

Increased self-management in type-two diabetes mellitus and pre-diabetic patients with the use
of social media

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Abstract

The number of people in the United States that are diagnosed with type two diabetes mellitus (T2DM) is approximately 30.3 million, while another 84.1 million (1/3 of the U.S. population) are either pre-diabetic or have not yet been diagnosed. If these pre-diabetic people don't change, they will likely become a T2DM within five years. The methods of education and self-management currently being used in the United States is clearly not working as hoped.

Diabetes remains the seventh leading cause of death in the U.S. and is a major co-morbidity in patients suffering from heart disease, stroke, and poor circulation. T2DM is a chronic disease that can be controlled with diet and lifestyle adaptations. Support in initiating and maintaining changes is mandatory.

The National Diabetic Prevention Program was a yearlong program that included a behavior change program. End results showed better eating habits and increase in daily exercise, which means a reduced risk of T2DM. When people are shown what and how to change, with encouragement they can succeed. A social support system that provides true, proven ways to decrease blood sugar is a great way to assist T2DM patients in becoming healthier, with fewer complications.

A readily available tool to help people self-manage DM needs to be utilized. A tool that is used frequently and is readily by their side most hours a day. A survey from 2017 (Smith, 2017), indicates nearly all Americans aged 18 – 50 own a smart phone (96 percent), and ownership only decreases slightly with age. The vast majority (75 percent) of Americans, aged 50-64 years old and over 50% of people over 65 years old own a smartphone. This project looks at the potential of using social media as a tool to enable a better self-management in patients with pre-diabetes and T2DM.

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Chapter1: Introduction

Diabetes and the condition of prediabetes are a serious concern. The number of people with this chronic disease is growing in alarming proportions. According to recent data from the Centers for Disease Control and Prevention (CDC), one in three Americans are prediabetic, meaning they are one step away from Type Two Diabetes mellitus (T2DM) (CDC, 2014). Without weight loss and at least some kind of moderate activity daily, 30 percent of these pre-diabetic people will develop T2DM within five years. In the year 2013, diabetes was estimated to cost \$322 billion, or \$1,000 a year for each American, including those without diabetes. This is 48 percent higher than the same benchmark in 2007 (Shute, 2014). Medical costs for a diabetic are twice as high than for a non-diabetic person, and costs are growing every year.

Significance.

Evidence-based support for focusing on participants diagnosed with pre-diabetes or T2DM includes a clinical review of 1345 patients with T2DM (Engelmann et al., 2016). This clinical review indicated patients with T2DM for less than 10 years were expected to live almost two years less than those without T2DM. For patients who have had T2DM for greater than 10 years, the life expectancy was almost three years shorter than non-diabetics. This article went on to present, from a statistical point of view, the highest mortality rate will occur in an over 55-year old, smoking and non-compliant diabetic woman with alcohol abuse, living in a rural area with a low level of education and a low socio-economic status. Diabetes is a chronic disease that can lead to blindness, kidney failure, stroke, heart disease, high blood pressure, numbness and burning sensation in hands and feet, and eventually limb amputation and premature death.

Diabetes was the seventh leading cause of death in the United States in 2016 (CDC, 2017).

T2DM is a complex chronic disease that requires active involvement of patients in its management. T2DM develops when the body does not produce enough insulin to maintain a normal blood glucose level, when the body is unable to effectively use the insulin that is produced, or the body has become resistant to producing insulin required to metabolize food. Specific risk factors for the development of T2DM are having a sedentary life-style, little exercise, poor nutrition, obesity, high blood pressure and cholesterol, increasing age, family history of diabetes and ethnicity (Stoppler, 2014). Many of these risk factors are controllable, including lack of exercise, poor nutrition and sedentary lifestyle, all of which typically lead to obesity. Frequently high cholesterol and high blood pressure are related to this couch potato type lifestyle. Education and encouragement will enable the patient to self-manage their lifestyle and become healthier.

The terms self-help and self-management are often used interchangeably. Self-help is defined by Merriam-Webster as the action or process of bettering oneself or overcoming one's problems without the aid of others. The definition of self-management is given as the act or manner of managing; handling, direction, or control the act or art of managing (Merriam-Webster, 2018). This is the terminology that will be utilized throughout this project, as it better defines the goal of greater feelings of efficacy in self-managing their own health when using a social media site.

There are many social media sites, including Twitter, Facebook, and Instagram, and these sites are all a popular venue for asking questions and giving points of view as well as “this worked for me” responses. However, the most popular social media site, for the past several years, has remained Facebook. Therefore, this project will focus on the Facebook Diabetic

Support Group. According to statistica.com, as of 2018, 168.8 million mobile users accessed the Facebook application, compared to the second most used app, Instagram, at 116.9 million users (Statistica.com, 2018).

This project focused on T2DM self-management training. Diabetes self-management education and training (DSMT) is an ongoing process of facilitating the knowledge, skill, and ability necessary for diabetes self-care. Self-management is a vital component of integrated diabetes care. T2DM care is typically being done in clinic and hospital settings by a diabetes educator. The health care professional will refer the patient to this educator, as well as give the patient handouts and pamphlets about T2DM. The patient hopefully will be able to obtain an appointment quickly, and the education can continue. Often, the educator appointment is delayed due to increased need and decreased supply. Consequently, the importance of self-management is forgotten by the patient. The patient is reminded of the importance of T2DM self-management at their next health care provider's appointment and the educator appointment cycle begins again. A patient's ability to learn about diabetes and how to implement self-management techniques are imperative to disease control (Li et. al 2014). Education on self-management of T2DM can play a pivotal role in tackling beliefs about health and improve disease management, metabolic control, agreement about drug decisions with healthcare professional, risk factors, prevent complications, and increase quality of life. By educating the persons with T2DM on how to effectively care for themselves, complications can be decreased, and the cost of healthcare will be reduced. If patients can effectively learn self-management through social media and smartphone applications, resulting monetary savings for the patient and insurance companies will be significant. Thanks to fewer health complications, there will be less expense for all, as well as improved health outcomes.

Background.

Self-help and self-management are far from new concepts. The origins of the self-help genre have been attributed to many, starting with Saint Augustine, from fourth century AD who wrote the self-help book *Confessions*, George Combe's book *The Constitution of Man* in 1828, and Ralph Waldo Emerson's book *Compensation* in 1841. These are reported to have started the self-help fascination. Dale Carnegie's books *How to Win Friends and Influence People*, written in 1936 and *How to Stop Worrying and Start Living* from 1944 still hold top-ranking spots on Amazon.com (Myers, 2014). Self-help is currently a multi-billion-dollar industry in the United States alone, with books, television shows, and seminars promoting the concept. People want to help themselves, and are continuously looking for ways to improve, including how to better self-manage their health, including self-management of T2DM patients. There is much information on social media, but limited information on who uses these self-care applications, how they use them, how reliable the information is, and to what extent they find these social media applications helpful.

