response for writing exercise prescriptions for patients with T2DM. See Table 2 for all participants’ BQI score changes.

All four participants had a modest positive score change for four of the five knowledge-items. The knowledge-item that remained unchanged was item one (the importance of exercise for improving glucose control). The participants ranked this knowledge item a four (highest ranked score) on the pre and post questionnaire. Knowledge item six regarding EBG familiarity had the highest percent mean (63%) value change. The participants had a 20% decrease in mean value change for attitude-item nine (less belief that patients would participate in structured exercise) in the BEQ. However, the participants believed there were fewer barriers for patients participating in exercise (attitude item ten). The mean value change for this item was 19%. Practice-items that encouraged patients to exercise and write prescriptions for exercise increased exponentially. The largest mean value change was seen in practice item four where participants’ prescription writing for

exercise in the BEQ increased by 100%. See Table 3 for BEQ's descriptive data.

Question five was omitted from this analysis due to an error on the rating scale. Question five (a practice question) read that if the participants referred patients to exercise what percent of those patients did they refer to a particular specialty (i.e. physical therapist, nurse, or exercise physiologist). See appendices for a description of questions one to ten, which includes question five (Appendix I) [49].

Structured Exercise Referral Participation

A practice finding under knowledge, attitudes, and practices. Prior to this study, the clinical site was achieving 0% potential referrals to SilverSneakers®; after implementation of SERP referrals grew to N = 31. See Figure 1 for number and percent of participants' referrals and patient participation to SilverSneakers®. A more detailed description of referrals and participation to SilverSneakers® can be found in the appendices (Appendix N and O).

As displayed in Figure 2 the BEQ scores were consistent with the participants' prescription writing and referrals to SERP for this project. For example Providers A and B who had the highest score change for practice question four also wrote the most prescriptions to SilverSneakers®. See Figure 2 and Table 2 for further assessment in participants' correlation between BEQ and number of referrals by provider to SERP.

Referrals by participants

Even though the participants ranked exercise as very important for glucose control, there was a lag time the initiation of SERP to the first generated referral to SilverSneakers®. This lag time may have been a result of the participants' barrier beliefs about participation or their unfamiliarity with SERP. As noted in Figure 3, referrals were not generated until the month of September creating a 47-day lag time. In September, once the providers acclimated to SERP, two referrals were generated 6.5% of N=31. From September to October referrals to SERP had a percent value increase of 71%, N=2 and N=7 respectively and from September to November referral rate and percent value increased exponentially to 82%. The referral rate remained constant for the last two months of this project. See Figure 3 for number and percentages of referrals between months [50].

Referrals by month

Referrals Participation for Structured Exercise. There was no significant demographic findings between those referrals who participated in SERP and who did not. As expected for this demographic area large percentage of the patients were White Hispanics. Other demographic findings of patients referred to SilverSneakers® are found in Table 4.

Referrals Demographics

Referral Participants

Twelve (39%) of the 31 patient referrals actually partook in structured exercise classes (Figure 1). A summary of the number

of visits for month one and two to SilverSneakers® can be found in the appendices (Appendix O) and Table 2. Four additional referrals were gained as a result of providing the patients with a second referral to SilverSneakers®. See Table 5 for the number of referral attendance at first and second attempt.

A significant number of patients who attended the structured exercise did so regularly. Only one referral did not return for exercise after his initial first to SilverSneakers®. The number of attendance to SilverSneakers® is displayed below in Table 6. The average number of exercise visits was 5.3 and ranged from 0-13. The mean and range number of visits for month one and month two was, respectively 2.6/0-8 and 8.1/0-13 (Table 6, Figure 5).

The investigator also analyzed the referrals' raw data and assessed the reasons why the referred patients did not attend SilverSneakers® (Appendix L). Throughout this project transportation was provided. As expected, zero patients reported lack of transportation as a reason for not attending SilverSneakers®. Fifty percent of those who attended SilverSneakers® utilized transportation vouchers. The most frequent reason patients reported for not attending SilverSneakers® was not being motivated. Reasons for not going to structured exercise are displayed in Figures 5 and 6.

Due to the small sample size no statistical analysis was conducted for this pilot project. However, the analysis of this project revealed significant practice changes in the healthcare providers' EBGs knowledge and practices for prescribing T2DM patients exercise.

Discussion

The main purpose of this project was to implement and embed an exercise structured referral process for patients with T2DM. Previous studies had shown that busy healthcare providers did not have the time to keep abreast with recommended evidence-base guidelines and would be more likely to use EBG if embedded in a practice through a passive process. Literature has estimated that healthcare providers would need to read close to 17 articles a day every day of the year to keep abreast with current EBGs.

This project found that primary healthcare providers would use evidence-base guidelines that were embedded into a structured referral process, and that a referral process would help in referring patients with T2DM for exercise. The implementation of SERP did show a significant increase in the number of T2DM patients being referred to structured exercise. The healthcare providers admitted that it took them some time to adjust to the notion of prescribing and referring exercise for T2DM patients. A few of the participants commented that during the intervention part of this project they realized they truly never had taken the time to write a prescription or properly refer a T2DM patient for exercise. These healthcare providers added that once the intervention was simplified and tailored to meet their needs it became a very useful tool. One healthcare provider added that upon completion of this project SERP could be used in referring other patients with chronic care diseases for exercise.

Although SERP only marginally increased the healthcare providers' knowledge and attitudes of exercise for T2DM it did significantly increase their practice of prescribing exercise for T2DM patients. This was evident by their changed response score in item number four of the BEQ and the meaningful number of referrals that were generated to SilverSneakers® during this project. In regards to the healthcare providers marginal knowledge change for EBG it should be noted that SERP was designed to passively engage the healthcare providers in the use of EBG. This thoughtless process may have contributed to the healthcare providers marginal response change for item six and seven on the BEQ, because the busy healthcare providers may have not realized they were gain this knowledge though an inactive process. The healthcare provider's attitudes toward the importance of exercise for T2DM did not change much, because the pre BEQ revealed that they believed exercise was very important for patients with T2DM. However, Provider B's change response attitude on item two of the BEQ (important to very important) hints that the embedded EBG and SERP can change healthcare providers current perception that diet is not the single most important lifestyle modification for improving glucose control in patients with T2DM. The Diabetes Prevention Trial showed that 150 minutes a week of moderate structured exercise significantly improved preventing and improving T2DM outcome. The greatest finding for this pilot study was that a structured exercise process with an embedded prescription could change healthcare providers practice in treating patients with T2DM.

Study findings regarding patient participation in exercise are also important to understand. There was also close to a 40% patient participation in the recommended exercise prescribed, and once the patients started attending the structured exercise classes they remained actively involved in the program. Fifty percent of the patients that participated in the structured exercise program utilized the transportation system that was set up for this project. Providing transportation may have played a role in the patients' participation to the structure exercise program. Lack of motivation was the biggest reason for those patients who did not participate in the structured exercise program. Thus, future research needs to explore this more from the patients' perspective.

