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Improving an Outpatient Diabetes Program Telephone Follow-up Process: Evaluating its Impact on Glycosylated Hemoglobin Levels

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DNP Capstone Scholarly Project Report

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Contents

Capstone Abstract

Telephone follow-up for diabetes self-management is used to facilitate ongoing support for individuals striving to maintain a healthy lifestyle. With the use of telephone follow-up after Diabetes Self-Management Education (DSME), key concepts can be emphasized and goal reinforcement can occur. When successfully managed, improved glycemic control occurs, as evidenced by reductions in glycosylated hemoglobin (A1C) levels. A review of the literature surrounding this topic and description of a capstone scholarly project utilizing findings from the literature to create an evidence-based telephone follow-up pilot study are included. Findings from this study did not reveal statistically significant reductions in A1C levels with increased telephone follow-up; however, previous research supports increased contact in facilitating ongoing motivation for diabetes self-management success.

Integrative Literature Review: Diabetes Telephone Follow-up

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Abstract

The purpose of this paper is to evaluate the literature related to telephone follow-up for diabetes management after individuals receive diabetes self-management education (DSME). Current research has demonstrated that telephone follow-up after DSME can improve ones' overall glucose control as demonstrated by reductions in glycosylated hemoglobin (A1C) levels. A search of computerized databases focusing on articles published from 2000 to the present was conducted utilizing key words such as type 2 diabetes, education, outpatient education, follow-up, and telephone calls. Seventeen articles are included in this integrative review with the majority of studies demonstrating A1C reductions of 1% or greater. There is evidence to support the use of increased telephone follow-up (weekly and/or biweekly frequency) in diabetes management. Additional research is needed to evaluate the sustainability of this form of telephone follow-up in maintaining long-term A1C reductions.

Integrative Literature Review: Diabetes Telephone Follow-up

Introduction

Type 2 Diabetes Mellitus (DM) is a growing health concern. Approximately 27 million or 8% of Americans have diabetes (Centers for Disease Control and Prevention [CDC], 2011), and 33% are unaware that they have the disease (Evans, 2010). More specifically, 10.9 million of diabetes related cases belong to U.S. residents aged 65 years and older (CDC, 2011). By 2020, it is estimated that 50% of Americans may have diabetes (CDC, 2011). Global estimates from the World Health Organization (WHO) project 300 million people will have diabetes by 2025 (Cinar et al., 2010). Many complications may result from prolonged elevated blood glucose levels in individuals with DM, including: heart disease (Nesari et al., 2010), stroke, blindness, kidney failure leading to dialysis or kidney transplantation, neuropathy, gastroparesis, and lower-limb amputations (Evans, 2010). Diabetes related complications have been predicted to generate healthcare costs of $500 billion annually or $3.35 trillion over the next decade if current trends continue (United Health Center, 2010).

Diabetes related complications can be decreased with an effective telephone follow-up process that facilitates ongoing support for individuals following DSME (Boucher et al., 2000). According to the American Association of Diabetes Educators (AADE), DSME is not effective when limited to a single encounter (Duncan, Birkmeyer, Coughlin, Li, Sherr, & Boren, 2009). It is an ongoing process of facilitating knowledge, skill, and ability to perform diabetes self-care with a multidisciplinary team approach (Duncan et al., 2009). The goal of DMSE is to help people with diabetes achieve optimal health status, improve quality of life, and reduce the need for costly healthcare (Duncan et al., 2009). The Standards of Medical Care in Diabetes (2011)

report that ongoing DSME provides the support people with diabetes need to maintain effective self-management strategies throughout their lifetime (ADA, 2011).

The use of telephone based interventions to facilitate an effective follow-up process for chronic disease management is on the rise because of the ease of implementing this form of follow-up with all ages (Boucher et al., 2000; Wong et al., 2005). Potential participants for this form of follow-up generally have access to a telephone and no specific training is needed (Piette, Weinberger, & McPhee, 2000b). Reinforcing the information received as an outpatient including diet, exercise, medication management, and blood glucose monitoring (Clark, 2008; Evans, 2010; Walker et al., 2011) and evaluating its effects at one's home is not only beneficial but cost effective (Handley et al., 2008; Piette, Weinberger, & McPhee, 2000b). DSME and ongoing support increases self-management success and improves long-term control (Evans, 2010; Nesari et al., 2010). More importantly, telephone follow-up empowers and motivates people for a lifetime of self-care activities (Nesari et al., 2010; Walker et al., 2011).

Purpose

The purpose of this paper is to review the literature related to the best evidence surrounding the frequency of telephone follow-up needed after participants receive DSME and the most evidence-based outcome measure(s) available to evaluate its impact.

