EFFECTIVENESS OF MOTIVATIONAL INTERVIEWING-BASED TELEPHONE FOLLOW-UP IN DIABETES MANAGEMENT

by

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Abstract

Diabetes mellitus is a chronic complex disease requiring persistent self-management by patients and ongoing support from the providers. The outpatient diabetes clinic of a teaching hospital in the Midwest has 78.3% patients with uncontrolled diabetes. The purpose of the project was to assess the effectiveness of telephone follow up using motivational interviewing techniques in improving glycosylated hemoglobin (HbA1c), glycemic control, and self-efficacy of patients with uncontrolled type 2 diabetes. The project involved 30 participants with uncontrolled type 2 diabetes who had a HbA1c 8% or above. The intervention included delivery of five motivational interviewing-based phone calls to the participants over 10 weeks. Patients had to attend diabetes self-management education group classes prior to the project. The diabetes empowerment scale-short form surveys conducted assessed the self-efficacy. Statistically significant improvements were noted in HbA1c levels, with a baseline HbA1c of 10.408% ± 1.71 and the post intervention HbA1c of 9.484% ± 1.62 (p = .008). The fasting blood glucose decreased significantly by 28.4%, pre-lunch blood glucose decreased by 29%, and the pre-dinner blood glucose decreased by 29% by the end of the study (p = .00). The body mass index improved slightly from 31.4 ± 6.1 to 30.37 ± 8.0 kg/m² (p = .26). Medication adherence improved significantly. The diabetes related self-efficacy also improved with the interventions. The motivational interviewing-based low-cost telephone follow-ups are effective approaches for improving HbA1c, glycemic control, and diabetes related self-efficacy of patients with uncontrolled type 2 diabetes mellitus.

Key words: uncontrolled diabetes mellitus, telehealth, telemedicine, motivational interviewing, and diabetes self-management

Effectiveness of Motivational Interviewing-Based Telephone Follow-up in Diabetes Management

The successful self-management of chronic diseases such as type 2 diabetes mellitus requires sustained assistance from the health care providers. Patient's comprehension of self-management and enthusiasm influence the efficiency of diabetes self-care and glycemic control (Awwad, Akour, Al-Muhaissen, & Morisky, 2015; Hocking, Laurence, & Lorimer, 2013; Rodriguez, 2013). Lack of necessary support of the patients results in poor self-management and inadequate control of diabetes, triggering complications (Gray, Drayton-Brooks, & Williamson, 2013). Efficient self-management is required to tackle this common chronic complex disease that requires patients to make a lifetime dedication of therapeutic lifestyle changes in diet as well as physical activity, regular capillary blood glucose monitoring, and medication adherence (Mitchell-Brown, 2014; Zhai, Zhu, Cai, Sun, & Zhao, 2014). The diabetes self-management education (DSME) and enduring diabetes self-management support (DSMS) are key components of coaching patients for proficient diabetes self-management (Funnell, Brown, Childs, Haas, & Hosey, 2011; Powers et al., 2015). Telephone follow-up is a cost-effective and efficient method of providing uninterrupted support to the patients with chronic diseases (Levy et al., 2015; McGloin, Timmins, Coates, & Boore, 2014).

Improved glycemic control prevents the development of complications and reduces the cost of diabetes care (American Diabetes Association [ADA], 2016; McBrien et al., 2013; Nordwall, Arnqvist, Bojestig, & Ludvigsson, 2009). Management of diabetes and related complications consume a large amount of the health care budgets in the United States (US) (ADA, 2014). The microvascular and macrovascular complications resulting from poorly controlled diabetes may be prevented by attaining a target HbA1c which will result in decreased

costs (ADA, 2016; Dowling, 2014; Fowler, 2008; Moore, Gregory, Kumah-Crystal, & Simmons, 2009; Nordwall et al., 2009; Walker et al., 2011).

The effectiveness of telephone follow-up in diabetes management using motivational interviewing (MI) has been long studied by various researchers (Chamany et al., 2015; Chang et al., 2007; Handley, Shumway, & Schillinger, 2008; Hawkins, 2010; Walker et al., 2011; Young et al., 2014). Vasconcelos et al. (2013) identified improvements in diabetes self-management with the telephone interventions. The MI approach is effective in motivating patients' innate needs for adopting behavior changes and improving diabetes self-care skills, generating better diabetes care outcomes (Chen, Creedy, Lin, & Wollin, 2012). The MI-based interactive telephone follow-up project was implemented in an underserved population with uncontrolled diabetes managed in the outpatient diabetes clinic, anticipating an improvement of their diabetes self-management skills, glycemic control, HbA1c, and diabetes related self-efficacy.

Problem Description

The outpatient diabetes clinic of a teaching hospital in the Midwest region of the US serves a large volume of medically underserved population living in poor socioeconomic conditions. The problem addressed in this clinic was poor glycemic control and uncontrolled HbA1c due to medication nonadherence and poor self-management of diabetes. Analysis of HbA1c data for the year 2015 revealed that out of 6,501 patients followed in this clinic, 78.3% patients had A1c above 7.1% and 39.5% patients had A1c above 9.1%. About 50.9% of 3,621 assessed patients had some level of noncompliance with the prescribed diabetes medications. The data showed that 2.7% patients completely ignored diabetes medications and 7.9% patients frequently missed them.

The traditional practice in this clinic was the providers and diabetes educators enforcing behavior changes rather than supporting patients in setting self-care goals. Due to the large volume of patients seeking diabetes care at this clinic, routine follow up visits are scheduled every three months only. The lack of any follow up between the routine three-month clinic visits of patients with uncontrolled diabetes was a gap in practice. The long gap often results in poor retention of knowledge regarding self-management, taught during the initial diabetes group class and the clinic visits. The diabetes knowledge tests are conducted at the time of follow up clinic visits to assess the knowledge retention of the patients. A review of the retention test scores of thirty random patients in diabetes clinic during the month of October 2016 showed that only 30% patients scored 100%. Follow up phone calls made between the clinic visits might be effective in reinforcing the diabetes care knowledge and self-care skills of these patients.