Important to note were the challenges of implanting SERP into this busy clinical practice and the change of translating evidence-base guidelines into practice. Even though the project's clinical site had knowledge and used the Chronic Care Model, during the initiation phase of the project linking this healthcare system to the needed community resource was a complex activity.

Conclusion

Only recently has research begun to show the positive effects of prescribing evidence based structured exercise for patients with T2DM. Healthcare providers have found it increasingly difficult to keep abreast, translate, and implement evidence-base guidelines into practice. This pilot project was effective in increasing the healthcare providers' knowledge, attitudes, and practices of exercise EBGs for patients with T2DM. In this study the use of

embedded EBGs into a structured referral process to refer T2DM patients to an exercise class resulted in an increase in referrals. Furthermore, the patients who were referred to the structured exercise classes did participate in the prescribed recommended exercise.

The challenges for translating evidence into healthcare practices to make a difference in healthcare systems are complex. This study only postulates that an EBG structured referral process will result in an increase in referrals, and patient participation in the prescribed recommended exercise. It will be important to evaluate further the relationship between this project's increases in referrals that were associated with the project's intervention. New and better ways of delivering exercise for patients with T2DM remains to be explored.

Implications

This Doctor of Nursing Practice (DNP) project exposes the leadership needed for implementing a science evidence base intervention into practice. This project illustrates how the new evolving DNP role can impact and change a healthcare delivery system to assure that patients receive the care they needed and deserve.

The outcomes of this study have implications to healthcare providers and T2DM patients. Exercise healthcare policies and self-management support are essential evidence-based components of good T2DM care. Implementing EBG with a comprehensive clinical and patient-centered framework, which influences health systems, clinicians, and patient behavior is vital for T2DM self-management support. This pilot study described healthcare provider use of current exercise EBG for T2DM. The study used the CCM as its clinical framework and was guided by a multilayered referral process. The study demonstrated that healthcare providers followed the recommended exercise EBG for T2DM when facilitated by a simple and supporting tool that improved their recall of these guidelines. Furthermore, the use of a broad system approach that involved community resources for delivering the prescribed evidence-based exercise seemed to activate the T2DM patient and increase participation to the structure exercise facilities.

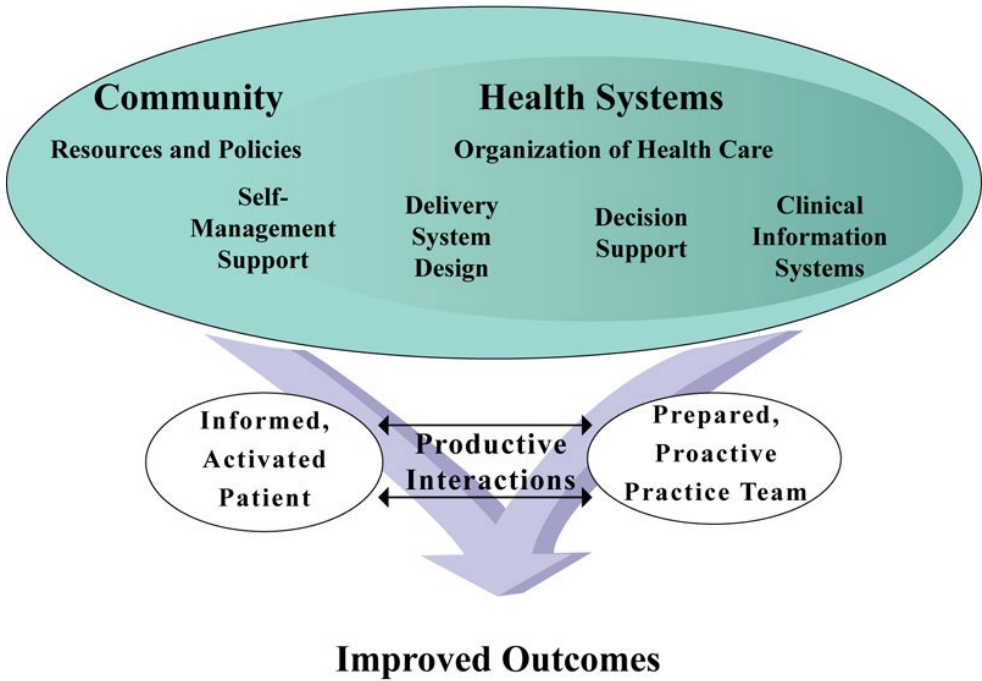
Overall healthcare provider knowledge and perceptions of the current exercise EBG for T2DM and structured exercise programs increased. Recommendations include: (a) performing a retrospective chart audit of patients who exercised to evaluate their post outcome, (b) generalizing this study to include other clinics within this healthcare system, (c) within this system conducting a randomized clinical trial with a placebo group (current standard of practice) and this new prescription driven referral process, and (d) within this system perform a cost-utility for providing exercise-transportation to T2DM patients compared to the cost of medication interventions. A within system analysis of this intervention's efficacy, effectiveness, and cost-effectiveness is advised to determine if this study could be generalized and implemented in other healthcare systems that are not driven by a capitation payer source.

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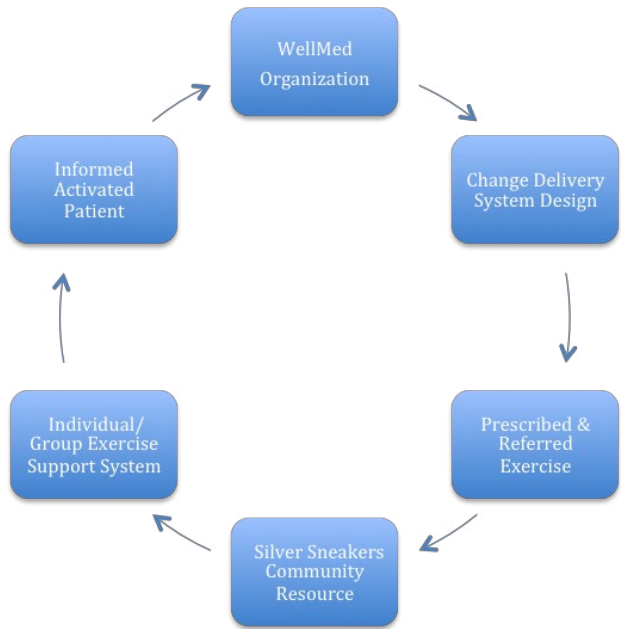
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43. NCHS (2010) Early release of selected estimates based on data from the 2009 national health interview survey (06/2010): Diagnosed diabetes.
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Appendix A: Chronic Care Model (CCM).
The Chronic Care Model

