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Increasing Exercise for patients with Diabetes using a mobile app – A Quality Improvement Project

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Abstract

Background: A literature review on Type 2 Diabetes Mellitus (T2DM) indicates that a combination of aerobic and resistance exercise leads to overall beneficial physical and psychological health benefits for people that have a diagnosis of Diabetes. Behavior change and social support are identified as essential factors that facilitate and help maintain a productive and committed exercise program for people with Diabetes. Patient self-management is an important indicator in maintaining good control of diabetes, and mobile phone interventions have been shown to improve such self-management. Exercise is an important component of treatment, and prevention of T2DM although people struggle with incorporating exercise into their daily lives and they have difficulty maintaining exercise once they initiate an exercise goal. *Method:* This quality improvement project provides an educational tool for diabetes educators on benefits of the MyFitnessPal app for people that have diabetes. Additionally, it teaches educators how to download and utilize the app so they can therefore teach their patients how to track and log food and improve patient self-management. Patient weight, glycohemoglobin, (A1c) and self-rated activity levels were also analyzed at the initial visit and at one to three month follow-up appointments. *Conclusion:* Educators were more comfortable using MyFitnessPal app after initial education, but did not find it useful for diabetes education. It was found that exercise is an important tool for patients with diabetes to lower A1C level and weight, and the MyFitnessPal app was shown to be useful tool for patients to utilize and to meet these goals.

Keywords: type 2 diabetes mellitus, exercise, physical activity, support, mobile apps, MyFitnessPal App

Introduction

Type 2 diabetes mellitus **(**T2DM**)** is a chronic disease that typically develops over many years. Diabetes is becoming more common in the United States, and 95% of diabetes cases are related to T2DM (Centers for Disease Control and Prevention, 2015). From 1980 through 2014, the number of people diagnosed with diabetes has drastically increased with four times as many Americans being diagnosed (Colberg et al., 2010). Exercise provides physical and psychological health benefits for people that have a diagnosis of T2DM, and is highly recommended to improve outcomes and general health. Despite the ADA's recommendations for regular exercise, there is still lack of physical activity in the diabetic population (Colberg et al., 2010).

People living with T2DM have difficulty following through and maintaining an exercise program. Mori et al.'s (2011) study analyzing people with diabetes compliance with an exercise program, found that half the participants dropped out of an exercise program within three months, and only 10% remained physically active one year later. Some of the barriers found that prevented people with T2DM from exercising are related to complications that develop from the progression of the disease process. Examples of barriers are foot or leg pain related to diabetic neuropathy, exercise-related hypoglycemia, and reduced eyesight. People with T2DM also had limited endurance due to deconditioning. These factors were found to decrease motivation to follow through with exercise recommendations. Additionally, Mori et al. found that absence of social support and psychosocial factors negatively affected people with T2DM, and this was one of the main barriers to exercise adoption.

There is a deficit of evidence-based exercise programs to prepare diabetes educators and health care providers with the appropriate knowledge to adequately prepare and support people with T2DM to reach and maintain a regular exercise routine. Balducci et al. (2015) concluded in

their randomized control study that many barriers are out of the control of persons with T2DM. Casey, De Civita, and Dasgupta (2010) report in their qualitative study that motivation was the most essential influence in exercise facilitation both during and after their exercise program. Additionally, the encouragement and reassurance provided by the program leaders helped participants to exercising on their own. Tulloch et al. (2013) also identified several barriers to exercise programs including experiencing an illness or injury, difficulties managing work commitments, inclement weather and general lack of time.

Problem Statement

Risk of lack of exercise among people with T2DM is indicated by poor health outcomes including: inadequate blood sugar control, increased risk of cardiovascular events, poor blood pressure control, and overall less quality of life. These poor outcomes result from barriers including lack of motivation to exercise and follow diet recommendations, lack of social support, and time barriers.