Available Knowledge

Diabetes mellitus is a common complex chronic disease with high prevalence in the US. According to the National Diabetes Statistics Report, about 30.3 million Americans had diabetes in 2015 (Centers for Disease Control and Prevention [CDC], 2017). There are significant morbidity and mortality associated with this chronic disease. The National Diabetes Statistics Report identified diabetes as the seventh leading cause of death in the US in 2015 (CDC, 2017). The rate of hospitalization and death from heart disease or stroke are drastically higher in adults with diabetes. Complications such as blindness, chronic kidney disease, kidney failure, and amputations also have significant incidence among adults with diabetes (CDC, n.d.). Consistent with ADA (2014), the projected total costs of diabetes in the US were $174 billion in 2007 which had increased to $245 billion by 2012. The cost of diabetes is increasing consistently.

Uncontrolled diabetes results in long-term microvascular and macrovascular complications. The microvascular complications of diabetes are retinopathy, nephropathy, and neuropathy. Common macrovascular complications resulting from diabetes are stroke and cardiovascular disease (Fowler, 2008; Moore et al., 2009; Nordwall et al., 2009). Uncontrolled diabetes increases the risk of dementia also (Xu, Von Strauss, Qiu, Winbald, & Fratiglioni, 2009). Diabetes complications can be reduced by achieving good glycemic control and target HbA1c (ADA, 2016; Dowling, 2014; Walker et al., 2011). It is a constant struggle for patients and providers to attain and maintain optimal glycemic control because of the multifactorial aspects involved in managing this chronic complex disease (Mitchell-Brown, 2014; Zhai et al., 2014).

To attain better diabetes control and a target HbA1c, each individual patient should make a complex array of self-management efforts and lifestyle changes daily in several aspects such as medication compliance, physical activity, healthy eating, capillary blood glucose monitoring, problem resolving, reducing risks, and adopting healthy coping mechanisms (Austin, 2006; Powers et al., 2015). The patients with diabetes demand ongoing teaching and training support in adopting and maintaining these self-care behaviors. Considering the complexity of management and the continuing support required by patients in self-management, a cost-effective intervention such as telephone follow-up is ideal in managing this chronic complex disease (Handley et al., 2008; Levy et al., 2015).

The extensive literature review assessed the efficiency of telephone interventions compared to the usual diabetes care in clinic as well as the effectiveness of MI approach in improving diabetes self-management and glycemic control. Studies have endorsed the effectiveness of MI-based telephone follow-up in managing patients with diabetes rather than

having frequent clinic visits (Chamany et al., 2015; Chang et al., 2007; Handley et al., 2008; Hawkins, 2010; Walker et al., 2011; Young et al., 2014). Telephone interventions are ideal, economic, and efficient means of managing diabetes. The MI approach is effective in perpetrating positive behavior changes, improving self-management, and subsequently improving the overall diabetes control (Chen et al., 2012; Collins, Niles, Mori, Silberbogen, & Seligowski, 2014).

The MI approach is an individual focused, reciprocated mode of prompting and reinforcing intrinsic change motivation in individuals (Miller & Rollnick, 2009). The core aspects of MI are conveying empathy, fostering incongruity, progressing with resistance, and reinforcing self-efficacy (Welch, Rose, & Ernst, 2006). The essential competences in MI include guiding patients using open-ended questions, making affirmations, restating using reflections, and summarizing to comprehend the patient's perceptions (Hall, Gibbie, & Lubman, 2012). Contemplative listening is an inevitable skill in accomplishing success in MI (Welch et al., 2006). The courses of MI are involving, directing, suggesting, and preparing. The collaborative MI approach supports patients' independence in behavior changes and efficiently addresses issues with medication adherence, alcohol or drug abuse, self-care compliance in chronic diseases, and stress management. By using the MI approach, patients are motivated to adopt changes (Grant, 2016). Consequently, using the MI approach in providing telehealth diabetes follow-up was anticipated to improve self-management and glycemic control.

The MI-based telehealth interventions are effective in stimulating behavior changes, increasing self-efficacy, improving knowledge related to diabetes management, decreasing A1c levels, and improving the glycemic control among diverse population with diabetes (Channon et al., 2007; Chlebowy et al., 2015; Collins et al., 2014; Hawkins, 2010; McGloin et al., 2014;

Young et al., 2014). Collins et al. (2014) assessed the effectiveness of telephone interventions and integrated MI skills when the participants had ambivalent thoughts about changing their behaviors. They found substantial progress in diabetes self-management such as patients embracing healthier diet habits, improving physical activity, and improving compliance with self-monitoring of blood glucose (SMBG). The stress level of the participants also decreased. The MI-based telehealth training improves diabetes related self-efficacy of the patients (McGloin et al., 2014; Young et al., 2014). The phone follow-up using MI approach was observed as improving the adoption of healthier diet habits, increasing exercise frequency, and improving the body mass index (BMI) among the participants (Reinhardt, Van der Ploeg, Grzegrzulka, & Timperley, 2012; Zolfaghari, Mousavifar, Pedram, & Haghani, 2012). The MI approach also had promoted attainment of weight loss (Fischer et al., 2016; Pourisharif et al., 2010).

Improving the skills in diabetes self-care is crucial in improving the glycemic control (Walker et al., 2011). The self-care skills are improved with the use of MI approach (Tshiananga et al., 2012). Improvements have been noted in HbA1c, glycemic control, and adherence to SMBG (Chamany et al., 2015; Chang et al., 2007; Davis et al., 2010; Fischer et al., 2016; Hawkins, 2010; Liang et al., 2011; Lorig, Ritter, Villa, and Piette, 2008; Walker et al., 2011; Zolfaghari et al., 2012). Low-density lipoprotein (LDL) levels also have improved by the telephone interventions (Davis et al., 2010). Frequent follow-up and reinforcement is necessary to improve diabetes self-management skills and motivation in self-care which may be attained by cost effective telephone follow-up (Levy et al., 2015; Lorig et al., 2008).

Telephone follow-ups are convenient and cost-efficient means of providing support in medication management and fostering medication adherence (Turner et al., 2009; Melko, Terry, Camp, Xi, & Healey, 2010; Walker et al., 2011; Zolfaghari et al., 2012). Patients commonly

experience anxiety and fear when insulin is initiated and they require frequent follow-up, encouragement, and support to accomplish good compliance with this treatment modality. Telehealth technology is effective in providing enduring support to the patients on initiating insulin and titrating insulin doses. Continued support may empower the patients to improve adherence to the treatment (Awwad et al., 2015; Levy et al., 2015; Turner, Larsen, Tarassenko, Neil, & Farmer, 2009).