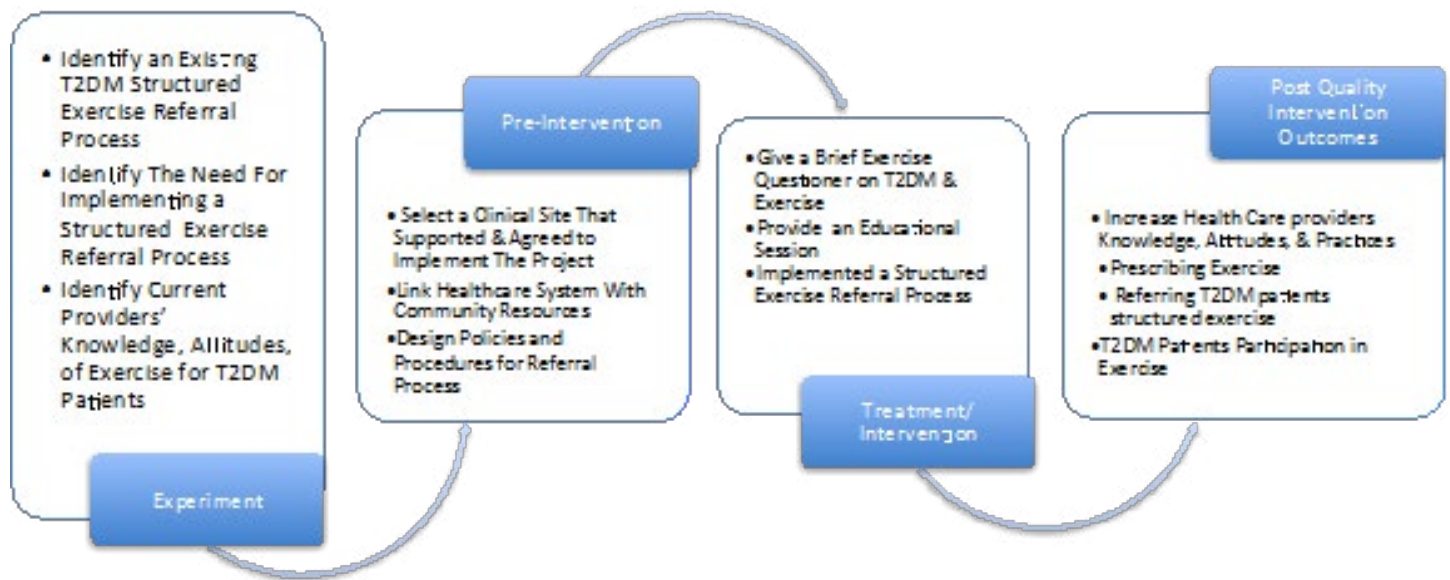


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Appendix B: Application of Theoretical Framework to Project Scope.



Appendix C: Project Design.



Appendix D: T2DM Exercise Referral Policy and Procedure to Silver Sneakers.

1. The medical office assistant or health coach is responsible for identifying T2DM patients that are candidates for glucose improvement through exercise.
 - a. All T2DM patients should be considered candidates for exercise.
 - b. Is the patient currently in a structured exercise program?
 - ☐ Yes: *explain* _____
 - ☐ No: *move to question number two*
2. The MOA and or health coach should screen all T2DM for eligibility of moderate to vigorous exercise. Using the following criteria:

<u>Stress Testing Not</u> Necessary (All Criteria Should Be Present)	<u>Stress Testing Recommended</u> (if ≥ 1 Criteria)
<input type="checkbox"/> No clinical history of CAD <input type="checkbox"/> No evidence of PAD or CVD <input type="checkbox"/> ECG normal <input type="checkbox"/> Asymptomatic <i>(No chest pain or dyspnea for > 3 months)</i> <input type="checkbox"/> Light to moderate exercise program	<input type="checkbox"/> History of CAD; no stress test within the past 2 years <input type="checkbox"/> Clinical or laboratory evidence of PAD or cerebrovascular disease <input type="checkbox"/> ECG evidence of infarction or ischemia <input type="checkbox"/> Symptoms of chest discomfort or dyspnea <input type="checkbox"/> Vigorous exercise program

3. After the MOA or health coach has identified the patient's ***probable*** level of eligibility of exercise a color-coded prescription will be placed in the chart for the health care providers ***final approval and signature***.

a. A **green exercise prescription** indicates that the patient has met all the criteria for vigorous exercise. Vigorous exercise is defined by the ACSM and the ADA as: "exercise more vigorous than a brisk walk or exceeding the demands of everyday living." The ACSM and ADA recommend that all T2DM patient receive an exercise stress test prior to participating in any vigorous exercise activity (ACSM and ADA, 2010).

b. A **yellow exercise prescription** indicates the patient has met all the criteria for low to moderate exercise. Low to Moderate exercise is defined by the ACSM and ADA as: a brisk walk or exercise that does ***not exceeding*** the demands of everyday living. Furthermore, the ACSM and ADA position statement is that an exercise stress test is unnecessary for low to moderate exercise (ACSM and ADA, 2010).

c. A **red exercise prescription** indicates that the patient has **not** met some of the criteria required for exercise and that a referral for an exercise stress test is maybe warranted.

* The heath care provider may request to change the color of the prescription or not prescribe exercise simply by not signing the prescription.

4. The health care provider will receive either a green, yellow, or red T2DM prescription for exercise. The provider will make the final determination to the frequency, intensity, type, and duration of exercise the patient will be referred to (see Appendix C).

5. Once the physician has prescribed and signed a T2DM prescription for exercise the MOA or health coach will be responsible for calling and setting up the initial visit to Silver Sneakers. A copy of the original T2DM prescription for exercise will be made and stored in the patient's chart. In an attempt to ensure that Silver Sneakers receives the T2DM prescription for exercise it will be faxed to the Silver Sneakers gym, and the original will be sent with the patient to turn in at the time of the initial visit.

6. Before the prescription is given to the patient the medical office assistant (MOA), health coach, or referral coordinator will make an initial call to Silver Sneakers. The patient will receive the addresses, date, and time of their initial appointment to Silver Sneakers.

7. To ensure that the patient kept their appointment with Silver Sneakers the MOA, health coach, or referral coordinator will call the patient no later than two week from their scheduled initial appointment.

a. Patient kept appointment ☐ Yes ☐ No

b. Reason for not keeping appointment: 1) Forgot ☐, 2) No transportation ☐, 3) Lack of Time ☐, 4) Not motivated (felt it was not important) ☐, 5) Lack of family support, 6) Other ☐ _____

8. If the patient did not keep referral to Silver Sneakers, but is still interested in attending an attempt to reschedule an initial visit to Silver Sneakers will be made. * Step # 7 will be used once again if another referral is made.

9. In about month after the initial visit to Silver Sneakers is ascertained the MOA, health coach, or medical office assistant will call Silver Sneakers and obtain the number of visits the patient as attended.

a. Total number of visits the patient has attended including the initial visit: 1st month _____ 2nd month _____ 3rd month _____.

Appendix E: Recommended Exercise Prescription.

Patient's Name _____ DOB _____

Patient's Code # _____

Exercise Guidelines

In support of the evidence based guidelines from the American Heart Association (2009), and the American Collage of Sports Medicine/American Diabetes Association (2010) the following amount and intensity of exercise is being prescribed to help the T2DM patient control their blood glucose.