Literature Review

A literature search was completed on Academic search premiere, Cumulative Index of Nursing and Allied Health Literature (CINAHL) PubMed, and PsycINFO utilizing the search terms diabetes, diabetes mellitus, exercise and physical activity, and exercise apps. The search was limited to articles that were peer reviewed, English language, and had full text available in the UMASS Amherst library system. All of the articles were published after December 2009. This literature review's main focus is on the importance of exercise in health maintenance and decreasing blood glucose levels for people with T2DM, and will highlight the facilitators that promote exercise in this population.

Exercise Benefits

A 9-month experimental study that assessed reasons that affect exercise maintenance for people that have a diagnosis of T2DM enrolled participants in an exercise trial. It offered free gym memberships and personal trainers. It was found that motivational factors improve fitness outcomes. The facilitators identified by participants were the possibility of obtaining health benefits in the future, and a general sense of well-being. While understanding that free gym memberships are not involved in standard diabetes care, this study still provides important information about an ideal exercise program for individuals with diabetes (Tulloch et al., 2013).

Additionally, a cross sectional study done on 207 Asians and Pacific Islanders utilizing structural equation modeling compared diabetes quality of life with general health, depression, health behavior, and glycemic control (Li et al., 2013). The results of the pre-intervention focus group assessment identified improvements in diet and exercise; additionally, participants considered physical activity as an essential part of an integrated self-management plan (Li et al., 2013). A randomized control study that analyzed resistance and cardiovascular exercise results concluded that specific practices were effective in reducing pre-glucose levels compared to post exercise blood glucose levels. Li et al. (2013) also indicated a decrease in HbA1c levels. While their sample size was small with only 20 participants, they had excellent compliance. Evidence from this study concluded that resistance exercise produced a more significant reduction in HbA1c level as compared to cardiovascular exercise. In comparison with the resistance group whom had an eighteen percent decrease in HbA1c, the treadmill group had a reduction of 8% (Li et al., 2013). An analysis of several randomized control trials by Umpierre et al. (2011) identified that there was not a dramatic difference in the type of exercise that decreased HbA1C levels. Evidence from this study suggests is that all types of exercise are beneficial for T2DM.

Additionally this evidence highlight the importance of dietary factors in conjunction with exercise to successfully control blood sugar levels (Umpierre et al. 2011).

Current recommendations are moderate to vigorous resistance training at least two to three times per week. It is estimated that participation in regular exercise improves blood glucose control. Additionally, Colberg et al. (2010) provide essential evidence in their clinical practice guideline that physical activity is a significant component in the avoidance and control of T2DM They highlight the lack of regular physical activity in people with T2DM. Colberg et al. (2010) discuss the many benefits of physical activity, and found improvements in insulin action from 2-72 hours after exercise. Additional benefits identified were prevention and postponement of T2DM onset. This study identifies other health benefits of exercise including lower cholesterol, maintaining optimal blood pressure, decreasing risk for vascular events, reducing mortality, and overall improvement in quality of life (Colberg et al., 2010).

The determinants of exercise training-induced advances in blood sugar levels were investigated in a randomized control study (Johanssen et al., 2013). There is evidence that muscle lipid storage and oxidation can work by an overall lowered serum free fatty acid. This is an important factor for lowering the HgbA1c level. The change in free-fatty acid concentration was a major element found to lower glycemic control. Additionally, Johanssen et al. (2013) found that lipid excess to skeletal muscle may lead to increased risk for insulin resistance. This process happens by accumulation of incompletely oxidized lipid class.

Self-Management

Self-management plays an important role in maintaining good control of T2DM, and mobile phone interventions have been shown to improve such self-management. Goh et al.

(2015) used the interactive Diet and Activity Tracker (iDAT) app in their study. A total of 84 patients with T2DM from a public primary care clinic in Singapore who had not previously used the iDAT app were enrolled. The app was demonstrated and patients' weekly use of the app was monitored over 8 weeks. Goh et al. (2015) results showed that patients with higher exercise motivation scores had greater app usage. There are many barriers to initiating or increasing an exercise routine, so patients who indicate higher exercise motivation may be more determined to take active steps toward improving their diabetes, including more diligent use of the app.