Research has indicated the majority of people, including those who have pre-diabetes or T2DM have a smartphone that they are using to learn about a health condition (Smith, 2017, Raine, 2013). They are one step away from having an application to help with managing their disease. There are numerous phone applications that are designed to help a person become more fit and eat better quality food. There are also a few phone applications made specifically for the diabetic patient, to enable them to manage their own disease more efficiently (Bell, Fonda, Walker, Schmit, & Vigersky, 2012). When a person is unsure about a day-to-day decision, they tend to look at an application on their smartphone for guidance. Some applications even provide positive feedback after the person has logged onto the application a few days in a row, or when a

goal set by the smartphone owner has been met. The application will enable the patient to learn how to care for themselves, how to make a better choice in food or activity in an enjoyable, practical, and understandable way. According to the American Psychological Association (2015), self-efficacy reflects confidence in the ability to exert control over one's own motivation, behavior, and social environment. The use of an application by a T2DM patient is self-efficacy in action.

Designed the right way, an application has the potential to improve a patient's glycemic control, weight control, and overall health. An application can easily keep track of daily food intake, exercise and blood sugar levels. According to the Walter Reed Army Medical Center (WRAMC), cell phones are being studied as an aid in diabetes management (Bell et. al, 2012).

Statement of the Problem.

The diagnosis of T2DM is growing significantly in numbers worldwide. Complications from diabetes are escalating and are costly. People of all ages, from elementary school aged children to the elderly are being affected by this disease. Diabetes self-help programs, although effective, are not being used universally to improve self-management in diabetic patients, and the information used in these teachings are not universal. In fact, most diabetes education programs only meet with a registered nurse diabetic educator once. After the one meeting, they are sent to another specialized entity such as exercise physiologist, a registered dietician, and a wound care nurse, to name a few. There is a lot of health-related information and conversation on social media regarding self-management skill building, but no evidence yet regarding effectiveness.

Research Question.

How does social media support for diabetes self-management affect people's ability to manage-improve disease indicators and outcomes? Key variables to this question include social

media applications, technology, availability, and ease of use for better self-care. Can social media be effective in improving T2DM patient's health outcomes?

Support for the Problem.

Studies with the U.S. and Canada have revealed low rates of utilization of existing T2DM education and self-management programs (Azar et al., 2015). It is difficult to conduct a program at a time that every patient and necessary staff will be able to attend. There are considerable variations in the content and form of diabetes self-management education as well (Steinsbekk, Rygg, Lisulo, Rise & Fretheim, 2012), with evidence of patient regression to old behaviors beginning in the first month after educational classes. The use of a smart phone application provides a helpful option for continued patient education. Furthermore, mobile interventions have the capacity to interact with the individual with much greater frequency and in the context of the behavior. Adherence to chronic disease management is critical to achieving improved health outcomes, quality of life, and cost-effective health care.

Reports speak of survey that was distributed to smartphone consumers at affiliated universities and businesses and posted on Facebook in April 2011. Survey results were collected from 395 respondents. More than 91 percent stated that they would be most interested in using a health application to gain information, and almost 40 percent were willing to use a health application several times a day. One-third of the consumers preferred free health applications, but the majority were willing to pay, with 30 percent willing to pay up to six dollars (Government Health IT, 2011). This clearly indicates there is a desire from patients to engage in self-management technology.

Health is a process, and when people with T2DM learn about the disease, and how they can stop, or at least control, this chronic disease by using technology, self-management can

begin. People must be taught about this crippling disease. They need to learn how to care for themselves. Self-management is seen as a partial solution to the global rise in health care costs. It is a fundamental pillar of health and is an essential component of the modern health care system. It is critical that self-management education (teach patients how to correctly self-manage their chronic disease) compliments traditional patient education (pamphlets, booklets, suggest a meeting with a diabetes educator) in primary care to support patients, to enable them to live the best possible quality life with their chronic condition. People with T2DM can learn to make healthier life choices. They will feel encouraged to have an open attitude about making changes, with an application to assist them in their choices. They will have social support from individual, community, and social networks such as Facebook and MyFitnessPal Community. The application will help ensure the patient will maintain their self-management responsibilities.

The technology will be patient friendly, easy to operate, and in a language the patient can easily understand. The technology will help teach the patient about T2DM and help maintain a healthier way of life. The patient must own and use a smartphone, and as realized in multiple studies (Rainie, 2013; Smith, 2017; CDC, 2015; Bell, et al., 2012), the majority of adults and older adults own a smartphone in the United States and worldwide. The number of smartphone owners are increasing every year.

Challenges include teaching the patient how to fully utilize the phone application and ensuring the people do have a compatible phone for the application as well as Internet access. Although an application does not require constant Internet connection to be able to function completely on the smartphone. There will be people who do not have the correct technology, and some will not want to use this technology. For this reason, there are always alternatives, including face-to-face education programs that are currently being held at the Veteran Affairs

(VA) clinics, hospitals, and local clinics. But, for the people that are interested in using technology, and the numbers are growing each year (Smith, 2017, Rainie, 2014), this project will show increased T2DM self-management using a smartphone application.

Group support is vital, but it is quickly being realized, today's technology has changed the meaning of support groups. Group support used to mean face-to-face group meetings. Now, Facebook and other social networks are very real support groups that have immediate support with group members around the world with just a click of the computer or smartphone. Online support groups reduce the sense of isolation for those who reside in underserved or remote locations, are housebound, need additional support between traditional support groups or counseling sessions, or seek anonymity.

Goal of the Project.

The goal of this project consists of patients will self-manage their diabetes with the guidance and inspiration of their smartphone application. This project will enable people with T2DM to take responsibility for their choices in nutrition, exercise and taking prescribed medication. The success of self-management relies on gaining knowledge, developing skills and becoming confident in putting these into practice, which takes time and support. In fact, the British National Service Framework for Diabetes (Department of Health) included a standard about patient empowerment, which recognized that supporting people to manage their own diabetes and involving them in shared decision-making was at the heart of empowering people improved their experience of services, and improved health outcomes (Hill, 2017).

Aims and Objectives of the Project.

Specific Aim 1: Finding an appropriate application and forum. This includes connecting the right people with the right tools.

Objective 1: Evaluate most popular existing self-management sites and applications.

Specific Aim 2: Examine who uses the site and the application, why and how – patient needs, realities, references, challenges

Objective 1: Evaluate what patients want to get out of the social media site, how they get the information and are they able to use this information.

Specific Aim 3: Evaluate the utility of social media support

Objective 1: Evaluate if the social media is a viable option for T2DM support, and in what way(s) could this be utilized as a routine support

Chapter 2: Review of the Literature

This chapter will include a review of literature regarding self-management, research on self-management, and T2DM disease management using applications. Currently, a gap exists between the promise and the reality of diabetes care. Practical interventions that facilitate collaborative relationships and foster patient-centered practices are the key to closing this gap (Funnel and Anderson, 2004).

A systematic review of the literature was conducted to evaluate the effectiveness of smartphone applications in supporting the adherence of patients to T2DM self-management, and the usability, feasibility, and acceptability of these tools in chronic disease management among patients. The databases of EBSCO, Medline, CINAHL, and Google Scholar were utilized, using the search terms of diabetes, T2DM, self-management behaviors, self-efficacy, and technology. The dates were restricted to 2014 through 2018. Out of a total of 10,246 journal articles, eight articles met the inclusion criteria of applications, smartphones, T2DM, self-management, and adult and/or older-adult populations.