Rationale

This project was founded on the common-sense model of self-regulation (CSM-SR) theory. This theory has been applied and found effective in reinforcing compliance with the management of chronic diseases such as diabetes. Better diabetes care outcomes have been accomplished by improvements in diabetes care knowledge and disease awareness (Abubakari et al., 2011; Mann, Ponieman, Leventhal, H., & Halm, 2009; Paddison, Alpass, & Stephens, 2010; Quandt et al., 2012; Yan et al., 2014).

Based on CSM-SR, the five domains influencing the health behaviors of patients with chronic diseases are “disease identity, cause, time-line, consequences, and control of the disease” (Phillips, Leventhal, E.A., & Leventhal, H., 2013, p. 1136). The people with chronic diseases continually gather knowledge about diseases from diverse sources, scrutinize the information, apply some in managing illness, and reject the rest of information (Leventhal, E.A., Weinman, Leventhal, H., & Phillips, 2008). They acquire information through various sources such as from subjective incidents, communal relations, and communications with the healthcare team members. The disease insights developed will direct the individual’s self-care and treatment decisions (Browning, Wewers, Ferketich, Otterson, & Reynolds, 2009). Based on this theory, individuals analyze any new knowledge they receive about diabetes. Developing a better

perception of the disease will change their disease concepts promoting the adoption of better self-care interventions (Quandt et al., 2012).

The plan, do, study, and act (PDSA) methodology involving four cyclical steps was applied in this quality improvement (QI) project (Agency for Healthcare Research and Quality [AHRQ], n.d.; Institute for Healthcare Improvement [IHI], n.d.). A DSME project aiming to improve the diabetes self-care in underserved patients in a community health center successfully used several cycles of PDSA methodology to revise and enhance the program (Anderson & Christison-Lagay, 2008). The diabetes management provided by the general practitioners also had improved by using the PDSA cycle (Wheatland, Porter, Gilles, Greenfield, & Larson, 2006). The PDSA methodology had directed the project implementation.

The low-cost MI-based telephone follow-up is an evidence-based approach prompting improvements in diabetes management and control (Chlebowy et al., 2015; Collins et al., 2014; Hawkins, 2010; Young et al., 2014). Telehealth is an ideal way of providing uninterrupted care and support to the patients (McGloin et al., 2014). Providing MI focused interactive telephone follow-up during the time between the routine three-month visits in the clinic was envisaged to motivate adoption of self-management skills such as regular blood glucose monitoring, medication adherence, regular exercise, and healthy eating. Additionally, this intervention was anticipated to give the provider an opportunity to adjust the insulin doses or oral diabetes medications as required and to support the patients newly started on insulin. The MI-based telephone follow-up was expected to improve the glycemic control of patients with uncontrolled diabetes in this project.

Telephone interventions are found to be effective in managing chronic diseases. A nonrandomized study assessed the effect of telemedicine on improving the blood pressure in

patients with uncontrolled hypertension compared to similar patients receiving regular care in clinic. The telephone group had greater reduction in systolic and diastolic blood pressure compared to the participants receiving regular care in clinic (Bernocchi, Scalvini, Bertacchini, Rivadossi, & Muiesan, 2014). This project is ideal to be implemented in other clinics at this organization managing chronic diseases as well.

Specific Aims

The aim of this project was to improve the glycemic control, HbA1c, and self-efficacy of patients with uncontrolled type 2 diabetes through the evidence-based, cost-effective, MI-based telephone follow-up. This project clearly addressed the framed clinical question, what is the effect of MI-based telephone follow-up on glycemic control of patients who have uncontrolled HbA1c? Uncontrolled diabetes results in several long-term complications which escalate the cost of care delivery. Cost efficiency and convenience are significant benefits of telephone follow-ups (McGloin et al., 2014). Improving glycemic control is expected to bring financial improvements of the organization by reducing the cost of diabetes care and decreasing the rate of hospitalization. Telephone based care in diabetes management is found to enhance glycemic control, reduce complications related to diabetes, and improve quality of life of patients (Williams et al., 2012).

Methods

Context

The setting of the project was the outpatient diabetes clinic of a 464-bed teaching hospital located in the Midwest region of the US. This government operated hospital primarily serves medically underserved people living in poor socioeconomic conditions. The outpatient diabetes clinic is an ADA certified location for providing culturally congruent DSME and DSMS to the

patients. Powers et al. (2015) described that the basic DSME and DSMS reinforcements should focus on the cultural needs, health standards, understanding of the disease management, somatic and emotional necessities, family support, health knowledge and proficiency, socioeconomic position, medical and surgical histories, and any other features influencing the self-care tasks of the patients. The DSME and DSMS services provided in this clinic are based on these self-care needs of the patients. Despite this program at the clinic, an analysis of 2015 HbA1c data from the organization showed that 39.5% of 6,501 diabetes patients managed in this clinic in 2015 had HbA1c above 9.1%.

The project had 30 volunteer participants including 20 males and 10 females, who had type 2 diabetes with a HbA1c 8% or above that has not improved for past six months or more. The oldest participant was 79 years old and the youngest was of age 27 years. Patients with any other form of diabetes and patients with type 2 diabetes who had HbA1c less than 8% were excluded from the project. Non-English speakers, patients with dementia, patients who do not have telephone access, and patients who have chronic kidney disease (CKD) with glomerular filtration rate (GFR) less than 30 milliliter/min (mL/min) were also excluded from participating in the project. The physicians and advanced practice nurses (APNs) in this clinic provided information about the project to the patients meeting the criteria for enrollment. The project manager then provided additional information about the project to the volunteer participants, obtained consent, enrolled them in diabetes group classes provided by certified diabetes educators (CDEs) if they had not attended the class before, conducted pretest using Diabetes Empowerment Scale-Short Form (DES-SF) developed by Michigan Diabetes and Research Center (2003), and gathered necessary demographic and clinical information from them.

Shaw, Kileen, Sullivan, and Bowman (2011) noted that the lower socioeconomic status patients have limited access to standard diabetes care and DSME skills training resulting in poor diabetes control and complications. Telephone follow ups are low-cost interventions and are ideal to be used among lower socioeconomic status population in supporting diabetes management (Handley et al., 2008; Levy et al., 2015). Considering the low socioeconomic status of the population served in this clinic, the cost effectiveness of the telephone interventions makes it ideal to be implemented here.