A randomized control study examined the possibility and effectiveness of a diabetes prevention intervention combined with a mobile app and pedometer in English-speaking overweight adults at risk for T2DM (Fukuoka, Gay, Joiner, and Vittinghoff, 2015). While sample size was small with only 61 participants, the intervention group's steps per day increased by 2,551 (4,712) compared to the control group's decrease of 734 (3,308) steps per day. Therefore, Fukuoka et al. (2015) conclusions recognize that mobile phone technology is an economical and appropriate way to deliver proven weight loss interventions and thereby prevent or delay onset of T2DM. Additionally, Spring et al. (2013) found in their randomized control study that the addition of a personal digital assistant and telephone coaching can enhance short-term weight loss in combination with an existing system of care. Their connective technology holds possibilities as an appropriate mechanism for augmenting the effect of physician-directed weight loss treatment.

MyFitnessPal App

To evaluate the effect of introducing primary care patients to a free smartphone app for weight loss, a randomized controlled trial was done that examined weight loss at 6 months, and changes in systolic blood pressure and behaviors, frequency of app use, and satisfaction. Of the

three different apps utilized most participants reported great satisfaction with MyFitnessPal (Laing et al., 2014). MyFitnessPal can be utilized on a variety of mobile devices including Windows smartphone, Android smartphone or tablet using Android OS 2.1 or higher, iPhone, iPod Touch, or iPad using iOS 7.0. According to the app blog site there are 75 million people who have signed up and are using the app (Rebedew, 2015). Some of the benefits of using this app are that it allows people to track caloric intake and physical activity. In addition, MyFitnessPal is a community that provides support by encouraging sharing of accomplishments, recipes, and weight-management tips (Rebedew, 2015).

There is a large database of nutritional data for an estimated 6 million food choices. In addition to the food items there are over 350 exercise options available. The app is user friendly and is customizable to the user. First-time users input their initial weight goal and current activity level, weekly weight goal, and ultimate weight goal. The ease of use of the app develops over time, as the app remembers the user's common food, meal, and exercise entries, it takes only minutes per day to keep track of total caloric intake and physical activity (Rebedew, 2015).

The most current recommendations for patients with T2DM is to perform regular and continuous aerobic and or resistance physical exercise, or a combination of both, 150 minutes per week, at least three times a week on alternate days (Agency for Healthcare Research and Quality, 2016). Although exercise is highly recommended for people with T2DM, only 39% of adults with diabetes are regularly contributing to physical activity. This is in comparison with other Americans whom report 58% of regular exercise (Bweir et al., 2009). In addition behavior change was found to be an essential component to keeping people engaged and committed to regular physical exercise. Moreover, Tullock et al. (2013) conclude from their findings that most people with T2DM necessitate social support, including continued contact with individuals who

are personal trainers or are certified and trained in exercise teaching. Johanssen et al. (2013) identify that increased understanding of the factors involved in the adoption and maintenance of exercise in people that have diabetes facilitates more positive outcomes. Importantly, Li et al. (2013) found that regular exercise induced higher health behavior scores related to lower blood sugar values and lower depression scores.

This evidence provides vital information for diabetic educators to adopt and facilitate additional support and self-management techniques for people to comply with their individualized exercise goals. Exercise recommendations and individual patient goals are already part of the curricula for diabetes educators. The increased emphasis on tracking using an app that can be used on a mobile device may increase the accountability for people with diabetes. Additionally, education for diabetes educators on proper use of mobile apps may help facilitate teaching patients how to use the app. This support is essential for behavior change and will be major factor in the success to complete and maintain individualized exercise goals, which will in turn lead to better health outcomes.

Theoretical Framework

Self-Determination Theory (SDT) is a theoretical framework that examines human motivation and personality (Van Lange, Kruglanski, Higgins, 2011). The focus of the theory is on motivational factors, both intrinsic and extrinsic. SDT theory recognizes individual differences both generally and developmentally. The other aspect of this theory is that it focuses on how social and cultural factors assist or undermine people's sense of resourcefulness, in addition to their welfare and the value of their performance. SDT proposes high quality motivation and immersion in activities; furthermore, it has an objective of better performance. SDT supports resilience, creativity and autonomy of the individual. Additionally, it recommends

that the amount to which any of these three psychological needs is uncorroborated within a social context will have a strong beneficial impact on wellness in that setting (Self Determination Theory, 2016). An important component of this theory is motivation. Self-management behaviors are essential in the management of diabetes and self-determination plays an important role in this management (Goh et al., 2015). MyFitnessPal app can aid in this process and serve as a resource for people with T2DM to follow through and use their own self-determination to succeed. MyFitnessPal app provides people a useful way to be autonomous with tracking and logging their activity. Incorporating social support for individualized exercise goals by tracking exercise using an app will allow utilization of the SDT theory as a model.