Use of technology.

Mobile phone applications, also called smartphone applications, also are conglomerated into the general term mHealth and/or eHealth. This includes short message service (SMS), phone calls, multimedia messaging service, access to the internet, and software applications. Due to the mixture of similar terms with very different meanings, the terms mHealth and dHealth were not used when searching databases.

The literature search revealed a program called Alive-PD. This is a one-year, fully automated behavior change program delivered by email. The program involves weekly tailored goal-setting, team-based and individual challenges, gamification, and other opportunities for

interaction. An accompanying mobile phone application supports goal-setting and activity planning (Block et al., 2015). This smartphone application is for reinforcement of what the team has taught the patient, but not necessarily to help the T2DM make healthier choices in food and activity. The Alive-PD focuses primarily on self-help through email notices. There are vast differences between email and applications. Mobile applications are an important part of everyday life, although measuring the degree which these devices are used to help self-manage chronic conditions is still slow (Hamine, Gerth-Guyette, Faulx, Green, & Ginsburg, 2015). One study, using a mobile phone application and counseling, was used to help self-manage blood glucose, food habits, physical activity, and personal goal setting along with provision of diabetes information. The trial showed a significant improvement in T2DM self-management and also demonstrated a reduction the overall participant group glycated hemoglobin (HgbA1c) of almost one percent.

Hunt and colleagues cited giving 151 T2DM study participants a smart-phone with an application to support diabetes self-management. The participants had not used a smartphone previously and had difficulty with basic operation of the phone. Although participants found the smartphones frustrating, most believed the program increased awareness of their health and helped them to be more focused and accountable for self-managing diabetes. Participants and researchers recommended using the technology with devices already familiar to patients (Hunt, et al., 2014). The researchers had access to smartphones which were given to each participant at the start of the study, with minimal orientation on use of the smartphone. Recommendations included using study participants own smartphone. If this is not possible, it was recommended to have a session with each participant on how to use the smartphone and the application. This

study, even though the participants were not thoroughly taught how to use the instruments, still had a significant, positive outcome.

In a study conducted by Franes, et. al, 2017, 103 Type 1 and T2DM patients, with ages ranging from 18-65 (median age was 37) were studied. Participants were questioned regarding feelings about mobile application technology and self-management of diabetes. Results indicated positive statements about the actual use of electronic devices for DM management, interaction between patient and physician, attitude toward using mobile technology, and quality of life evaluation. Younger patients with better glycemic control and higher education level had a significantly more positive attitude toward mobile applications and using modern technology.

Technology-mediated behavioral interventions have shown promise in facilitating diabetes prevention and management in behavioral medicine (Bacigalupo et. al, 2013; Connelly et. al, 2014.) These studies reviewed using a smartphone application with people suffering from depression. There was positive feedback from patients, and authors of both these studies stated diabetes, blood pressure monitoring and chronic heart failure could utilize smartphone applications with likely positive results as well. Future research is needed to understand how patients with diabetes, including family members and providers, use technology to assist in diabetes prevention and management goals. There is also a need for industry-academia partnerships to create empirically-supported and scalable apps containing proven behavioral strategies that are appropriate for the target user.

Present literature supports the use of technology to meet the needs of people living with diabetes, more research is needed to determine which types of technological interventions are most beneficial. Technology should be evaluated for motivation for diabetes self-management, user satisfaction, and diabetes outcomes. The pace of development has been rapid, but there

remains a lack of evidence and evaluation which makes applications a challenge for sustainability (Stetson, et al. 2017).

Self-management behavior tracking, as well as improved access to diabetes education and health care providers, can increase knowledge, self-efficacy, and participation in self-management behaviors, and ultimately may improve diabetes outcomes. A pilot study of United States veterans, ages 21 through 80 years old was able to show the relatively high engagement levels when mHealth tools of sending a reminder text to diabetic participants. The reminder was to record the daily fasting blood sugar (FBS). The FBS was then transmitted to the healthcare providers office. This study is encouraging and suggest that mHealth tools are a viable medium to deliver chronic disease interventions and to monitor self-care among older adults, consistent with evidence that older adults are indeed interested in using mHealth technologies. The widespread use of mobile technology makes mHealth a promising and pragmatic candidate for helping patients with diabetes improve their diabetes self-management (Dugas, et. al, 2018).

Adherence to treatment, and specifically adherence to treatment of T2DM, is a critical link that connects the promise of smartphone applications to the ultimate goal of improved clinical outcomes. These devices and applications allow patients to monitor their health, access health information, and communicate with their health care provider without requiring a wired connection to the Internet (Muralidharan, et al. 2017). The ability of the application to access and transmit the information has made the healthcare provider and the patient's life simpler and less stressful.

A systematic review from Fu, McMahon, Gross, Adam and Wyman (2017), found similar results when looking for smartphone application participant satisfaction, with 723 articles published between 2011 and 2017. Of these 723 studies, seven studies from 20 publications

were pertinent for review. This review did indicate patient and expert satisfaction rates from 38% up to 80% when using smartphone applications. An interesting note, it was difficult to compare patient satisfaction ratings when different applications were used in each study. This was noted by the researchers as well as the journal reader.

Research has also focused on self-help technology and improved diabetes control with the use of text messages and web-based learning. For example, a study by Quinn et al. (2011) used the combination of behavioral mobile coaching with a web-based system for patients with specific psychological issues and diabetes. Blood glucose data, lifestyle behaviors, and patient self-management data were individually analyzed and presented with evidence-based guidelines to respective healthcare providers. Recommendations of the study included participant frustrations with contacting the healthcare provider through email. The patient's question is usually not answered immediately, the client must wait for the provider to respond to their question. An application was not mentioned in this study, although it is a quick way to provide possible answers that the client can choose and learn how to better control their life choices without waiting for the provider's reply.

A study by Fukuoka, Gay, Joiner, & Vittinghoff (2015), used a pedometer and a smartphone application to determine if using these two tools would increase participant activity and decrease the need for group meetings related to weight loss. The curriculum was adapted from the Diabetes Prevention Program (National Institute of Diabetes and Digestive and Kidney Disease, 2017) with the frequency of educational sessions reduced from 16 to six sessions and group exercise sessions were replaced by a home-based exercise program. The study also used a pedometer and a daily phone message. The main outcome measure was a significant weight loss, as well as reductions in hip circumference and blood pressure in the control group.

There are currently 79 free applications in the on-line store for the iPhone that have “diabetes” or “glucose” in the title. Reviewing each application shows 25 were entirely food related, seven were for Type 1 Diabetes Mellitus patients, five were for healthcare professionals caring for these patients, 20 were exercise and weight-loss related, and four were news articles and journals. The remaining 18 free applications were related to T2DM self-management, mostly with food choices. A few tracked the blood sugar levels that the person put in as well as the food intake, but exercise was either a very small feature or was not mentioned at all. Nearly all applications offer the free application, which is the basic version. When the person agrees to an additional charge ranging from \$2.99 to \$59.99 per year, they are granted access to the “pro” version, which has more features.