Interventions

The project intervention was providing five MI-based phone calls to the participants. The participant recruitment, project implementation, and data collection were completed during the period of January 2017 to May 2017. Seven among the participants who had not previously attended the DSME group classes previously were made to attend that prior to initiating the phone calls. The baseline HbA1c and SMBG data were collected at the time of the clinic visit. Before being discharged from the clinic, participants have scheduled a date for the initial phone call. An order was placed for a three month follow up HbA1c test which is a standard practice at this clinic.

The effectiveness of the intervention in improving diabetes related self-efficacy of the participants was assessed by conducting a pretest and posttest using the DES-SF tool. This tool was developed by Michigan Diabetes and Research Center to evaluate the self-efficacy of patients with diabetes (Michigan Diabetes and Research Center, 2003). The validity and reliability of this tool in measuring diabetes associated self-efficacy has been assessed and established (Anderson, Fitzgerald, Gruppen, Funnell, & Oh, 2003; Anderson, Funnell, Fitzgerald, & Marrero, 2000). The Michigan Diabetes and Research Center has granted

permission to use this tool in this project. The pretest using the DES-SF tool was conducted at the recruitment time during the clinic visit.

The project manager initiated the interactive MI centered telephone calls in one to two weeks after the clinic visit. The telephone management calls included all elements of a clinic visit except for the physical examination. Reinforcement of DSME was performed based on specific patient needs. The patients' questions and concerns were addressed during the phone calls. Participants were supported in developing self-management behavioral goals. They were assisted with insulin titration as necessary based on capillary blood glucose data reported by the patients during each phone call. The phone calls lasted approximately 15 to 20 minutes based on the individual patient needs. This project used a scripted telephone call outline to direct the MI-based phone calls. The MI-based phone calls were continued once every two weeks for a total of 10 weeks. The participants were instructed to continue monitoring capillary blood glucose at least once daily alternating between fasting and premeal timings.

Study of the Interventions

The effects of the interventions were analyzed using outcome measures and data analysis. The clinical assessments and statistical data analysis have revealed that the observed outcomes resulted due to the interventions. Other than the MI-based phone call intervention, factors such as frequent insulin dose adjustments, weight loss, and improved medication compliance might have influenced the outcomes.

Measures

The primary outcome measured was any changes in mean HbA1c data by analyzing the baseline and post intervention HbA1c data. The mean of baseline and post intervention premeal capillary blood glucose data were also compared. Diabetes related self-efficacy was measured by

comparing the pretest and posttest scores of DES-SF. The data collection was completed in two different phases. The first phase of data collection was prior to initiating the telephone calls. This included the collection of baseline HbA1c and SMBG data as well as pretest DES-SF score at the time of clinic visit. If patient did not have any recent HbA1c test, point of care testing of HbA1c was done at the time of clinic visit which is the current standard practice in this clinic. The patients who were noncompliant with SMBG were advised to monitor fasting and premeal capillary blood glucose twice daily for one week and to record the results. The baseline SMBG data was collected from them during the initial phone call. The blood glucose data was gathered during each follow-up phone call and was used for insulin dose titration.

The second phase of data collection was after the completion of the telephone follow up calls. Posttest DES-SF was conducted over the phone to assess diabetes related self-efficacy. Fasting and pre-meal capillary blood glucose data were also collected by making phone calls at the completion of the interventions. Post intervention HbA1c data was collected by performing a chart review after the completion of the project. Twenty-five among the total 30 participants returned for HbA1c test at the end. The data was entered in Access database on the same day of collection. The accuracy and completeness of the data was assessed manually by using the features in the database and verified again during the analysis.

Analysis

This project used a quantitative pretest posttest comparative design. In this project, HbA1c at baseline and post intervention at twelve weeks was measured and compared. Diabetes related self-efficacy was assessed by comparing the pretest and posttest scores of DES-SF. The mean of capillary blood glucose data at baseline and post intervention were compared as well.

A statistical analysis was performed to evaluate the effectiveness of MI-based telephone follow-up in improving HbA1c. The Statistical Package for the Social Sciences (SPSS) version 24 software was used for the statistical analysis. The outcomes of the project were analyzed by comparing the baseline and post intervention HbA1c data using 2-tailed paired *t*-test. Pretest and posttest results of DES-SF were also analyzed using 2-tailed paired *t*-test to assess diabetes related self-efficacy. Paired *t*-test was performed to analyze the changes in capillary blood glucose data and average change in insulin or diabetes medication dose as well. At the end, the project outcomes were communicated to all the stakeholders.

Ethical Considerations

Permission to conduct the project was initially obtained from the chairman of endocrinology division of the hospital. Capella University Institutional Review Board (IRB) was contacted for approval of the project. The IRB of the hospital was also contacted to obtain permission to implement the project and their regulations were strictly followed during the entire project. The objectives of the project were discussed with the participants. Patient privacy was protected by following the Health Insurance Portability and Accountability Act (HIPAA) rules followed in the hospital. The four ethical principles of autonomy, non-maleficence, beneficence, and justice were followed in this project (Page, 2012). Informed consent signed by the participants ensured the observance of these principles. No patient safety threats were identified in implementing this QI project.

Results

This project had a total of 30 participants. Twenty-three participants had previously attended the DSME group classes and the rest of them had to attend the classes after recruitment. The intervention was started only after the completion of DSME group classes for all the

participants. The project intervention plan was to deliver five MI-based phone calls to the participants. Twenty-two among all the participants completed all five phone calls as planned. Three participants completed four MI-based phone calls, two among them completed three phone calls, and three of them completed only two calls. All 30 participants completed a minimum of two MI-based phone call interventions and were included in the data analysis. The posttest using DES-SF was completed by 27 participants.

Demographic Data

The demographic data were collected by review of the electronic medical records as well as through direct participant interviews. The project included 20 (66.7%) male participants and 10 (33.3%) female participants. The racial distribution of the sample was diverse with seven (23.3%) Whites, 15 (50%) African Americans, six (20%) Asians, and two (6.7%) being Hispanics. The average age was 56.13 (*SD* = 9.58) years and the average duration of diabetes of the participants was 17.13 (*SD* = 8.37) years. See Figure 1 below.