Project Design and Methods

This is a quality improvement project to improve outcomes for patients with a diagnosis of T2DM. The DNP project consisted of education of MyFitnessPal app, with the development of an educational sheet for diabetes educators. The handout was designed by the DNP student and approved by the director of diabetes education as an appropriate handout for educators to give to diabetes patients. A questionnaire was given to the educators before they were instructed on MyFitnessPal app, and after the project implementation was completed. Diabetes educators were given individual educational session of approximately 10 minutes each on how to download and utilize MyFitnessPal app by the DNP student. They were instructed to give the handout to all diabetes patients who were coming in for their initial education, and answer any questions they may have about download or using the app.

Setting and Resources

This Quality Improvement Project took place at outpatient diabetes education center in Western Massachusetts. All of the educators work at least one day at the main office in one day out of the week. Berkshire Medical Centers outpatient diabetes educators service all adults ages 18 years and older who are referred to them by primary care providers in Berkshire County with a diagnosis of diabetes, both type 1 and type 2. The population estimates of Berkshire County as of July 1, 2015 were 127,828. Ninety two percent of the population is Caucasian while 3.1% are black and 1.4% are of Asian descent. The number of people with a disability, under age 65 years was 10.0% in 2014 (Berkshire County, Massachusetts, 2015). Convenience sampling was utilized to recruit patients following the regular flow of the office. All patients with diabetes that were there for initial diabetes education were included. Currently there are between 15-20 initial patient visits each month.

Organizational analysis

The endocrinologist office in Pittsfield, MA is where the majority of the outpatient diabetes educators facilitate and follow-through with their individual and group diabetes education. This office has a total of two endocrinologists and one endocrinology nurse practitioner. There are a total of two registered dieticians and four registered nurses whom conduct diabetes education. One of the registered nurses and educators is also the director for diabetes education and the stakeholder for this quality improvement project. The diabetes educators also travel to other locations including a North County campus and a South County campus. Additionally, they travel to two primary care offices in the Berkshires. The primary office in Pittsfield has three secretaries. Two of them facilitate appointments for endocrinology and one of them sets up the appointments for diabetes education.

Currently the diabetes educators are utilizing the American Association of Diabetes of Education (AADE) current recommendations for exercise as a teaching recommendation for patients with exercise. These recommendations are to walk or perform other moderate-intensity physical activity three or more days a week for a total of 150 minutes per week and engage in weight lifting or other muscles strengthening resistance exercise three days a week (U.S. Department of Health and Human Services, 2016). The gap identified at this facility is the lack of encouragement educators use to encourage mobile apps to track calories and exercise.

Goals and Objectives

Goals	Objectives
1. Evaluate diabetic educator's level of knowledge about MyFitnessPal app by October, 2016.	Assess diabetes educator's current level of knowledge on MyFitnessPal app by giving a questionnaire to all six of the diabetes educators that will exam current ability to download and utilize the app by October 7th, 2016.
2. Perform an intervention to educate diabetes educators about MyFitnessPal app by October, 2016.	Implementation of ten minute individual educational sessions for each of the six educators by October 14th, 2016 that will teach them the benefits of MyFitnessPal app and also how to download and use the many features of the app based on their current knowledge of MyFitnessPal app.
3. Administer a post educational questionnaire given to the educators to assess their new level of understanding to teach others by October, 2016.	The objective is to see if the six educators have the knowledge and skill necessary with using the MyFitnessPal app to teach diabetes patients.
4. Have diabetes educators give the instructional sheet to patients at their initial diabetes education visit for October and November	Objective is to have the educators give MyFitnessPal app educational handout to 90% of diabetes patient that come in for their initial visit in October and November.
5 Have diabetes educator's follow-up with patients by February for their 2-3 month follow-up visit.	Objective is to have educator's follow-up with 40 % of patients by February and record their weight, most recent Hemoglobin A1C level with date, and their self-rating of current exercise.