Methods

The following databases were used to evaluate DSME telephone follow-up in the literature: Medline via Ovid, CINHAL, the Cochrane Database of Systemic Reviews, EbscoHost, ProQuest, PubMed, and the National Guideline Clearinghouse. Key words used to retrieve research articles applicable to this topic included: diabetes mellitus, type 2 diabetes, education, outpatient education, follow-up telephone, telephone calls, telephone counseling, and automated

phone calls. Articles were searched from 2000 to 2013 with focus predominantly on the last five years. Genev et al. (1999) was the only article evaluated prior to 2000. After reviewing the literature, 17 out of 135 articles discussed specific recommendations regarding frequency of telephone calls, follow-up questions, tools and outcome measures. Table 1 includes a literature matrix of the telephone specific articles reviewed.

Similarities and differences among studies analyzing the effects of telephone follow-up after DSME were evaluated (Evans, 2010; Handley et al., 2008; Kim & Oh, 2003; Oh, Kim, Yoon & Choi; 2003; Piette et al., 2003a; Piette, Weinberger & McPhee, 2000b). Study characteristics included: sample size, setting and study type, focus areas during the telephone discussions, frequency and length of telephone follow-up and outcome measures.

Findings

Sample Size, Setting, and Study Design. Sample sizes evaluating blood glucose control ranged from 36 (Nesari et al., 2010; Kim & Oh, 2003; Oh, Kim, Yoon, & Choi, 2003) to over 500 participants (Piette, Weinberger, & McPhee, 2000b; Maljanian et al., 2005; Wu et al., 2010). Seven of the 17 telephone follow-up diabetes specific studies used a sample size ranging from 12-61 participants. The most common sample size used was 30-60 participants. The remaining studies used 100 to over 500 participants. Study participants were recruited from physician offices, general medicine clinics, and hospital-based disease management programs.

The most commonly used study design conducted on this topic was randomized control trials (RCT's) which included 11 out of the 17 studies (Evans, 2010; Handley, Shumway, and Schillinger, 2008; Kim & Oh, 2003; Maljanian et al., 2005; Mollon et al., 2008; Oh, Kim, Yoon and Choi, 2003; Piette et al., 2000a; Piette et al., 2000b; Piette et al., 2001; Walker et al., 2011; Wong et al., 2005). The studies included: one prospective, observational study with a

convenience sample (Cinar et al., 2010), one observational longitudinal study (Duncan et al., 2009), one simple random sampling study (Nesari et al., 2010), one retrospective evaluation study (Rhee et al., 2005) and two pre-test/post test design studies (Hendricks & Hendricks, 2000; Kim & Jeong, 2006). Assessment of the quality of a study was based on an evaluation of its study design (Ebell et al., 2004). The work of Rosswurm & Larrabee (1999) was used to grade the evidence-based articles in Table 1. Four stages are used to rank the level of evidence from the highest to lowest level of quality. Level I includes randomized controlled trials which are considered the gold standard research design (Polit & Beck 2008). Level II represents quasi-experimental studies which involve experiments that have an intervention but lack randomization (Polit & Beck, 2008). Level III denotes comparative, correlational, and other descriptive studies. Level IV characterizes evidence from expert committee reports and opinions (Rosswurm & Larrabee, 1999).

Intervention Focus. In the DSME telephone follow-up articles reviewed, various data collection formats were used. Authors of all but one study evaluated participants' adherence to diet, exercise, blood glucose monitoring, medication, hypoglycemia management, and foot care (Hendricks & Hendricks, 2000). Unlike other studies, Evans (2010) created his own follow-up tool consisting of 29 questions based on the American Diabetes Association (ADA) Standards of Medical Care in Diabetes Guidelines to facilitate each telephone follow-up session. Information regarding annual eye exams, nutritional counseling, flu and pneumonia vaccination status and smoking cessation were also included in the work conducted by Maljanian (2005). Piette et al. (2003a) evaluated participants' glucose monitoring, foot inspection adherence, and weight over a twelve month period. In this study, a nurse conducted telephone follow-up calls to target individual problems and discuss items from the previous week's class.

Length and Frequency of Telephone Follow-up. There was variation found in the length and frequency of telephone calls among the studies reviewed. In the majority of studies reviewed, telephone follow-up sessions were adapted to meet the participant's individual needs (Keogh et al., 2011). As a result, telephone follow-up times ranged from 5-25 minutes (Evans, 2010; Handley, Shumway, & Schillinger, 2008; Hendricks & Hendricks, 2000; Kim & Oh, 2003; Nesari et al. 2010; Oh, Kim, Yoon, & Choi, 2003; Piette et al., 2000; Polonsky et al., 2003; Young et al., 2005). Genev et al. (1990), however, used two 15 minute telephone calls at 2 and 5 week intervals following initial education.