Recommended Exercise Prescription With T2DM (Consider all that apply)

Mode of Exercise	Intensity	Frequency	Duration/Goal	Community Center Classes
Cardiorespiratory (Large-muscle activities)	<u>Low-Moderate</u>	<input type="checkbox"/> 2-3 d/wk <input type="checkbox"/> 3-4 d/wk <input type="checkbox"/> 4-5 d/wk <input type="checkbox"/> 5-7 d/wk	<input type="checkbox"/> 150 min/wk <input type="checkbox"/> other: _____ _____ _____ _____	<input type="checkbox"/> Silver Sneakers Cardio Fit® (Low-Moderate Aerobic) <input type="checkbox"/> Silver Sneakers Splash® (Low-Moderate Water Aerobic)
Resistance (Large-muscle group, multi-joint)	<u>Low-Moderate</u> (2-4 sets of 8-10 repetitions at a weight that cannot be lifted > 8-10 times, with 1-2 minutes rest periods between sets)	<input type="checkbox"/> 2-3 d/wk <input type="checkbox"/> 3-4 d/wk <input type="checkbox"/> 4-5 d/wk	<input type="checkbox"/> 150 min/wk <input type="checkbox"/> other: _____ _____ _____ _____	<input type="checkbox"/> Silver Sneakers Cardio Circuit® (Low-Moderate Combination Aerobic + Resistance) <input type="checkbox"/> Silver Sneakers Muscular Strength & Range of Motion® (Low-Moderate Combination Aerobic + Resistance)
Cardiorespiratory (Large-muscle activities)	<u>Vigorous</u>	<input type="checkbox"/> 3-4 d/wk <input type="checkbox"/> 4-5 d/wk <input type="checkbox"/> 5-7 d/wk	<input type="checkbox"/> 90 min/wk <input type="checkbox"/> other: _____ _____ _____ _____	<input type="checkbox"/> Silver Sneakers II® (Vigorous Aerobic)

Note: Silver Sneakers ® indicates that classes are structured and offered by a certified personal trainer (all classes are designed for age 60+). The classes are free/covered by Secure Horizon.

Prescribers' signature (☐ Physician, ☐ NP, ☐ PA)

Appendix F: Structured Referral Process.
Tracking Referral Form for Exercise and T2DM Patients

Patient's Name _____
DOB _____

Patient's Code # _____

Physician's Code #: ☐01 ☐02 ☐03 ☐04 ☐05 ☐06 ☐07 ☐08 ☐09 ☐10

Date of referral _____

Date of appointment for referral _____

Was transportation set up for patient's initial visit to SilverSneakers®? ☐ Yes ☐ No

Date staff confirmed if patient kept referral to SilverSneakers® _____

Did patient keep initial appointment to SilverSneakers®? ☐ Yes ☐ No

a. Reason for not keeping appointment:

- ☐ Forgot
 - ☐ No transportation
 - ☐ Lack of Time
 - ☐ Not motivated (felt it was not important)
 - ☐ Lack of family support
 - ☐ Other
- _____

For Patients who did not keep initial appointment:

Date of 2nd referral _____

Date of appointment for referral _____

Did patient keep this appointment to SilverSneakers®? ☐ Yes ☐ No

a. Reason for not keeping appointment:

- ☐ Forgot
 - ☐ No transportation
 - ☐ Lack of Time
 - ☐ Not motivated (felt it was not important)
 - ☐ Lack of family support
 - ☐ Other
- _____

Total Number of Visits at (including initial visit):

Month 1 _____
Month 2 _____
Month 3 _____

Appendix G: Transportation Vouchers.

<div><div>T2DM Exercise Transportation Voucher</div><div>Client's Name: _____</div><div>Issued By: _____</div><div><div>PRESA COMMUNITY TRANSPORTATION</div><div>WELLMED AT INGRAM PARK</div><div>.....</div><div>123456</div></div></div>	<div><div>T2DM Exercise Transportation Voucher</div><div>Client's Name: _____</div><div>Issued By: _____</div><div><div>PRESA COMMUNITY TRANSPORTATION</div><div>WELLMED AT INGRAM PARK</div><div>.....</div><div>123456</div></div></div>
<div><div>T2DM Exercise Transportation Voucher</div><div>Client's Name: _____</div><div>Issued By: _____</div><div><div>PRESA COMMUNITY TRANSPORTATION</div><div>WELLMED AT INGRAM PARK</div><div>.....</div><div>123456</div></div></div>	<div><div>T2DM Exercise Transportation Voucher</div><div>Client's Name: _____</div><div>Issued By: _____</div><div><div>PRESA COMMUNITY TRANSPORTATION</div><div>WELLMED AT INGRAM PARK</div><div>.....</div><div>123456</div></div></div>
<div><div>T2DM Exercise Transportation Voucher</div><div>Client's Name: _____</div><div>Issued By: _____</div><div><div>PRESA COMMUNITY TRANSPORTATION</div><div>WELLMED AT INGRAM PARK</div><div>.....</div><div>123456</div></div></div>	<div><div>T2DM Exercise Transportation Voucher</div><div>Client's Name: _____</div><div>Issued By: _____</div><div><div>PRESA COMMUNITY TRANSPORTATION</div><div>WELLMED AT INGRAM PARK</div><div>.....</div><div>123456</div></div></div>
<div><div>T2DM Exercise Transportation Voucher</div><div>Client's Name: _____</div><div>Issued By: _____</div><div><div>PRESA COMMUNITY TRANSPORTATION</div><div>WELLMED AT INGRAM PARK</div><div>.....</div><div>123456</div></div></div>	<div><div>T2DM Exercise Transportation Voucher</div><div>Client's Name: _____</div><div>Issued By: _____</div><div><div>PRESA COMMUNITY TRANSPORTATION</div><div>WELLMED AT INGRAM PARK</div><div>.....</div><div>123456</div></div></div>
<div><div>T2DM Exercise Transportation Voucher</div><div>Client's Name: _____</div><div>Issued By: _____</div><div><div>PRESA COMMUNITY TRANSPORTATION</div><div>WELLMED AT INGRAM PARK</div><div>.....</div><div>123456</div></div></div>	<div><div>T2DM Exercise Transportation Voucher</div><div>Client's Name: _____</div><div>Issued By: _____</div><div><div>PRESA COMMUNITY TRANSPORTATION</div><div>WELLMED AT INGRAM PARK</div><div>.....</div><div>123456</div></div></div>

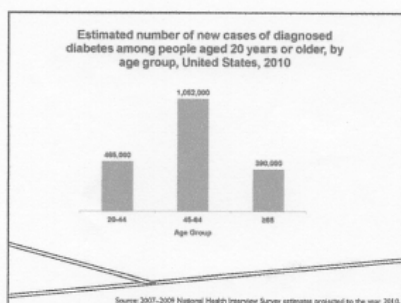
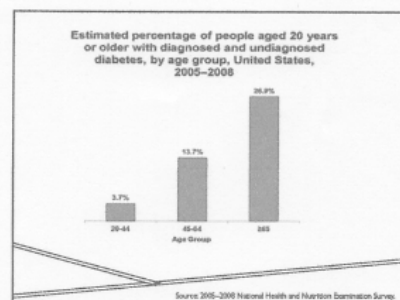
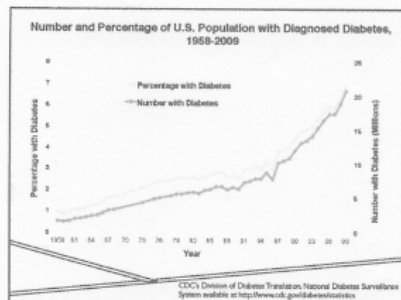
Appendix H: Educational Power Point Presentation for Providers.