Implementation Plan

It was important that diabetic educators have a solid understanding of the app to ensure proper teaching to patients. The DNP student conducted a pre-education questionnaire assessing the educator's level of understanding of mobile apps and MyFitnessPal app specifically. This included identifying barriers for using MyFitnessPal app, their comfort level using the app, and whether they feel the app is helpful for diabetes education. After careful review of the educators' strengths and weaknesses regarding using mobile apps, the DNP student conducted approximately ten minute individualized teaching to each educator on the handout and app. Each educator was instructed to give the handout to every patient that came in for their initial diabetes education visit. A post educational questionnaire was given to the educators at the completion of the project. The DNP student also collected data on the patient's age, gender, initial A1C level, and weight at initial visit and then again one to three months later to monitor for any significant changes. Other data collected included whether the patient chose exercise as a goal at initial visit and their individualized self-rating of activity level. (See Appendix VI for activity scale.)

Procedure

Once the diabetes educators were educated and the pre-education questionnaire was completed, the DNP student evaluated the results and confirmed that the educators were ready to educate diabetes patients about the MyFitnessPal app. Educators were provided an informational instruction sheet to give to the patients during their initial diabetes education visit. This educational tool provides basic, clear and concise information on how to download and properly utilize the app to log both exercise and food. The educator then gave the patient the informational tool. Additionally, educators assisted patients with downloading the MyFitnessPal app if they had their mobile phone with them and if time allowed for it during the visit.

After the initial education, the educators set up a one to three month patient follow-up visit according to current practice protocol. Typically, 30% of patients come to the follow-up vising within two to three months. At this follow-up visit patient weight was recorded, A1C levels were obtained, as well as patient self-rated activity scores. The outcome measures were obtained from a diabetes educator who works in the office who offered to provide this information as de-identified patient data. The DNP student was also provided with the patient's self-rated scores of exercise if they chose exercise as a goal at initial visit, and the two to three month follow up visit. This is already routinely collected and tracked.

Ethical Considerations

To follow through with this quality improvement project, ethical standards were followed. Fair participant selection was utilized as well as protecting patient confidentiality. Privacy and confidentiality agreements currently utilized at Berkshire Medical Center were followed. A determination of human subjects research form to get appropriate approval from to the UMass IRB was done. It was found that the activity does not meet the federal regulation definition of human subject research, therefore does not require a submission to the IRB.

Results

Results of Educational Intervention

The results will be discussed in two sections. This first section will discuss the impact of the educational intervention on the providers and the second section will discuss the patient results. All analyses were completed using SPSS V22.

Impact of the Intervention on Providers

The provider educational intervention for the diabetes educators was presented to five educators. Of the educators, three were registered nurses and two were dieticians. Comparing pre-post intervention knowledge was performed using a paired sample t-test with a one-tail alpha level due to a small sample size. Results identified educators were more comfortable using MyFitnessPal app post education, although results also identified that educators did not feel that MyFitnessPal app was helpful for patients with diabetes (see Table 1).

Table 1

Educator Data

	Pre-Intervention		*Post Intervention*		*t*	*p*
Helpful	2.6	1.1	2.0	1.2	2.5	0.035
Comfort Using	2.0	1.6	2.8	1.6	-2.1	0.050

Patient Results. Among the 32 patients that were seen during the intervention assessment time-period, 18 were male and 14 were female. The majority of patients had Type 2 diabetes (N=29) and just over 50% (N=18) came to the office for a one to three month follow-up visit and 61% (N=11) chose activity as a goal.