Smartphones, both iPhone and android, are used by a great majority of people in the United States and worldwide. According to techcrunch.com (Perez, S., 2017), consumers in the United States are now spending five hours a day on their mobile devices, with Facebook claiming 19 percent and social media 12 percent of this time each day. The majority of people, ages ranging from children to great-grandparents are rapidly becoming smartphone and mobile application savvy. The time spent in mobile apps had increased by 69 percent from 2015 to 2016 (Kesiraju, L. et al., 2016). In fact, 75 percent of active users open their health & fitness application at least two times a week.

Many of the applications that are classified as a diabetic application are found in the health and fitness section of the application store. United States population aged 55 and older, with less education and in a lower socio-economic status have more difficulty managing their T2DM (Bowen, Clay, Lee, Vice, Ovalle & Crowe, 2015). Of particular interest, more than 25 percent of people over the age of 65 have been diagnosed with diabetes in the United States

(CDC, 2017). Clearly, a special interest needs to be paid to this high-risk population. Nearly half of the same aged population own smartphones (Anderson & Perrin, 2017), and the use of social media continues to increase. Facebook is the most used social media site, with 81 percent of the United States mobile phone audience. Data indicates an efficient way to engage the older population is through Facebook and smartphones (Frommer, 2017).

The most recent PEW research indicates seventy-four percent of Americans ages 50-64 are smartphone owners and 52 percent of those 65 and older own a smartphone. These numbers are increases of 16 and 12 percent respectively from the previous year. (Smith, 2017). These new statistics are good news when looking at the number of older adults who use a smartphone, and therefore are very likely to be familiar with the use of applications.

Summary.

As indicated, the research on T2DM patients using a smartphone application is minimal to date. This is a newly emerging thought process, and literature is not published yet. There have been a few projects indicating the T2DM patients, including the older generation of United States veterans experienced a positive result when using a smartphone application and reminder texts. Smartphones and applications are becoming a common tool for the majority of people worldwide. Many healthcare professionals are recognizing and striving to utilize more current technology in their day to day conversations with their patients.

Conceptual Framework.

The framework utilized for this project will be the Transtheoretical Model (TTM) of behavior change (see Appendix A). The TTM integrates elements of Bandura's self-efficacy theory (Bandura, 1997). This model reflects the degree of confidence individuals have in maintaining their desired behavior change in situations that often trigger relapse. It is also

measured by the degree to which individuals feel tempted to return to their problem behavior in high-risk situations. This model assumes six stages of change. The first stage is precontemplation, when people are not aware their behavior is problematic, and they are not intending to take action in the foreseeable future. The next stage involves people beginning to recognize there is a problem in their behavior. This is known as contemplation. They begin looking at what will happen if they continue their behavior and what will happen if they change. This is the stage that a T2DM patient would probably be at upon first diagnosis. This is when the newly diagnosed patient turns to the Facebook Diabetic Support Group and similar social media sites for guidance and support.

The next stage, preparation, happens when people intend to take action in the immediate future, and may even begin taking small steps toward behavior change. The patient is looking at information provided by the healthcare professional, and probably looking at the new diagnosis on an internet site, including social media such as Facebook. This would also be ideal time to introduce the patient to smartphone applications if they are not aware of this technology. The next stage, action, is when people have made specific, overt modifications in modifying their behavior, or they are beginning to acquire new, healthy behaviors. Examples of this include the patient using the application several times daily. Also considered an action would be the patient attending a diabetes management self-help group, either a face-to-face group or one of the numerous social media support groups, such as Facebook Diabetic Support Group, or an on-line support group that has members from the specific smartphone application they are using, such as the MyFitnessPal Community. The benefits of the on-line support groups are immediate feedback from individuals are on these support groups 24-hours a day, seven days a week.

The maintenance stage is when the patient has been able to sustain action for at least six

months in their new, healthy behavior. The patient is continuously working to prevent relapse back to their old, unhealthy behaviors. They are comfortable with most of their daily decisions about food and exercise. The T2DM patient continues to use their self-maintenance application daily. Again, the support-groups are always open, and these patients should feel confident in their new role, and hopefully will be able to convey hope and answer questions of new members.

Lastly, termination indicates the stage when people have little to no temptation to resume their old, unhealthy habits. The patient continues to utilize a self-management application on their smartphone, they are comfortable with their new, healthier lifestyle, and they continue to use the application

This model allows the patient outcomes to be evaluated at each stage, as well as the final stage of self-efficacy. The TTM behavior model works specifically with coaching, as in a mobile phone application. The focus in the TMM expands from health promotion to well-being.

Concept Map.

The concept map (Appendix B) indicates the concepts of knowledge, independence, self-help and technology all working together. Health is a process that can work as a motivational pull to manage or overcome health challenges. Education and a smartphone application will stimulate awareness and provide motivation in change. An application must use patient friendly language, be easy to understand and easy to use. An application in a different language or difficult and complex steps to enter data will be used little and abandoned by most, including a patient attempting to better control their chronic disease. An open attitude of the patient and the healthcare professionals that work with the patient are vital. When patients are making changes and learning new things, an open attitude can make the changes easier to accept. When first learning how to manipulate an application, it can seem difficult to some. The patient must

realize with repeated use, the application will become easier to use. A patient's choice is paramount. With the use of self-management technology, the patient will be able to make better-educated choices. The patient will have support from the application community, from the phone and from others who are using an application for self-management. The support will be both individual and communal, with positive reinforcement coming regularly from the application. This will help ensure the patient will maintain his/her responsibilities of self-care. Responsibility is important to technology and to the community. "To the person you give responsibility, you give power" a popular self-help mantra (Kasch n.d.).

Planning Tool Framework.

The planning tool framework for this project is the precede-proceed model, which is a cost-benefit evaluation model proposed by Dr. Lawrence W. Green in 1974 (Appendix G). This model was originally developed for use in public health, and since has been used to analyze situations and design health programs efficiently. This model allows attention to be directed to the outcomes, rather than the inputs, and is a comprehensive structure for assessing health needs for designing, implementing, and evaluating health promotion and public health programs to meet those needs.

A major premise of this model is change process should focus initially on the outcome, not on the activity. Then move backward from the desired result to where and how the intervention will take place to bring about that result. Lastly, evaluate the administrative and policy issues that need to be addressed in order to mount that intervention successfully. The attention to outcomes, rather than inputs explains this project's planning tool.

PRECEDE stands for Predisposing, Reinforcing, and Enabling Constructs in Educational/Environmental Diagnosis and Evaluation. As its name implies, it represents the

process that precedes, or leads up to, an intervention. It is the planning phase, and looks at identifying desirable outcomes, such as the quality of life, health status, lifestyle and environment.

PROCEED spells out Policy, Regulatory, and Organizational Constructs in Educational and Environmental Development, and describes both how to proceed with the intervention itself as well as implementation and evaluation of the intervention. PROCEED is what will be done as the treatment to get the desired result. It consists of four phases, with phase five being actual implementation, conduct the intervention.