4/26/12

PREScription & REFERRAL PROCESS FOR T2DM EXERCISE Evidence-Based Guidelines

BACKGROUND

- In 2011 the National Diabetes Fact sheet reported:
 - Total (prevalence) of 25.8 million people with diabetes
 - 7.1% whites
 - 11.8% Hispanics
 - 12.5% non-Hispanic blacks
 - New cases (incidence) 1.9 million were diagnosed in 2010 (using fasting glucose and A1C)
- 90-95% of T2DM is manifested in adults
- Prevalence of T2DM increases with age
- 10.9 million (26.9%) of adults age 65 or older have diabetes

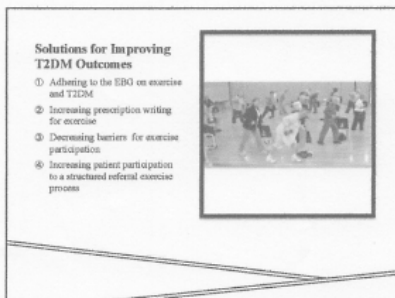
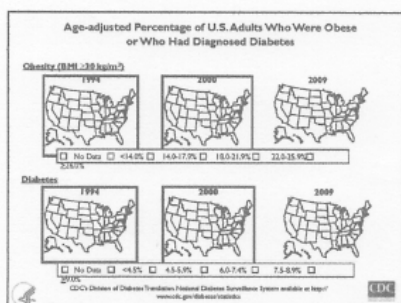
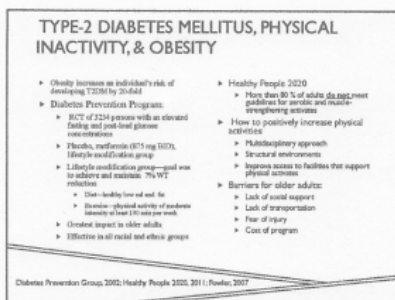
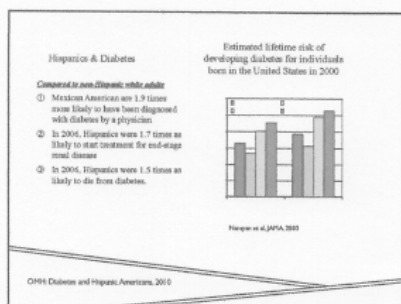
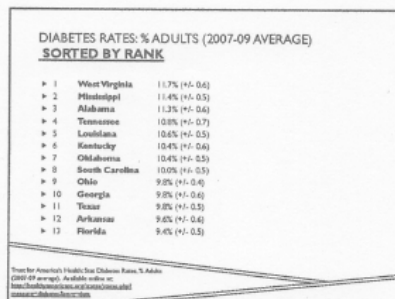
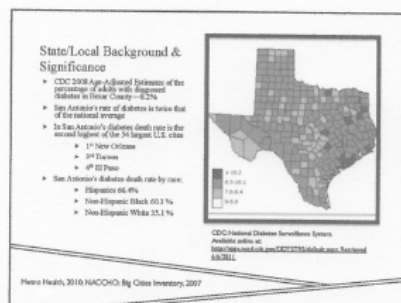


SIGNIFICANCE OF PROBLEM

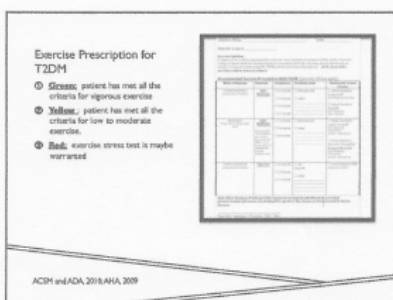
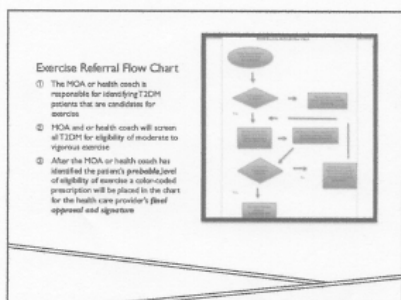
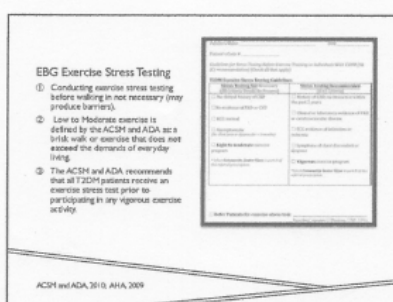
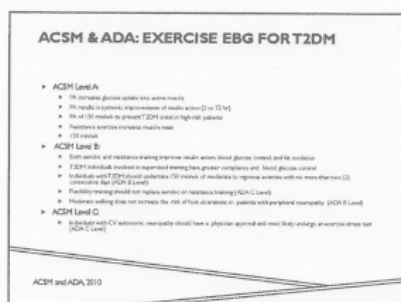
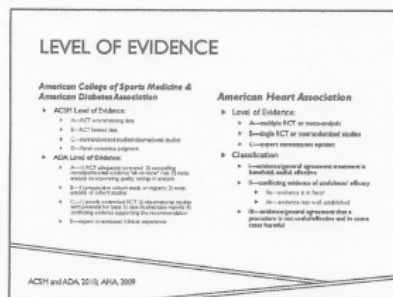
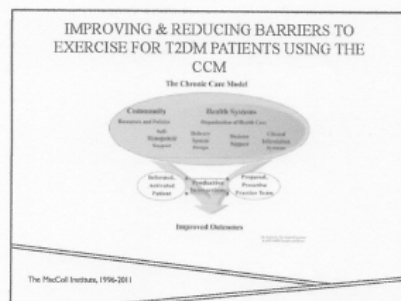
- Diabetes is the 7th leading cause of death
- Diabetes increases heart disease by 2 to 4 times that of adults without diabetes
- T2DM is the leading cause of:
 - Kidney Failure
 - Incidence of adult blindness
 - Lower Limb Amputations
- Total Health care cost associated with diabetes is estimated between \$174-\$218 million