To examine the impact of the activity on patient outcomes, the general linear model was used to examine both within subject change as well as between subject differences in intervention choice (i.e., choosing the activity). In addition, since the sample size was small, a one-tailed alpha was used to evaluate statistical significance. The results identified that overall Hemoglobin A1C level reduced during the intervention time-period ($F=4.6$, $p = 0.028$). Although

weight went down (221 lbs. compared to 217 lbs.) the difference was not statistically significant (F=1.6, p = 0.114). Additionally, although patients reported that their activity level increased (1.6 vs 2.5), this was also not a statistically significant change (F=0.9, p = 0.204).

Additional analyses were performed to identify if there was an impact of activity choice on outcome. Importantly, there was a significant weight by activity choice interaction (F=3.7, p = 0.037). In addition, there was a marginal effect for A1C by Activity interaction (F=2.7, p = 0.063). These data suggest that of those who choose the activity as their goal, they lost more weight and their A1C levels dropped more than those who did not choose the activity as their goal (See figures 1 and 2).

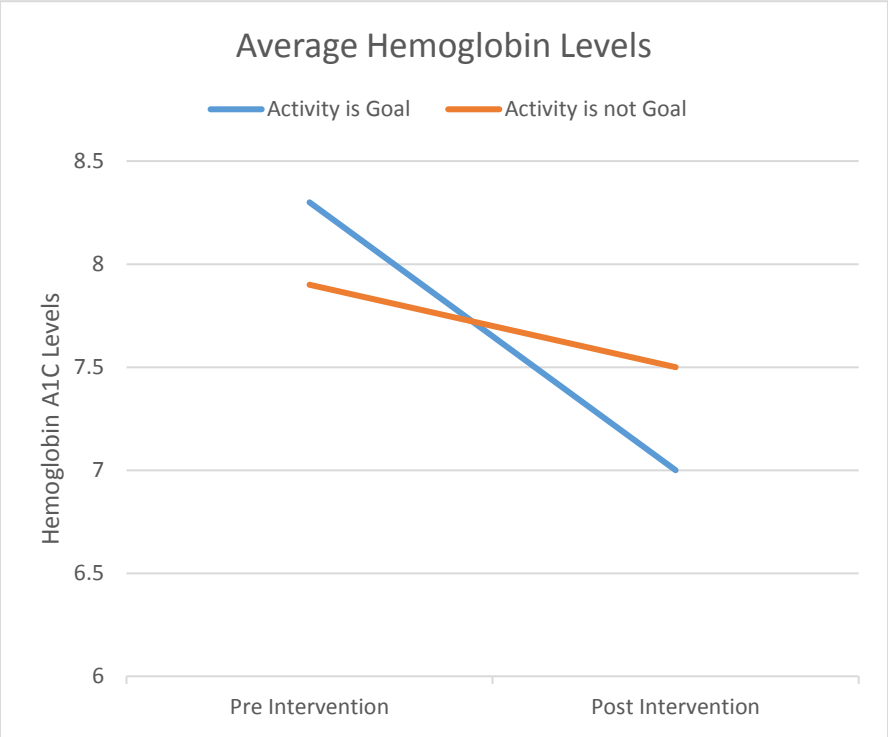

Figure 1: *A1C levels by Activity Choice Comparing Pre-to-Post Intervention.*

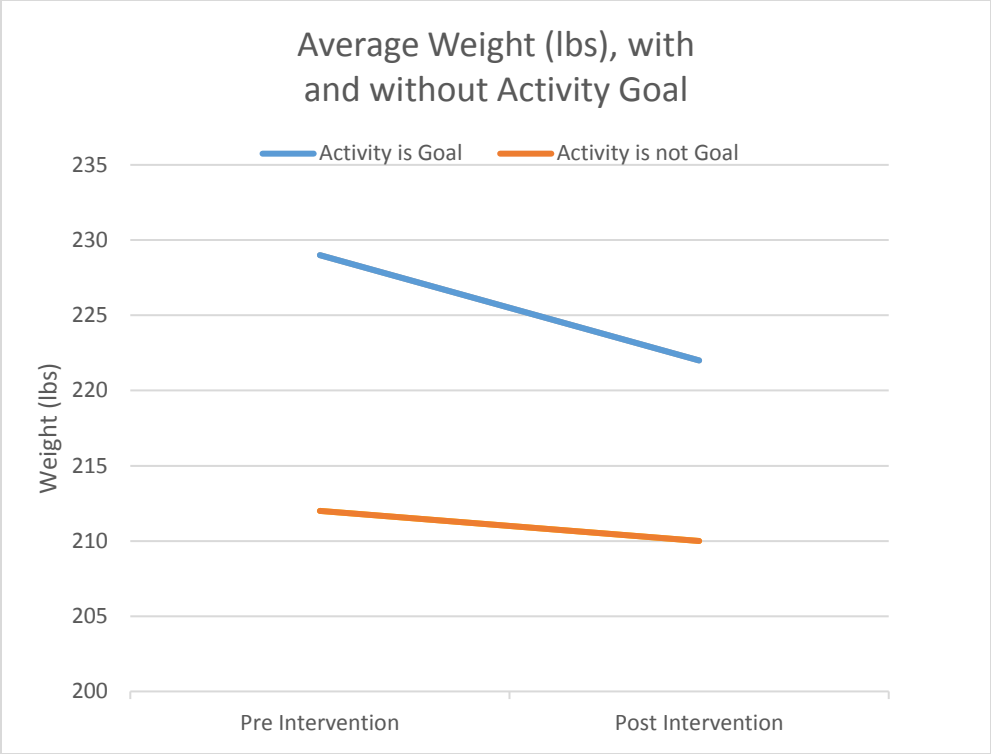

Figure 2: *Weight by Activity Choice Comparing Pre-to-Post Intervention.*

Discussion

The goals for this project were to increase diabetes educator's knowledge on the MyFitnessPal app, and to have diabetes patients utilize MyFitnessPal app as an aid to increase exercise, which would in turn reduce their weight and Glycohemaglobin levels. In comparing pre- and post-intervention questionnaires, the educational intervention positively influenced diabetes educators' level of comfort with utilizing MyFitnessPal app. This positive finding was likely related to individualized educational sessions, and increased use of the app for diabetes education. More remarkably, the initiation of MyFitnessPal in diabetes education was related to decreases in patient weight and hemoglobin A1C levels, with the greatest decreases in patients who made exercise goals. It is likely that these positive patient outcomes were related to