Phase six is process the evaluation, determine whether the intervention is actually taking the actions intended, and phase seven is the impact evaluation. Determine whether the intervention is having the intended effects on behaviors and/or environment. The final phase, phase eight is the outcome evaluation, determine whether the intervention was effective (Green, et al., 2005).

As applied to this framework, health behavior (diabetic patient feeling unsure of food and activity choices) is regarded as being influenced by both individual and environmental factors, and hence has two distinct parts. The model is multidimensional and is founded in the social and behavioral sciences, epidemiology, administration, and education. The systematic use of the framework in numerous clinical and field trials confirmed the utility and predictive validity of the model as a planning tool (Glanz, Rimer, 2005).

The main purpose and guiding principle of the PRECEDE–PROCEED model is to direct initial attention to outcomes, rather than inputs. The desired outcome of this project is increased self-management of diabetic patients. A mix of strategies for achieving those objectives is then decided upon, including the use of a smartphone application to improve the patient's self-

management (outcome). The survey will determine participants confidence level in self-management. A fundamental assumption of the model is the active participation of its intended audience, the T2DM patients. These participants, using better-informed choices by using a social media application, will be able to take an active part in defining their own problems, establishing their goals and developing their solutions.

Chapter 3: Project Design and Evaluation Plan

The fundamental goal of this project is to assess diabetes self-management using social media support. How does this social media affect people's ability to manage and improve disease outcomes and indicators? This chapter presents the project design, aims and objectives, and identification of evaluation methods used in this study. Discussion of a proposed budget and expected timeline are included.

Setting.

The setting for this project is an on-line Facebook Diabetic Support Group. The participants are never in a group setting, they do not see the investigator nor each other. The individual participants will sign onto Facebook Diabetic Support Group individually, on their personal smartphone, iPad, Tablet, laptop or tabletop computer, or a public computer if they choose. Since this is a random group, with no setting used to perform this investigation, a memorandum of understanding was not required.

Population.

The target population will be T2DM patients of all ages, from 18 – 79. These patients will be self-referred from a flier posted on the Facebook Diabetic Support website (see appendix D). The participants are a mixture of Caucasian, Latino, American Indian and African-American across the United States. Participants must be able to speak, read and write in English. It is anticipated 25-30 people will participate, both male, female and undeclared will be recruited. Respondents will be informed of the one step in this project, to answer a survey, taking approximately 10 minutes. They will be informed of the reason for the survey, assured of anonymity, and also informed this is entirely voluntary, with no compensation for taking the survey.

Procedure.

In order to achieve the goal of diabetes self-management using a social media support group application, the following procedures will be followed. The project will be approximately three weeks long. The investigator will post a survey, already approved by the Facebook Diabetic Support Group moderator, inviting T2DM participants to fill out the 10-minute survey, with explanation of who is conducting this survey, why it is being conducted, and assurance of anonymity.

Instruments.

The survey (Appendix E) consists of 14 questions including sex, ethnicity, and age. Why use this support group, disease management, confidence in food choices, exercise assistance and intake management from support group, and how, when, and how much do you use the support group information versus your medical provider how, when, and how much. The questions are at a sixth-grade reading level to enable participant understanding of every question (Martins, Burmeister, 2011). This survey was constructed by the investigator, with the assistance of University of Hawai'i, Hilo faculty.

Google.survey is an online medium that allows people to take a survey wherever they are located, anywhere in the world. After the survey is taken, the results are downloaded directly into Excel for efficient data collection and interpretation. Training needed for the participant is minimal. The participant clicks on the link, the survey opens with explanation how to answer the Likert Scale questions. At the end of the survey, the participant clicks on the complete button and the survey is sent to this investigators specific Google.survey file. The PRECEDE-PROCEED directs initial attention to outcomes. By assisting the T2DM patients begin self-management with the utilization of a smartphone application, the outcome has been realized. Self-

management knowledge and techniques will be evaluated with the use of pre- and post-surveys. Results will be used to analyze participants confidence levels when using an on-line support group.

Aims and Objectives of the Project

Specific Aim 1: Finding an appropriate application and forum. This includes connecting the right people with the right tools.

Objective 1: Evaluate most popular existing self-management sites and applications.

Specific Aim 2: Examine who uses the site and the application, why and how – patient needs, realities, references, challenges

Objective 1: Evaluate what patients want to get out of the social media site, how they get the information and are they able to use this information.

Specific Aim 3: Evaluate the utility of social media support

Objective 1: Evaluate if the social media is a viable option for T2DM support, and if this could be utilized as a routine support

Budget.

The financial budget for this project (see Appendix H) was minimal. The time spent on this project by this investigator was the only financial commitment, even though this was indeed a large portion of the investigator's time. A look at a bigger budget is the potential savings that can be felt by pre-diabetic and T2DM patients, insurance companies and the United States Government Medicare and Medicaid division. The savings include reduced hospital stays, reduced adverse health outcomes due to continuous high blood sugar including limb preservation, fewer heart attacks and strokes, and improved health outcomes for millions of Americans.

Timeline.

Approval for protection of human subjects from the Institutional Review Board (IRB) was given in January 2019. This project began January 15, 2019 and ended January 31, 2019. This investigator anticipated a minimum of ten participants, with no maximum participant guideline number. In actuality, there were 56 respondents.

Chapter 4: Data collection and data analysis

This project used the Precede-Proceed framework as discussed in previous chapters. This evaluation framework is a widely used tool that helps effectively analyze situations, and design efficient health care programs. It is a very effective tool for monitoring chronic health interventions, including this Facebook Diabetic Support Group assisting members in reaching efficacy in the self-management of their type-two diabetic lifestyle. The survey (see Appendix K) asked specific questions, including does this support group assist with nutrition, lifestyle and exercise management.

This project was dealt a setback when the Facebook administrator for the closed Diabetes Support Group refused to post the survey. The administrator was forwarded the memo from Facebook administration stating the survey would be allowed, but this administrator still refused to comply. This was the largest diabetic support group, with an estimated 17,000 members, with a reported 800-1200 (seven percent) were called dedicated. This means they are on this site at least one time every day.

After surfing the Facebook website, this investigator found three more Diabetic Support Groups. Although the number of members in each group was smaller, the people on these three support groups were dedicated to daily check-ins. The group numbers ranged from 2000 to 12,000, and the number of dedicated members ranged from 13 to 25 percent. (Facebook.com). The survey was allowed on all three of these diabetic support group sites and a total of 55 responses were recorded. It was not recorded which person answered the survey from which support group, as this was completely anonymous.

The respondents were mostly female (78.2%), and Caucasian was also the majority at 61.8%. Age varied from 23 years old to 73, and the question ‘Why do you use Facebook

Diabetic Support group” showed “easy to understand answers” 29.1%, with “quick answers” and “easy to get answers” 27.3 and 23.6% respectively. There were 16.4% of respondents who got answers because they did not like to wait at a healthcare providers office. This was a surprising result, as a seemingly common complaint is waiting to get an appointment and then waiting in the office to see the healthcare provider.