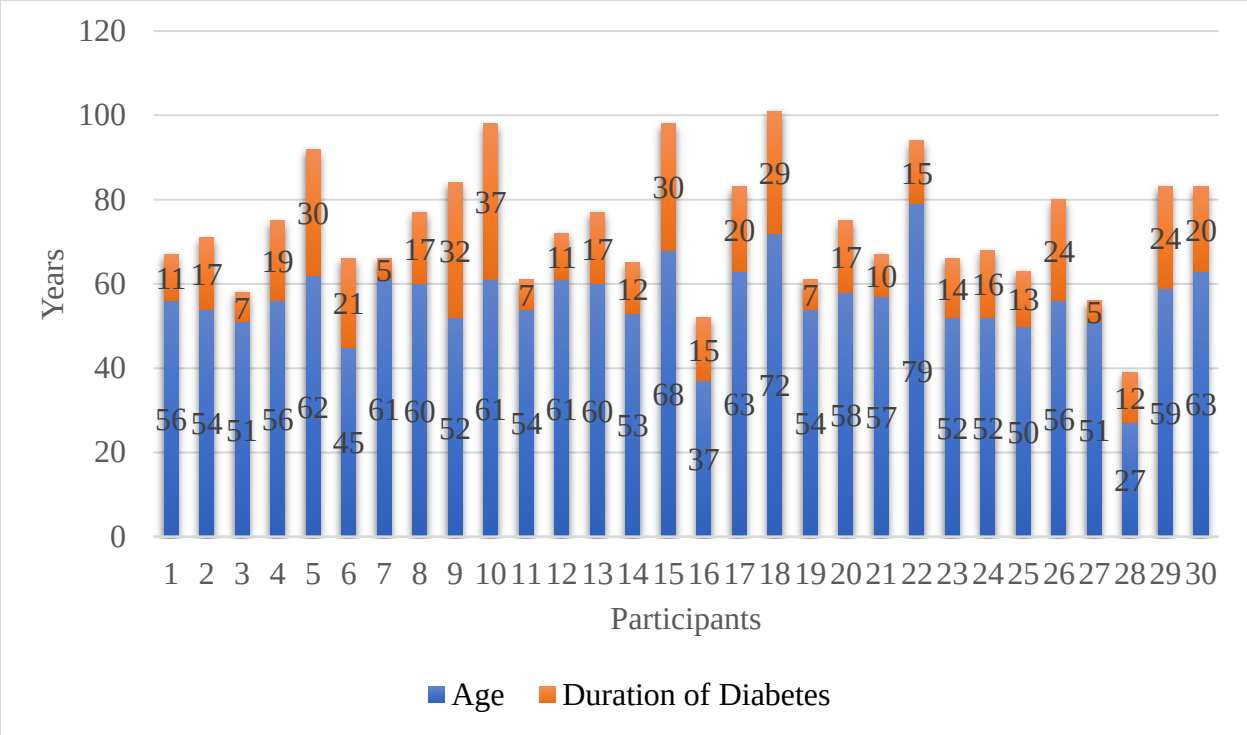

Figure 1. Age of the participants and duration of diabetes in years.

As a standard practice, the educational status and level of comprehension of the patients are being assessed and documented during their initial visit at this clinic. The level of comprehension is rated on a scale of one to five, with five being the highest and one being the lowest level. These data were gathered by performing a chart review. At least 50% of the participants were educated more than high school. Among the participants, 63.3% had a level of comprehension of four, 16.7% were assessed as level five, and 20% had a level of comprehension of three. None of the participants had a level of comprehension below three.

Data Analysis

The project data was analyzed using SPSS version 24. Descriptive statistics were used to characterize the demographic variables. A 2-tailed paired *t*-test was performed to analyze the preintervention and postintervention mean HbA1c levels, mean pre-prandial blood glucose

levels, weight, body mass index (BMI), and survey scores of DES-SF among the project participants.

Description of the Results

The primary outcome measurement of the project was to assess any improvements in HbA1c with the interventions. A 2-tailed paired *t*-test analysis performed found statistically significant improvements in HbA1c with the MI-based telephone call interventions. The preintervention mean HbA1c was 10.408% (*SD* = 1.71) and postintervention mean HbA1c was 9.484% (*SD* = 1.62) (*p* = .008) (see Figure 2). The mean HbA1c significantly reduced by 0.924% with the intervention.

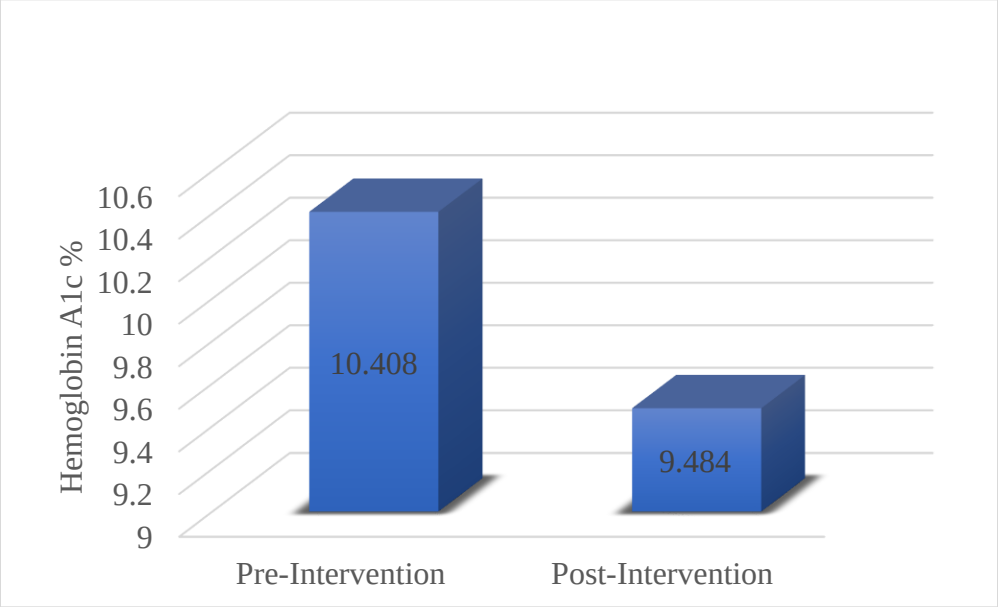

Figure 2. Comparison of baseline and post-intervention mean hemoglobin A1c data.

The overall glycemic control of the participants also significantly improved with the MI-based telephone follow up. After the completion of the project, the fasting blood glucose before breakfast decreased by 28.4%, prelunch blood glucose decreased by 29%, predinner blood glucose decreased by 29%, and the overall total blood glucose decreased by 29% (*p* = .000) (see Figure 3).