increased accountability with tracking and logging activity levels in the app and self-determination to comply with their individualized activity goals.

Limitations

There were several findings that were not anticipated. For example, it was expected that educators would feel that MyFitnessPal app was useful for diabetes education. However, the data did not reflect this change. It is possible that educators were resistant to the initiation of this new teaching method for diabetes education. Nurses who have a tendency to resist and avoid changes are more likely to manifest negative reactions, which can hamper the effectiveness of organizational changes (Montant, Courcy, Giorgi, Boilard, 2015). Another barrier is that some patients do not own a smart phone or device and do not have the capabilities to use this app. Therefore the education on the app and handout would not be beneficial for them to use.

Conclusion

The importance of exercise for people that have T2DM is essential for both physical and mental health. Due to several reasons they are not getting enough exercise and they have more difficulty being consistent with regular physical activity. This project is important for providers, educators and diabetes patients as it shows not only the continued importance of diabetes education for patients with diabetes, but also the importance of regular exercise for diabetes management. It would be important to implement this project with a larger patient group, but this project shows initial evidence that MyFitnessPal app is beneficial for reducing both patient weight and A1C levels. The results also suggest that educators should instruct diabetic patients on the importance of exercise.

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Appendix A

Pre-focus group questionnaire for diabetes educators

1. What type of cell phone(s) have you had?

Type	Have Now		Had Before	
iPhone	No	Yes	No	Yes
Android	No	Yes	No	Yes
Blackberry	No	Yes	No	Yes
Flip phone	No	Yes	No	Yes
Other (describe: _____)	No	Yes	No	Yes

2. What is the name of the last phone app you downloaded? _____

3. What date did you download the app? _____

4. On average, how many phone apps do you download in one month? (circle one)

   None One to two Three to five Six +

5. How proficient do you feel you are at downloading phone apps? (circle one)

   Poor at Downloading | Somewhat good Downloading | Good at Downloading | Very good at Downloading | Excellent at Downloading