The survey responders also seemed to agree that the two hardest parts of managing their diabetes is diet control (57.4%) and exercise (35.2%). This not a new finding, but it does reinforce the need to find various methods for diabetics to practice diet and exercise with less stress. Making the food and exercise routine fun will help ensure the routine will become a part of the patient’s life. Results from this project will potentially enable social media participants a better support group, including exercise and nutrition platforms.

The confidence in this diabetic support group by participants was neither very confident nor very un-confident, with the average seven out of 10 confidence points. This could have a much higher confidence rating with the use of a stronger, more professional influence giving more than merely monitoring what is being asked and published on the site. A true support group involves supporting each person with facts and assisting the person in finding an answer that will work for them.

This project has high potential efficacy. The respondent’s answers indicated they are looking for a positive support group, but this has not yet been completely realized. When a question was put onto the forum of “How did you hear about this support group?”, many people responded they were referred by their healthcare provider. There is a need realized by many for a support group that can help the T2DM patient better self-manage themselves, but this support is evidently still in the makings. With an improved social media support group, adoption and

implementation should happen smoothly, especially with referrals by healthcare professionals and other social media participants.

Maintenance will be a continuous process, with many new healthcare discoveries that affect the health and well-being of the support group participants. These discoveries need to be implemented quickly, with participants receiving nothing but up-to-date information. Healthcare and support groups must be maintained with the most current information for the betterment of all the participants of all ages.

As discussed, this project was limited to people using Facebook Diabetic Support Group. Facebook now has several diabetic support groups, and it appears the number of people who use each support group has, of course, divided from one to three groups, but the total number of members has had an overall decline. The reasons were not formally investigated, although multiple sites including published forums on Facebook and other sites indicate increasing customer distrust. Facebook has experienced some serious confidentiality and hacking issues. Multiple new agencies including CNN, FOX and New York Times, speak of the Facebook breach of information, in September 2018, affected 50 million users, and was rated in the top 17 worst corporation breaches in the United States of 2018.

Chapter 5: Conclusions and Recommendations

The first aim of this project was to survey social media resources for T2DM disease management information and support. Objectives included identify social media resources available, identify the most popular credible forum that attempts to fill the face to face gap, and evaluate what is offered and whom do they target.

Facebook remains the most used social media, in both the United States and the world (Smith, 2018). Facebook has changed in the last year, with more support groups, and administrators to the closed support group reviewing all statements made by a participant. If the administrator decides to not allow the statement to be posted, there is no recourse. This has caused more support groups to be formed, and fewer daily postings. Facebook still targets the T2DM participant, but the number of people who are using this support group are dwindling, with reasons discussed in the previous chapter.

The second aim of this project includes examining who used the social media forum, why, and how frequently. Objectives include rules of conduct, disclosure, why use Facebook and what is offered. As stated above, the rules of conduct are being enforced by the administrator. This is causing fewer conversations, and questions, answers are limited as well. This has caused new diabetic support groups to emerge, and time will tell if these newer groups will entice more followers.

The third aim is to evaluate the utility of social media support. Objectives of evaluating whether social media is a viable option and evaluating ways to suggest a more professional influence has proven positive, but with reservations. The vast majority of the world uses social media to communicate, that is definitely not going to change. Social media can be used as a very positive support group. The advantage of being able to attend a meeting without leaving the

home or by using the smartphone to attend a meeting is phenomenal. The ease of use, the ability to meet with numerous people without having to drive distances, and the information that can be provided in these support groups can be a tremendous gain for every person.

It has been noted, Facebook's policy of using an administrator to monitor what is said frequently triggers negative reactions. Possibly the administrator is too strict, or they have a different set of ideals and values relating to what questions should be allowed and discussed. Evidence of dissatisfaction is indicated by new Diabetic Support groups becoming established, and members are disassociating themselves from the previous support group. They are looking towards new avenues for support. The healthcare professional can suggest a diabetic support group on-line, including the Facebook groups, and many are indeed doing this. But it is a suggestion that needs to be monitored, as incorrect information can lead the diabetic patient astray. To suggest a more professional influence in what is published on Facebook support group must be handled with care. There is a fine line between professional influence and participants feeling a loss of power with less freedom to speak their honest feelings.

Chapter 6: Implications for practice

The findings from this project can readily be used in community clinics, private practice, and even in the hospital setting. As indicated in previous chapters, most people have some form of internet connection, usually with a smart phone or tablet. The concept of a person having a chronic disease diagnosis, indicating long-term maintenance is mandatory is usually daunting. Basic tools, including pamphlets are given to the patient and family at diagnosis, but support is a crucial factor that needs to be addressed every time the patient is seen in a healthcare professional setting. The ability to use a social media support group is a tool that will enable and improve patient self-management skills.

This has been a positive project, with much potential in using social media support groups to help T2DM patients become better at self-management. The use of social media is used by the vast majority of the people of the United States, and there is little evidence of something different will be taking over social media anytime soon. Social media can be used as an effective tool to reach many people in a support group or individually. Information can easily be transmitted to multiple people at once, and their responses can be dealt with on a group or individual basis as needed.

A future project that would be a good next step would be to use an application on the smartphone, iPad or Tablet that would assist the T2DM patient with daily exercise and nutrition choices. The application would be effective for the diabetic if daily blood sugars were recorded, and the patient could see what happens to the blood sugars depending on foods eaten, when they ate the foods and how much exercise they were able to fit in that day.