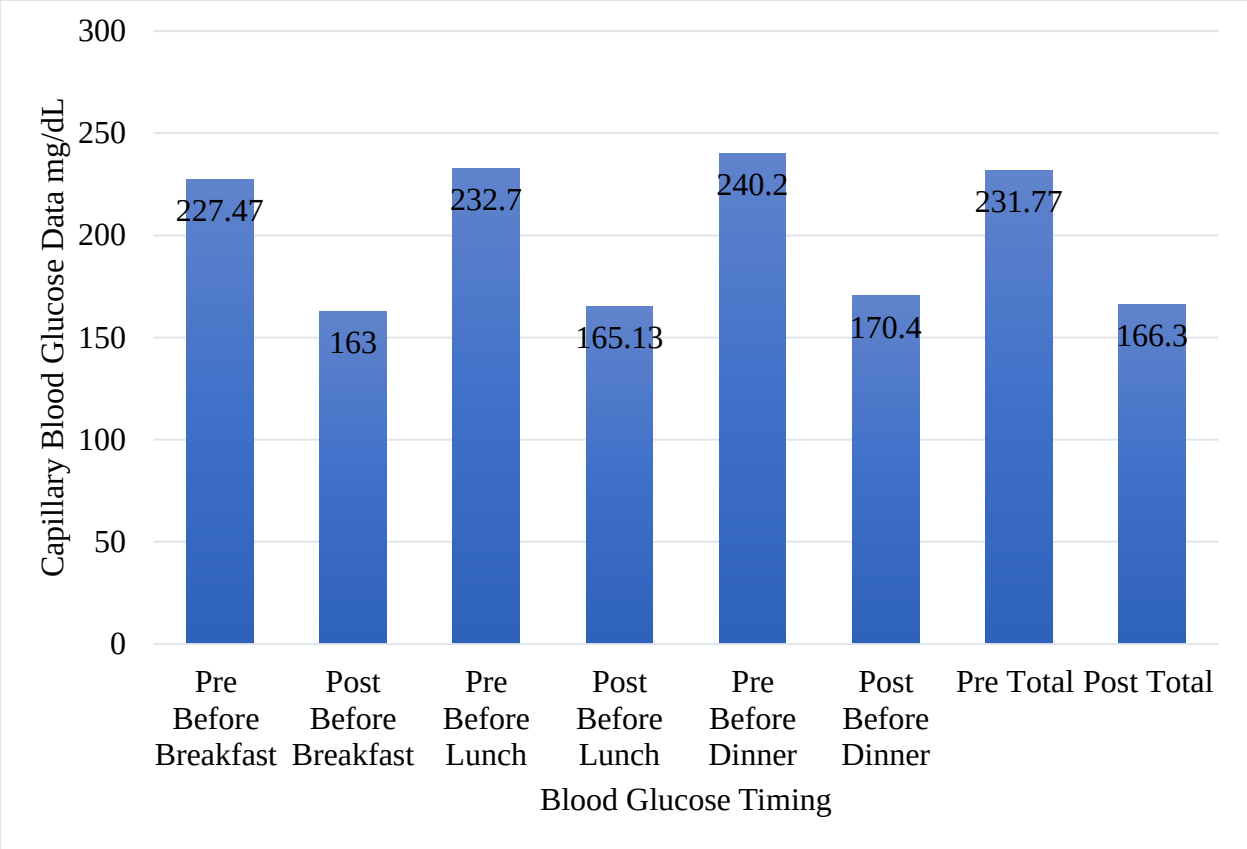

Figure 3. Comparison of mean fasting, premeal, and total capillary blood glucose data.

Preintervention and postintervention medication adherence was also assessed by interviewing the patients and grouping in categories of *skipping sometimes, skipping frequently*, or *having full compliance*. The participants missing medications at least once a week or more were categorized in skipping medications frequently and the others missing medications up to three times a month were considered skipping sometimes. The reasons for poor medication adherence were stated as *forgot to take medications, got afraid of the side effects, and had poor understanding of medications*. The analysis performed by finding the percentage of medication adherence of the participants revealed improvements in medication adherence with the intervention. About 40% of the participants *frequently skipped medications* before the intervention, which decreased to 3.4% postintervention. The participants *skipping medications*

sometimes remained same as 43.3% before and after the interventions. The participants with *full compliance* improved from 16.7% to 53.3% (see Figure 4). The telephone follow-up improved the participants' knowledge of the medications by the end as revealed by none of them reporting poor medication understanding as a reason for missing the medications.

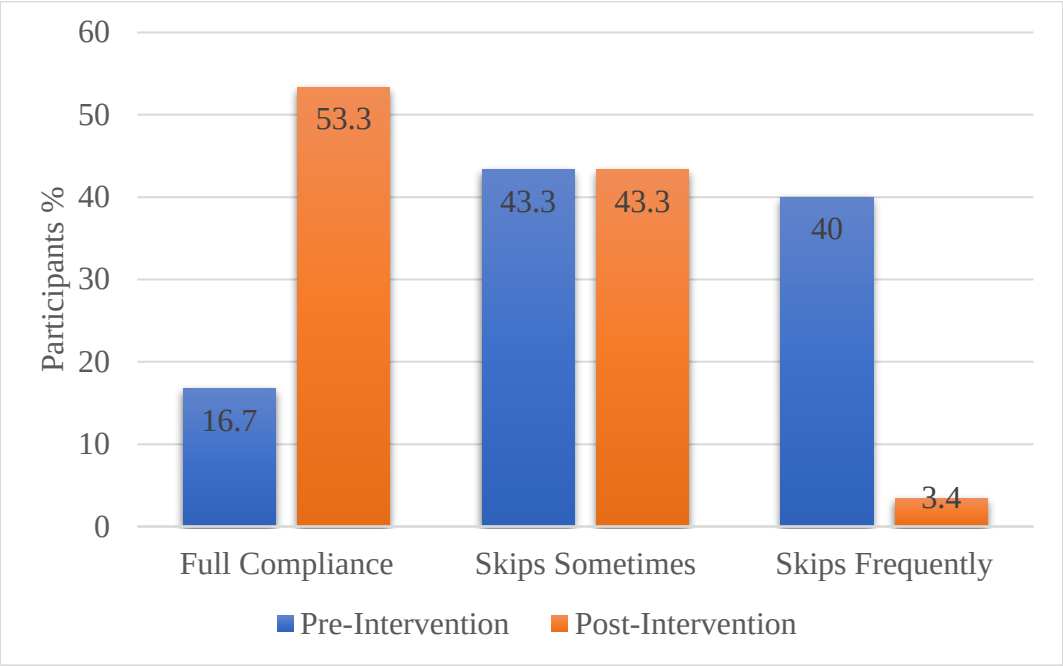

Figure 4. Comparison of preintervention and postintervention medication adherence data.