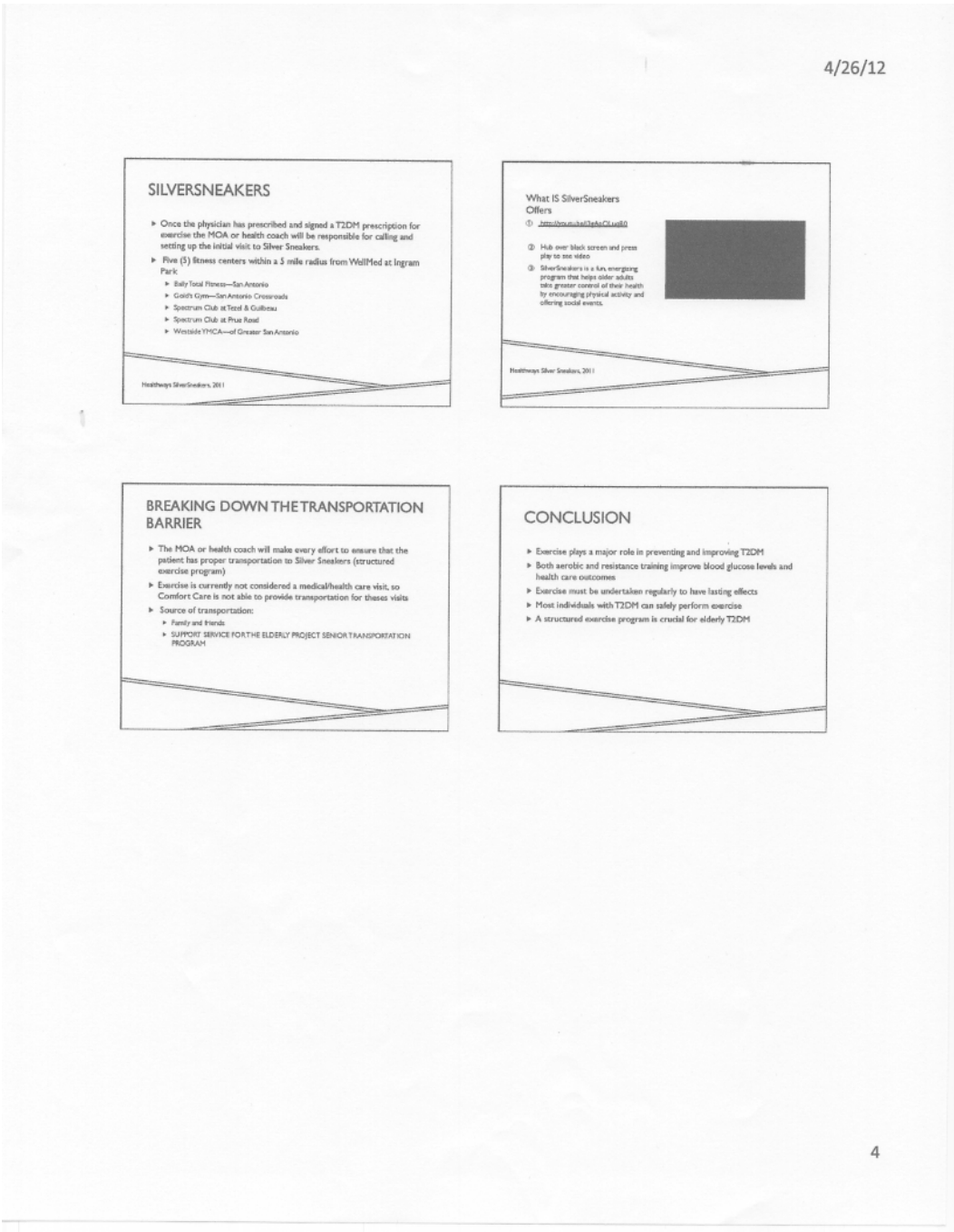
AHA National Diabetes Fact Sheet, 2011

4/26/12



4/26/12





Appendix I: Brief Exercise Questionnaire for T2DM.

Confidential For Research and Service Purpose

Participants Questionnaire

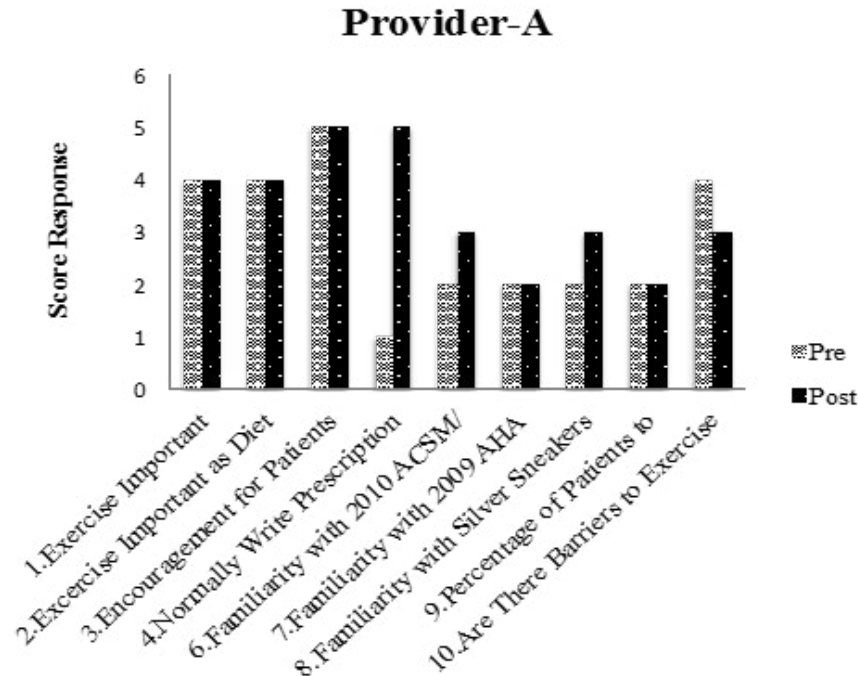
Name	Date
Sex: <input type="checkbox"/> Male <input type="checkbox"/> Female Race: <input type="checkbox"/> White <input type="checkbox"/> Hispanic <input type="checkbox"/> Black <input type="checkbox"/> Asian <input type="checkbox"/> American Indian <input type="checkbox"/> Other: _____	Type of Provider: <input type="checkbox"/> MD <input type="checkbox"/> DO <input type="checkbox"/> NP <input type="checkbox"/> PA Number of Years Practicing: <input type="checkbox"/> 0-4 <input type="checkbox"/> 5-9 <input type="checkbox"/> 10-14 <input type="checkbox"/> > 15