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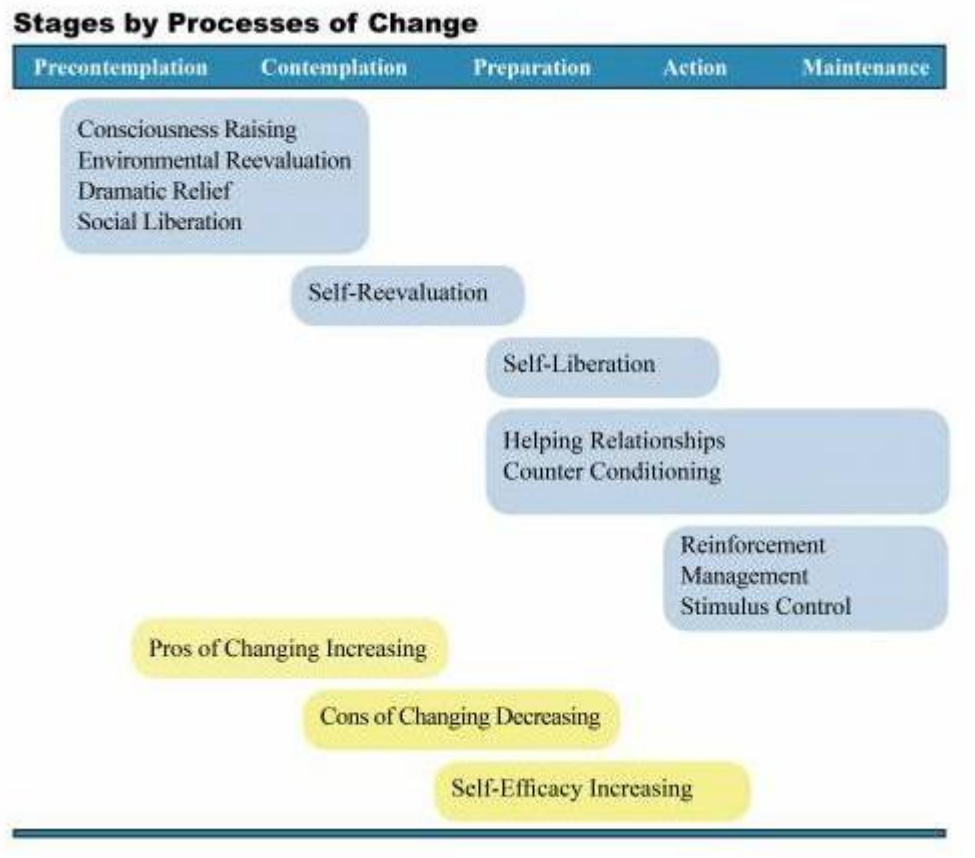
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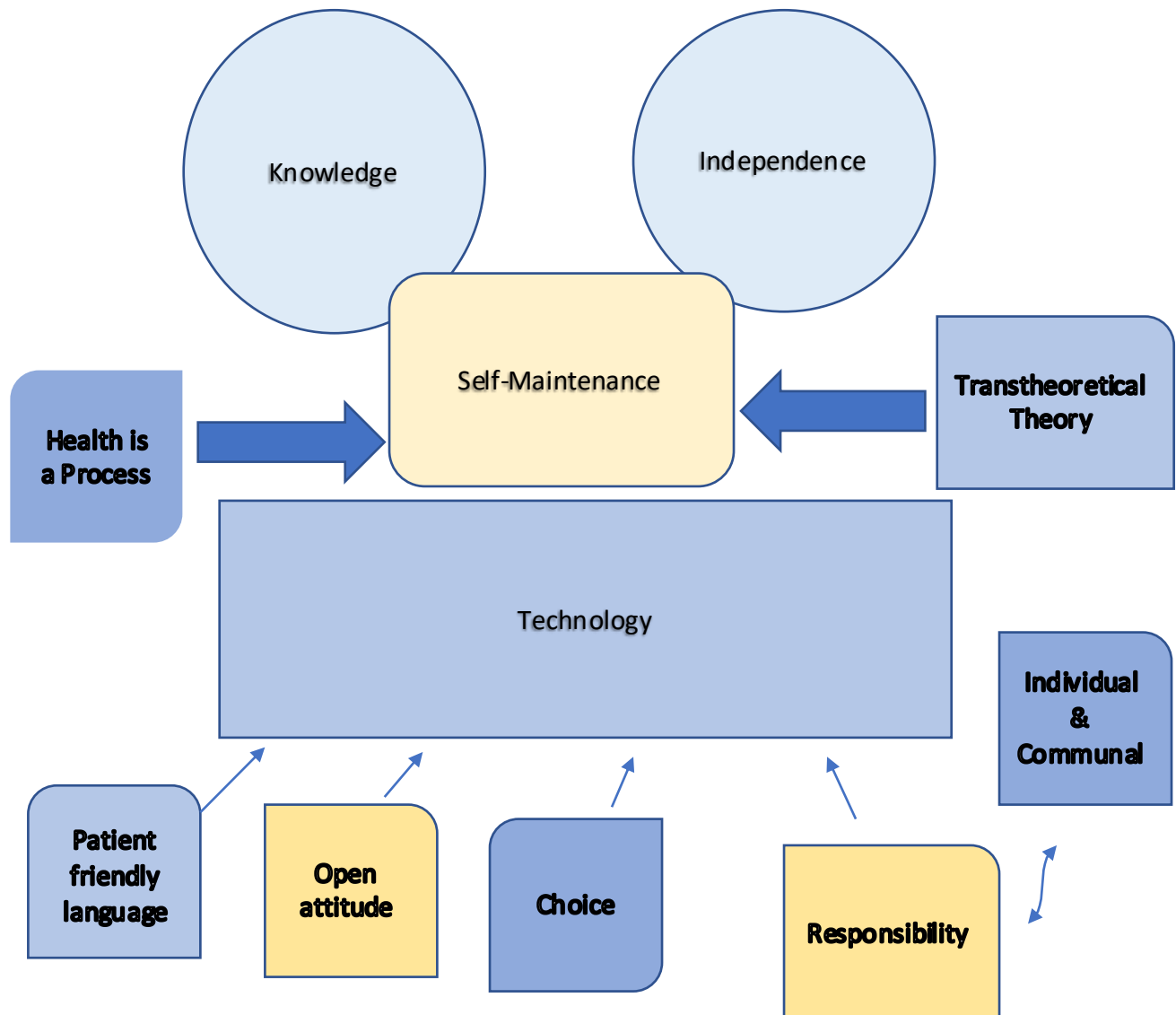
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Appendix A TransTheoretical Model of Health Behavior Change



Accessed 10-1-2017

Appendix B Concept Map



This concept map represents knowledge and independence as the two primary factors the person will experience when utilizing self-maintenance, the main concept.

Technology is the stepping stone that all patients will use to utilize self-maintenance. Important factors that will many patients will experience There are several factors that most patients will experience and will enhance the patient's ability to experience self-help. Included is health is a process, patient friendly language, open attitude, choice, responsibility relating both to the

technology and between the individual and community, and the TransTheoretical Model of health behavior change (TTM).

Appendix C Research Flier

Research Project

Does using a diabetic support group help you feel more confident about your health choices, such as food, snacks, and activity?

If you are 18 years old or older and have been diagnosed with Type 2 Diabetes Mellitus or Pre-Diabetes, you are eligible to take this survey!

This Investigator must complete a research project in order to receive her Doctor of Nursing Practice degree. This research will examine if using the Facebook Diabetic Support Group helps you with questions including meals and activity. Does this support group help you, the diabetic, feel more confident in how to better care for yourself and your blood sugars?

If you take part in this research, you will be guided to a quick survey, asking questions about what you learn and gain from this support group. The survey is completely anonymous, Google.survey will tally the results for my research project. No names or identifying numbers will be used, and the total results of all the surveys will be saved on my personal computer. This computer is password protected.

This research is through the University of Hawai'i at Hilo student Patricia Robinson, advisor Dr. Katharyn Daub.

For more information, please contact










DNP student Patricia Robinson at

parobins@Hawaii.edu

Appendix D CITI Certification

Patricia Robinson ID: 1678870

University of Hawaii Courses

 Course	 Status	 Completion Record
<u>Conflicts of Interest</u>	Passed 04/05/2017	
<u>Exempt Researchers and Key Personnel</u>	Passed 04/06/2017	
<u>Non-Exempt Biomedical Researchers and Key Personnel IPS</u>	Passed 04/06/2017	
<u>Non-Exempt Social & Behavioral Sciences Researchers and Key Personnel</u>	Passed 04/06/2017	
<u>Non-Exempt Social & Behavioral Sciences Researchers and Key Personnel IPS</u>	Passed 04/06/2017	
<u>Social & Behavioral IRB Members</u>	Passed 04/06/2017	
<u>Social and Behavioral Responsible Conduct of Research</u>	Passed 04/06/2017	

University of Nebraska Medical Center (UNMC/UNO) Courses[Click here to affiliate with another institution](#)[Affiliate as an Independent Learner](#)

Appendix E Survey with responses

What sex do you most identify with?