A post hoc analysis of the weight and body mass index (BMI) did not reveal any statistically significant changes with the intervention. The preintervention average weight of the participants was 93.26 (*SD* = 25.1) kilograms (kg) and post intervention weight was 93.06 (*SD* = 25.1) kg (p = .6). The average BMI pre-intervention was 31.4 (*SD* = 6.16) kg/m² and post-intervention was 30.37 (*SD* = 8.0) kg/m² (p = .26).

All the 30 participants of this project were on insulin and the insulin doses were titrated as necessary based on the blood sugar readings during the phone calls. Insulin dose was increased in 83.3%, decreased in 6.7%, and unchanged in 10% participants. The basal insulin dose increased by 14.1% (p = .001) and the bolus insulin dose increased by 22.6% (p = .016) by

the end of the project. Only a few oral medication changes made were noted during the project where a participant's Metformin dose was reduced by 50% and other two participants had one new oral medication added to their regimen.

The pretest and posttest survey was conducted using the eight item DES-SF tool to measure diabetes related self-efficacy of the participants. Anderson (1999) described the three subscales of DES-SF tool. The subscale I is “managing the psychosocial aspects of diabetes,” subscale II is “assessing dissatisfaction and readiness to change,” and subscale III is “setting and achieving diabetes goals” (Scoring key section, para. 1). Only 27 out of the 30 participants had completed the survey at the completion of the project. The participants who completed only two phone calls were the ones who did not complete the survey at the end. The survey scores of these 27 participants were analyzed using the 2-tailed paired *t*-test. The MI-based phone call follow ups effected statistically significant improvements in diabetes related self-efficacy of the participants ($p = .000$) (see Figure 5).

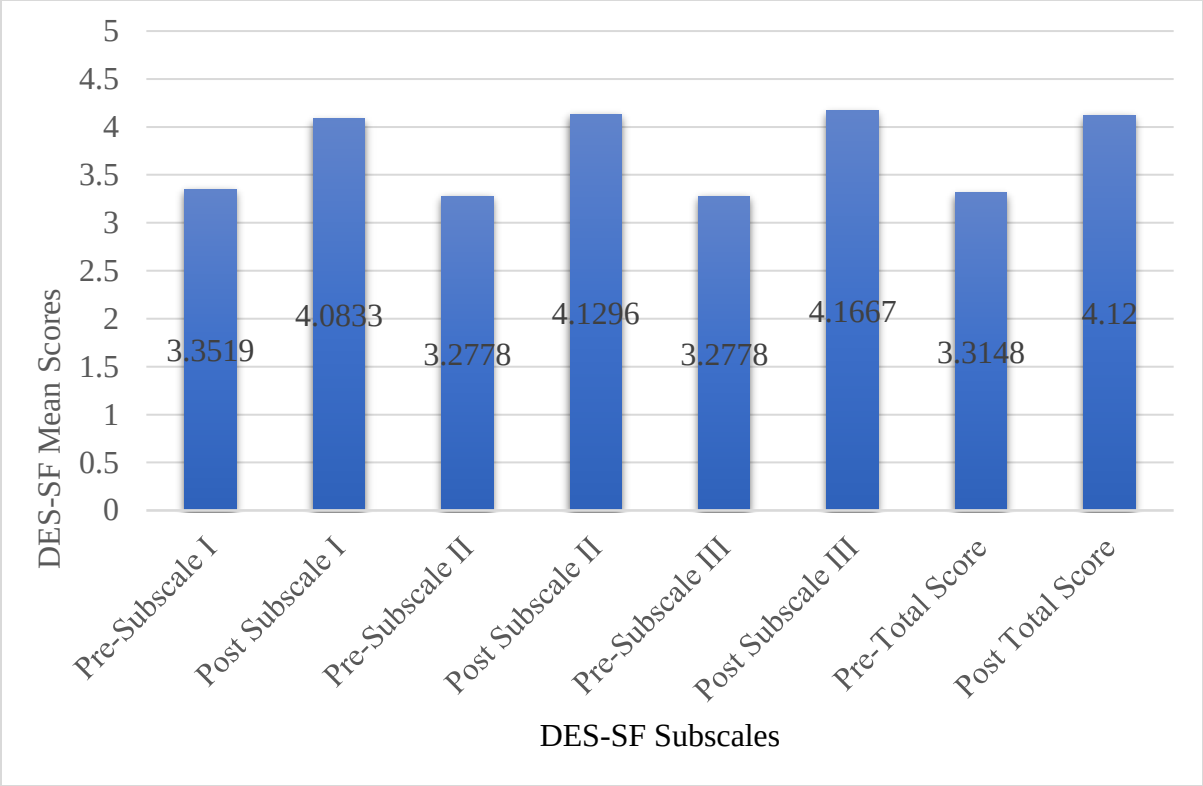

Figure 5. Comparison of baseline and post-intervention DES-SF scores.

Discussion

Summary

The scholarly project addressed the following clinical question: *In patients with uncontrolled type 2 diabetes mellitus with hemoglobin A1c of 8% or above, how does motivational interviewing-based telephone follow-up compared to the usual care in clinic, affect hemoglobin A1c and glycemic control, in a period of three months?* The key findings of the project were statistically significant improvements in HbA1c, blood glucose levels, and diabetes related self-efficacy of the patients achieved by MI-based telephone follow-ups. The MI-based telephone follow-up used CSM-SR as the theoretical framework. Participants had DSME group classes initially and self-management knowledge was then reinforced by the phone calls. Based on the theory, participants' diabetes knowledge improvements and better perception of the

disease changed their disease concepts, resulting in better self-care decisions (Quandt et al., 2012). Studies have found the value of MI-based telephone follow-ups in supporting the adoption and maintenance of therapeutic lifestyle changes (Fischer et al., 2016; Yan et al., 2014).