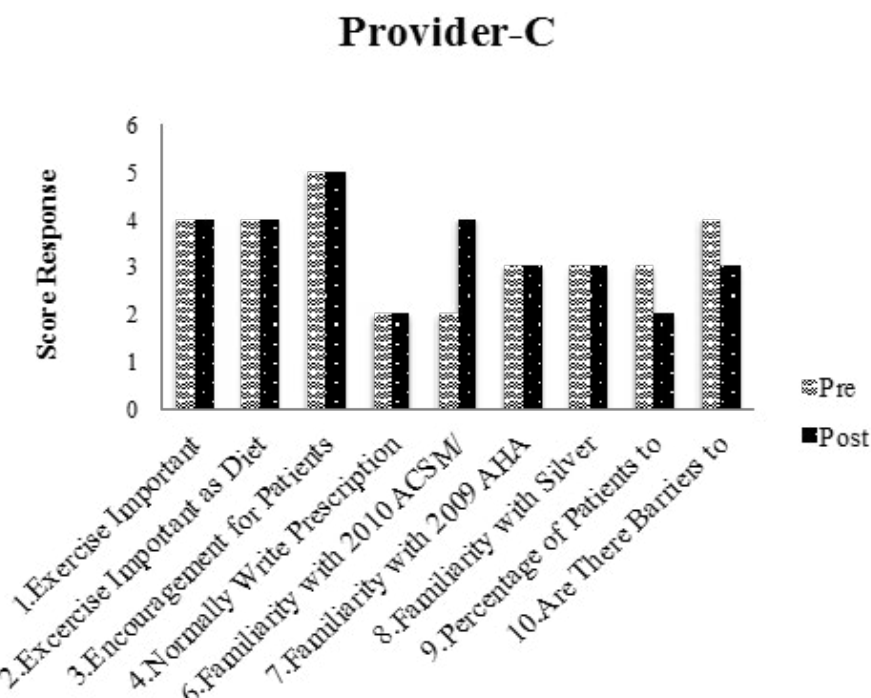
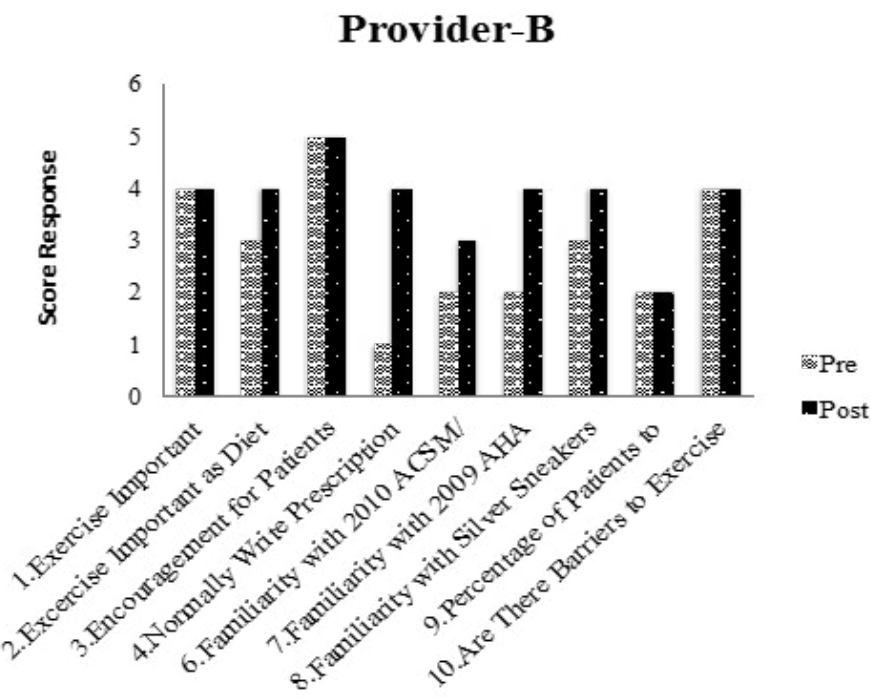
Please read the statements and check the appropriate box.

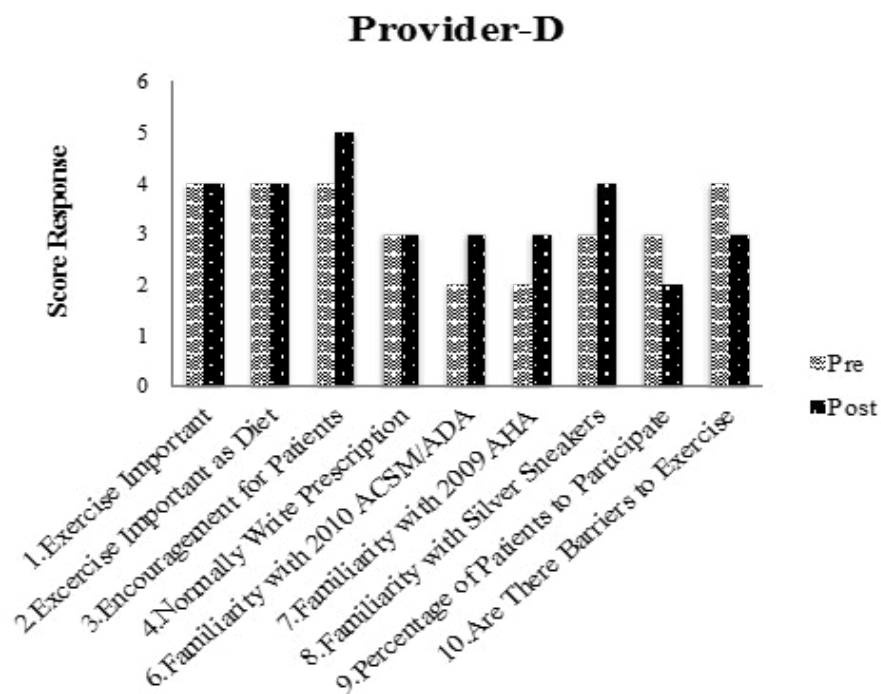
- Do you believe exercise is important for improving blood glucose in T2DM patients?
☐ Very important ☐ Important ☐ Somewhat important ☐ Not important
- Do you think that exercise is as important as diet in improving blood glucose in T2DM patients?
☐ Very important ☐ Important ☐ Somewhat important ☐ Not important
- Do you **usually** encourage T2DM patients to exercise?
☐ Always ☐ Often ☐ Sometimes ☐ Rarely ☐ Never
- Do you **normally** write exercise prescriptions for T2DM that includes the frequency, intensity, and duration?
☐ Always ☐ Often ☐ Sometimes ☐ Rarely ☐ Never
- If you refer** T2DM patients for exercise, **what percent**, of patients do you primarily refer to:
 - Physical therapy
☐ 0-20 ☐ 21-40 ☐ 41-60 ☐ 61-80 ☐ 81-100
 - Other physician
☐ 0-20 ☐ 21-40 ☐ 41-60 ☐ 61-80 ☐ 81-100
 - Exercise physiologist
☐ 0-20 ☐ 21-40 ☐ 41-60 ☐ 61-80 ☐ 81-100
 - Nurse
☐ 0-20 ☐ 21-40 ☐ 41-60 ☐ 61-80 ☐ 81-100

- e. SilverSneakers®
☐ 0-20 ☐ 21-40 ☐ 41-60 ☐ 61-80 ☐ 81-100
- f. Other structured exercise program
☐ 0-20 ☐ 21-40 ☐ 41-60 ☐ 61-80 ☐ 81-100
6. Are you familiar with the 2010 American College of Sports Medicine /American Diabetes Association Joint Position Statement on Exercise and Type 2 Diabetes?
☐ Very familiar ☐ Familiar ☐ Somewhat familiar ☐ Not familiar
7. Are you familiar with the 2009 American Heart Association (AHA) Guidelines on Exercise Training for Type 2 Diabetes Mellitus?
☐ Very familiar ☐ Familiar ☐ Somewhat familiar ☐ Not familiar
8. Are you familiar are you with the SilverSneakers® program?
☐ Very familiar ☐ Familiar ☐ Somewhat familiar ☐ Not familiar
9. What percent of patients with T2DM do you believe will participate in a structured exercise program that you prescribe?
☐ 0-20 ☐ 21-40 ☐ 41-60 ☐ 61-80 ☐ 81-100
10. Do you believe there are barriers to getting patients involved in exercise?
☐ Many ☐ Some ☐ Few ☐ None

Appendix J: Providers' Bar Graph Question 1-4 and 6-10.