6. How proficient do you feel you are at using phone apps? (circle one)

   Poor when Using | Somewhat good When using | Good when Using | Very good When using | Excellent When using

7. Are there barriers that prevent you from using apps? (circle no or yes for each)

Barrier		
Cost	No	Yes
Time	No	Yes
Fear	No	Yes
Complexity	No	Yes

8. Have you ever heard of or used MyFitnessPal app? (circle one) No Yes

9. If yes, have you ever downloaded or used myfitnesspal app? (circle one) No Yes

   a. If yes, do you find that it is helpful for logging food and activity? (circle one)

      Never Infrequently Sometimes Frequently Always

10. Do you currently use myfitnesspal for health education for diabetes patients? (circle one)

Never	Infrequently	Sometimes	Frequently	Always

a. If you use this app when you educate patients do you think it is helpful? (circle one)

Never	Infrequently	Sometimes	Frequently	Always

Appendix B

Post questionnaire for diabetes educators

1. Since having been educated on how to download MyFitnessPal app on a mobile device do you feel that you could download an app without instruction? (circle one)
   Not at all comfortable somewhat comfortable comfortable
   very comfortable extremely comfortable

2. Do you feel that you can teach and instruct patients the correct way to download myfitnesspal?

   Not at all comfortable somewhat comfortable comfortable

   very comfortable extremely comfortable

3. If you are having problems with downloading and using the app, circle all that apply

   Unable to download Unable to setup Unable to log food

   Unable to log physical activity

4. Do you feel that you can teach and instruct diabetes patients on how to utilize MyFitnessPal app?

   Not at all comfortable somewhat comfortable comfortable

   Very comfortable extremely

5. Do you understand the benefits of people with diabetes using this app for health and fitness?

   Never Infrequently Sometimes Frequently Always

6. Do you feel adequately prepared to teach patients the benefits of this app for health and fitness?

   Not at all comfortable somewhat comfortable comfortable

   very comfortable extremely

7. Do you find this app to be helpful for logging food and activity? (circle one)

Never Infrequently Sometimes Frequently Always

Appendix C

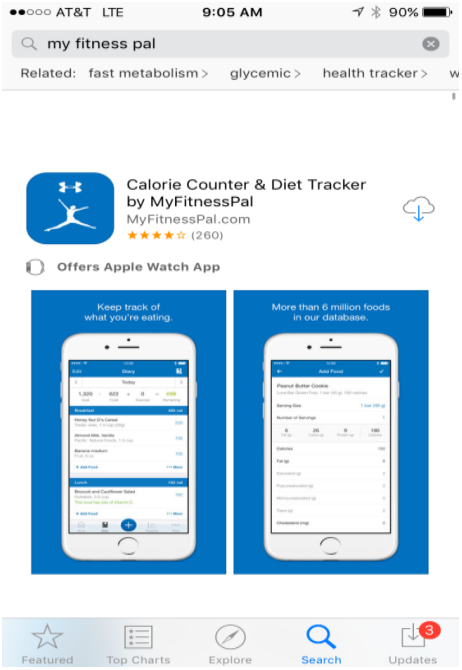
MyFitnessPal

FREE downloadable app for keeping track of both food and activity

Easy carbohydrate, fat, protein, sugar, and calorie counting

Over 6,000,000 foods available by search or using package barcode scanner

Database of over 350 cardio and strength training exercises



- **To install this FREE APP on your iPhone or Apple device go to the "App Store", and search for MyFitnessPal, then click on the cloud with the downward arrow to download (picture left)**
- **To download from Android device go to your "Google play" store**

- **Once installed find MyFitnessPal**  **on your home screen.**

- **When opening the app for the first time, you will to choose a goal, activity level, and answer a few simple questions about yourself. You will then create a free personal account using an email and password. Lastly, follow the prompts until you are led to the main screen where you can start logging away!**

- **To log your data (food, exercise, weight, water, or status update), hit the blue plus sign at the bottom of the screen.**

Appendix D
Patient Rated Activity scale

1. Never Exercise
2. Rarely
3. Sometimes
4. Frequently
5. Always