Telephone follow-up is a simple way of providing continued support to patients in need. The focus interviews performed by McGloin et al. (2014) revealed the need for ongoing support to sustain behavior changes. Telephone follow-up is exceptionally valuable in providing support when initiating insulin or titrating insulin doses (Turner et al., 2009). This cost-efficient intervention is ideal in providing frequent and continuing support to patients in medication management and adoption of healthier lifestyles (Handley et al., 2008; Levy et al., 2015).

The perceptions of patients and providers should be assessed and the barriers should be addressed for the success of MI-based telehealth approach. The patients and providers were satisfied with this care delivery model (Collins et al., 2011; McGloin et al., 2014; Turner et al., 2009). Since diabetes is a mostly self-managed chronic disease, only motivated, informed, and proactive patients will be successful in keeping this complex disease under control (Funnell, Anderson, Austin, & Gillespie, 2007). The significance of MI approach in motivating patients is exceptionally valuable in ongoing diabetes self-care.

A strength of the project was all participants of the project completed a minimum of two phone calls and were included in the analysis. Most of the participants except five had returned to check HbA1c at the end which made the analysis and results more meaningful. The participants have potential benefits from the project such as prevention of complications and cost reduction by attaining better self-care knowledge and diabetes control (ADA, 2016; Nordwall et al., 2009). Frequent phone follow-ups and monitoring of blood glucose levels helps to safely adjust the insulin doses and reach optimal insulin doses without many adverse effects (Levy et

al., 2015). The insulin dose titrations might have influenced the outcomes independent of the effect of MI approach.

Interpretation

The intervention planned for the participants of this project was five MI-based phone follow-up calls after attending DSME group classes. The MI-based telephone interventions are effective in improving HbA1c, diabetes related self-efficacy, and the glycemic control among the subjects (Channon et al., 2007; Chlebowy et al., 2015; Collins et al., 2014; Hawkins, 2010; McGloin et al., 2014; Young et al., 2014). The anticipated primary outcome was achieving any improvements from the baseline HbA1c. Improvements in blood glucose data from their baseline status and improvements in diabetes related self-efficacy of the participants were the other predicted findings.

The results of the project revealed significant improvements in HbA1c and diabetes related self-efficacy of the participants. Eight out of the thirty participants attended between two to four calls only which may not have been sufficient to cause positive changes among them. The optimal goal of fasting and pre-meal blood glucose readings preferably reaching the ADA (2016) target of 80 to 130 milligrams/deciliter (mg/dL) was not attained. The short time duration of the project may have restricted the attainment of ADA recommended target blood glucose levels. However, even with three months long interventions, significant improvements were observed in the blood glucose levels of the project participants who had uncontrolled diabetes. In addition to the MI approach, other factors such as titration of insulin doses may have improved the blood glucose levels of the participants. Other than the routine clinic expenses, the project did not have any financial expenses or associated costs in patient recruitment, project implementation, data

collection, or data analysis. Even the post intervention HbA1c was completed as part of the standard clinic practice and did not incur any additional charges.

Implications

This project was implemented in a US Midwest hospital undergoing financial struggles. Telephone follow-up improves medication compliance and supports lifestyle changes of patients. Telehealth has shown to increase access to care and made it possible to provide care to patients at the convenience of their home (Campion, Dorsey, & Topol, 2016). Cost efficiency of the telephone follow-ups are eminent (Levy et al., 2015; Lorig et al., 2008; Tshiananga et al., 2012; Walker et al., 2011). Low-cost telehealth interventions are ideal for application in this setting.

This project conducted by a nurse practitioner (NP) is significant to nursing practice since nurses are valuable in training and teaching the patients, imparting the skills for diabetes self-care which is a lifelong commitment for patients with diabetes. Nurses play an important role in telephone based diabetes management and interventions resulting in better glycemic control (Handley et al., 2008; Zolfaghari et al., 2012). They have significant roles in motivating diabetes patients to improve self-care using the MI approach (Channon et al., 2007). The knowledge and competence of nurses are elemental in training the patients for effective self-management (Tschannen, Aebersold, Sauter, & Funnell, 2013). The participants of this project were benefitted with the attainment of a better diabetes control.

Limitations

This proposed project is a QI project and the results are not generalizable. The QI projects are generalizable only in the background that the project was conducted (Holly, 2014). Several of the participants of this project had poor socioeconomic status which made the telephone interventions difficult since some of them had restrictions with the telephone use.

Difficulties were encountered in reaching participants over the phone due to lack of time and interest of the patients. Several attempts had to be made to reach several of these participants at different occasions. Twenty of the thirty participants completed five phone calls and the rest of them completed between two to four calls. The difficulty in reaching the participants through telephone is a drawback in adopting this approach. Food insecurity of some of the poor participants was another challenge encountered in fostering healthy eating.

About 20% of the participants were noted as having a low level of comprehension of three which made it difficult to train these participants and reinforce the self-management education. The short duration of 12 weeks was another limitation in training and assessing the participants. Inability to see the participant face to face and perform physical examination was a drawback. Establishing professional provider patient rapport is easier with face to face visit compared to the telephone follow up. The questionable reliability of the verbal data such as capillary blood glucose levels and medication adherence data obtained from the participants through phone interview was also a limitation. Since the participants were contacted by phone for the data collection at the end, the blood glucose data could not be verified by comparing with the glucometer data. The posttest DES-SF survey conducted over the phone was frustrating for some of the participants. The restricted compensation currently available for telehealth services may threaten the continuation of this approach.

Conclusions

The scholarly project reveals the effectiveness of MI-based telephone follow-up in improving the overall glycemic control, HbA1c, and diabetes related self-efficacy of the participants with uncontrolled diabetes. The frequent phone follow-up provided efficient means of assisting in insulin dose titration without causing severe hypoglycemia incidents among the

participants. The outcomes of the project indicate the prospective advantage of the intervention in improving access to quality diabetes care, leading to better diabetes control among the underserved communities. The telemedicine approach is projected for future implementation in the diabetes clinic.

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Statement of Original Work and Signature

I have read, understood, and abided by Capella University's Academic Honesty Policy (3.01.01) and Research Misconduct Policy (3.03.06), including the Policy Statements, Rationale, and Definitions.

I attest that this dissertation or capstone project is my own work. Where I have used the ideas or words of others, I have paraphrased, summarized, or used direct quotes following the guidelines set forth in the APA *Publication Manual*.

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