Appendix K: Participants’ BEQ Changed Score Summary.

Question Ordering	Questions	Pre/Post A	Change Score A	Pre/Post B	Change Score B	Pre/Post C	Change Score C	Pre/Post- D	Change Score D	Participant with Changed Scores	Number of Participant with Changed Scores	Changes Among All Participant	Highest Change Value	Lowest Change Value
1	Q1	4,4	0	4,4	0	4,4	0	4,4	0	N/A	N/A	0	0	0
2	Q2	4,4	0	3,4	1	4,4	0	4,4	0	B	1	1	0	0
3	Q3	5,5	0	5,5	1	5,5	0	4,5	0	B	1	1	1	0
4	Q4	1,5	4	1,4	3	2,2	0	3,3	0	A,B	2	7	4	0
5	Q5A	1,1	0	2,4	2	1,1	0	2,2	0	B	1	2	2	0
6	Q5B	1,1	0	2,1	-1	1,1	0	1,1	0	B	1	-1	0	-1
7	Q5C	1,1	0	1,1	0	1,1	0	1,1	0	N/A	N/A	0	0	0
8	Q5D	1,1	0	1,3	2	1,1	0	1,2	1	B,D	2	3	2	1
9	Q5E	1,2	1	4,5	1	1,1	0	2,2	0	A,B	2	2	1	0
10	Q5F	1,1	0	1,4	3	1,1	0	1,2	1	B,D	2	4	3	0
11	Q6	2,3	1	2,3	1	2,4	2	2,3	1	A,B,C,D	4	5	2	0
12	Q7	2,2	0	2,4	2	3,3	0	2,3	1	B,D	2	3	2	0
13	Q8	2,3	1	3,4	1	3,3	0	3,4	1	A,B,D	3	3	1	0
14	Q9	2,2	0	2,2	0	3,2	-1	3,2	-1	C,D	2	-2	0	-1
15	Q10	4,3	1	4,4	0	4,3	1	4,3	1	A,C,D	3	3	1	0
Participant	Number of Questions with Changed Response													
A	5													
B	11													
C	3													
D	7													

Appendix K: Participants' BEQ Changed Score Summary.

Appendix L: Summary of Patients Participation in Structured Exercise.

Referrals to Silver Sneakers

Participant-A Referrals

Patient's Code	DOB	GYM	Date of Referral	Sex	Race	Transportation Needed	1st Date FU Call	Reason Not Going (1st)	2nd Referral	Reason Not Going (2nd)		# Of Visits Month 1	# Of Visits Month 2
										Going (2nd)			
1041	3/2/32	YMCA	10/14/11	M	H	2	11/4/11	1	1	0		0	8
1042	4/26/54	Gold's	10/20/11	M	H	2	11/4/11	4	1	3		0	0
1043	5/8/66	Gold's	10/21/11	M	H	2	11/8/11	4	1	3		0	0
1045	6/26/64	Gold's	10/27/11	M	H	2	11/10/11	3	1	4		0	0
1057	5/28/47	Gold's	11/15/11	F	H	1	12/2/11	4	1	4		0	0
1058	6/20/56	Gold's	11/16/11	F	H	1	12/2/11	1	1	3		0	0
1048	1/17/46	Gold's	11/18/11	M	H	2	12/2/11	3	1	1		0	0
1046	3/2/39	Gold's	11/18/11	F	H	1	12/2/11	4	1	0		0	12
1047	8/12/37	Gold's	11/18/11	M	H	1	12/2/11	4	1	0		0	12
1049	12/24/44	Gold's	12/8/11	F	W	1	12/22/11	4	1	4		0	0
1050	4/6/43	Gold's	12/9/11	F	H	1	12/22/11	0	2	0		2	5
1059	7/13/59	Gold's	12/13/11	F	H	2	12/29/11	0	2	0		3	8
1051	9/20/57	Gold's	12/13/11	M	H	2	12/29/11	0	2	0		3	8
1052	7/19/28	Gold's	12/13/11	M	H	1	12/29/11	4	1	4		0	0
1053	1/23/28	Gold's	12/13/11	F	H	1	12/29/11	4	1	4		0	0
1055	5/22/24	Gold's	12/28/11	F	W	1	1/12/12	1	1	4		0	0

Participant-B Referrals

1106	4/3/37	YMCA	11/11/11	F	H	2	12/1/11	1	2	0		0	7
1102	9/15/45	Gold's	9/27/11	M	H	1	10/14/11	0	2	0		6	8
1101	7/2/47	Gold's	9/27/11	F	H	1	10/14/11	0	2	0		6	8
1103	4/30/53	YMCA	10/6/11	M	H	2	10/21/11	3	1	3		0	0
1105	6/29/43	YMCA	10/11/11	M	H	2	10/29/11	4	1	4		0	0
1107	12/9/44	Gold's	11/15/11	M	H	2	12/1/11	0	2	0		8	13
1108	6/20/36	Gold's	11/12/11	F	H	1	12/1/11	4	1	4		0	0
1104	5/9/42	Gold's	10/25/11	F	H	1	11/11/11	0	2	0		1	0

Participant-C Referrals

1071	7/1/32	Gold's	11/16/11	F	W	1	11/29/11	4	1	4		0	0
1076	4/2/35	Gold's	11/11/11	F	H	1	11/29/11	4	1	4		0	0
1073	1/2/43	Gold's	12/8/11	M	W	2	12/22/11	0	2	0		3	8
1072	1/11/46	Gold's	12/8/11	F	H	2	12/22/11	4	1	3		0	0
1074	9/24/31	Gold's	12/15/11	M	W	1	12/29/11	1	1	4		0	0
1075	9/2/69	Gold's	12/16/11	F	H	2	12/29/11	3	1	3		0	0

Participant-D Referrals

1061	3/14/46	Gold's	10/10/11	F	H	2	10/28/11	4	1	1		0	0
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Was Transportation Set Up for Initial Visit: 1 Yes, 2 No

Reason did not go: 0 Went, 1 Forgot, 2 No Transportation, 3 Lack of Time, 4 Not motivated, 5 Lack of Family Support, 6 Other

2nd Referral 1 Yes, 2 No