Prefer not to answer – 20%

Male – 40%

Female – 60%

What ethnicity best describes you?

White/Non-Hispanic – 61.6%

African American 2%

Hispanic – 10.9%

Asian/Pacific Islander – 16.4%

Native American – 9.1%

What is your age?

Ranged from 23 to 73, with mean and median 38 years old

Why do you use the Facebook Diabetic Support Group site?

Easy to get answers – 29.1%

Quick answers – 27.3%

Facebook answers are easier to understand than from healthcare professionals - 23.6%

I don't like to wait to get to see a healthcare professional – 16.4%

Other diabetics with similar experiences to get additional information – 1.8%

What is the hardest part of managing your disease?

Diet – 58.2%

Exercise – 34.5%

Support of friends – 6%

Other – 1.8%

The next 4 questions are Likert Scale questions

To what extent does the social support from the Facebook Diabetic Support Group help you with managing your disease?

1 through 4 – 0	5 - 23.6%	6 - 16.4%	7 - 18.7%
8 - 14.5%	9 - 9.1%	10 - 3.6%	

How confident are you that you can make healthy food choices when eating out thanks to the help of the Facebook Diabetic Support Group?

1 - 0	2 – 0	3 - 1.8%	4 – 0	5 - 20%
6 - 25.6	7 - 23.6%	8 - 21.8%	9 - 5.5%	10 - 1.8%

How much does the Facebook Diabetic Support Group help you find time for exercise every day?

1 - 1.8%	2 - 10.9%	3 – 10.9%	4 - 7.3%	5 - 25.5%
6 - 21.8%	7 - 9.1%	8 - 9.1%	9 - 1.8%	10 - 1.8%

How much does the Facebook Diabetic Support Group help you manage your daily intake of protein, carbohydrates and calories?

1 through 3 – 0	4 - 7.3%	5 - 20%	6 – 27.3%
7 - 32.7%	8 – 7.3%	9 - 3.6%	10 - 1.8%

Rate these from Most Important, Really Important, Important and Least Important Why do you the Facebook Diabetic Support Group

Health Information - important

Recipes - important

Encouragement - important

Other - important

How often do you use the Facebook Diabetic Support Group?

At least once a day – 30.9%

3-4 times a week – 16.4%

Once a week – 40%

Rarely – 30.9%

How did you learn about this support group?

Friends - 29.1%

Healthcare Provider - 12.7%

Surfing the web – 58.2%

Do you use the information and recommendations from your healthcare provider?

Yes – 36.4%

Sometimes – 63.6%

No – 0

How does the Facebook Support Group make self-management easier?

Exercise tips - 20%

Nutrition facts – 52.7%

Friendship – 9.1%

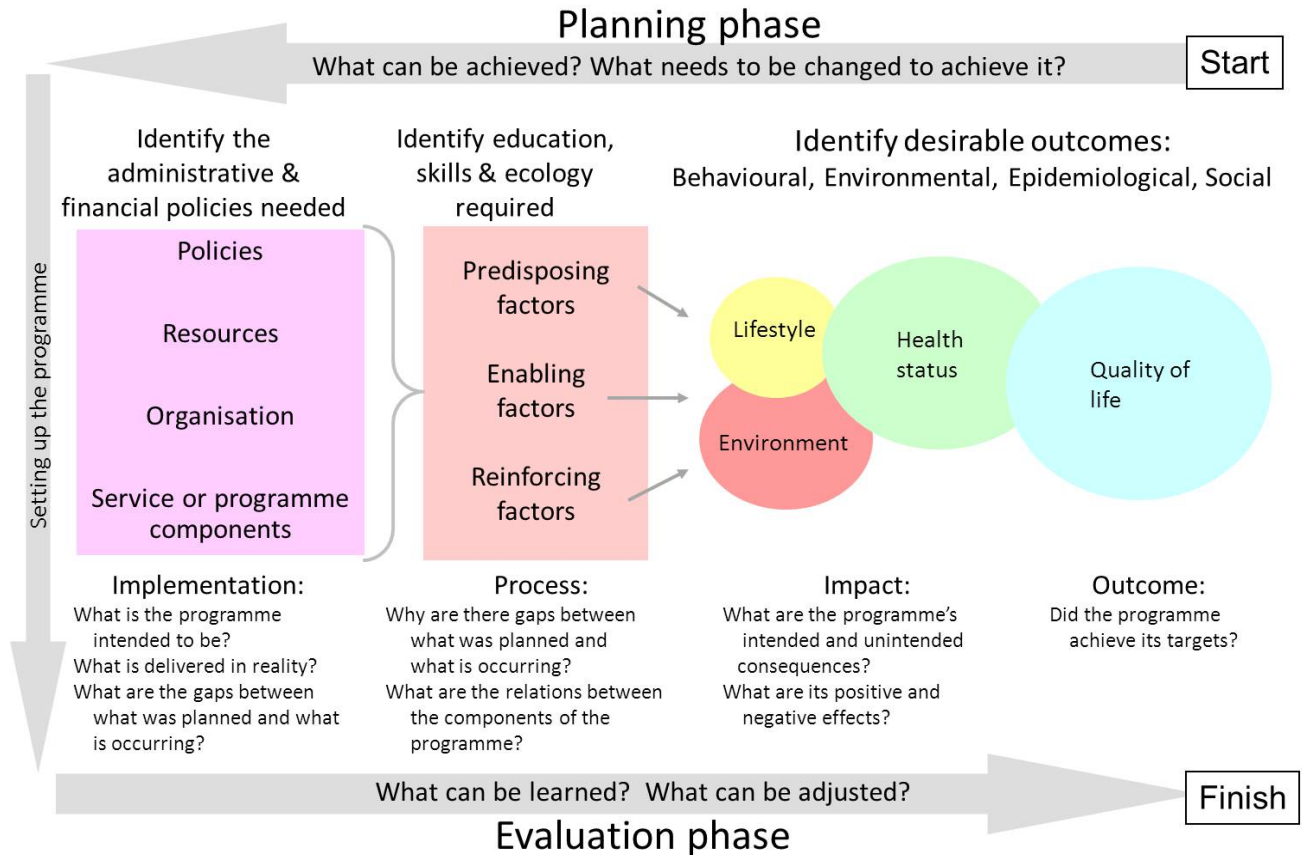
Support – 18.2%

Thank you for taking the time to answer these questions! This is an on-line survey, and all answers are completely confidential. Thank You!

Appendix F Budget

	Hours	Dollars/hour	Total
Establish membership on Google.survey, post explanation and survey, correspondence with FBDBSG monitors, checking google.survey for results – all completed by primary investigator	280 hours	20.00	\$5,600.00
Transcription of pre- and post-survey results, with interpretations	80 hrs	\$20.00/hr	1600.00
			\$7,200.00

Appendix G PRECEDE-PROCEDE Diagram



Adapted from: Green L. <http://www.lgreen.net/precede.htm> (Accessed May, 2009)

Accessed November 2017