Telephone follow-up interventions ranged from weekly calls for a month (i.e. a total 4 calls) to a total of 16 calls spread over a one year period. The frequency of telephone calls depended on the length of the study and telephone protocol (Cinar et al. 2010; Evans, 2010; Handley, Shumway, Schillinger, 2008; Kim and Jeong 2007; Kim & Oh, 2003; Maljanian, et al., 2005; Nesari et al., 2010; Oh, Kim, Yoon, & Choi, 2003; Piette, Weinberger, McPhee, Mah, Kraemer, & Crapo, 2000a; Piette, Weinberger, Kraemer, & McPhee, 2001; Polonsky et al., 2003; Wu, Forbes, & While, 2010). The majority of telephone follow-up interventions were completed after structured DSME classes. One study used the A1C level to determine the frequency of telephone follow-up (Young, Taylor, Friede, Hollis, Mason, Lee, Burns, et al. 2005). Participants with an A1C $\leq$7% received a follow-up telephone call every 3 months, those with an A1C between 7.1-9.0% received follow-up every 7 weeks, and those with an A1C over 9.0% received monthly follow-up (Young et al., 2005).

Nine of the seventeen diabetes specific telephone follow-up studies utilized a weekly or biweekly (every other week) regimen over 3, 6, 9 or 12 months to impact improvements in diabetes self-management. Five out of nine articles used both a weekly and biweekly regimen in

which participants were contacted for a period of time on a monthly basis followed by every other month until study completion (Cinar et. al, 2010; Kim & Oh, 2003; Nesari et al., 2010; Oh, Kim, Yoon, & Choi, 2003; Wong et al., 2005). Four out of nine articles used a biweekly regimen exclusively (Evan, 2010; Piette et al., 2000a; Piette et al., 2000b; Piette et al., 2001).

Outcome Measure. One of the primary outcome measures used to evaluate the effectiveness of a telephone follow-up was the A1C level pre and post intervention (Nesari, 2010). Eleven of the seventeen diabetes specific articles analyzed used the A1C as a baseline and outcome measure (Duncan et al., 2009; Handley et al., 2008; Kim & Oh, 2003; Kim & Jeong, 2006; Nesari et al., 2010; Oh, Kim, Yoon, & Choi, 2003; Piette et al., 2001; Polonsky et al., 2003; Rhee et al., 2005; Walker et al., 2011; Wong et al., 2005). Other studies used fasting blood glucose (Evans, 2010), appointment adherence (Mollon et al., 2008), depression, self-efficacy, days in bed, satisfaction and anxiety (Piette et al., 2000b) as outcome measures. Adherence to ADA guidelines such as eye, foot care, and vaccinations were evaluated by Maljanian et al., (2005) while Duncan et al. (2009) and Wong et al. (2005) evaluated healthcare savings and hospital costs associated with a telephone follow-up intervention.

Several international studies have been conducted to evaluate the effect of telephone follow-up on A1C outcomes. The work of Oh, Kim Yoon, & Choi (2003) and Cinar et al. (2010) decreased A1C values by 1.1 to 1.2% after sixteen telephone calls over a three month period. Researchers at King's College in London conducted a review of 36 randomized controlled trials related to telephone follow-up as part of diabetes management. Overall findings revealed that 73% of participants who received telephone follow-up had initial A1C's of 9% reduced their A1Cs values to 8% after telephone contact. As previous research has shown, this is a 1% reduction in A1C value (Hutchins, 2010). With a large sample size of 1334 participants, Wu et al

(2010), found that initial A1C levels of 9.0% could also be reduced by an average of 1% or more with a nurse led telephone intervention. Telephone frequency was monthly for those participants with A1C levels over 9.0% and a total of 3 monthly calls for those participants with an A1C less than 9.0% (Wu et al., 2010). In a study of 167 participants, Polonsky et al. (2003) revealed that two or more follow up telephone calls could achieve an A1C of 7.0% or less by 6 months with baseline reports starting at over 8.5%.

Discussion

Telephone follow-up is often used to provide medical management, ongoing support, and education (Boucher et al., 2000). After DSME, telephone follow-up allows continued support of behavioral changes including healthy eating, exercise, blood glucose monitoring and medication adherence (Boucher et al., 2000). Based on the current literature, a combination of weekly and biweekly telephone follow-up can be beneficial in reducing A1C levels by 1% or more in as few as 12 weeks after DSME. With the implementation of a telephone based intervention to reinforce important diabetes self-care information, individuals can be better prepared to care for their disease (Walker et al., 2011).

The evidence for the efficacy of post DSME telephone follow-up was demonstrated by eleven out of seventeen studies reviewed that utilized a randomized control trial (RCT) study design. Previously determined reliability and validity of the various measures used in each study were reported by the authors (Handley et al., 2008 and Kim & Oh, 2003). Reliable evidence surrounding cause and effect and potential confounders are often controlled in this type of research (Polit & Beck, 2008). The majority of studies reviewed were RCT's, providing a strong source of evidence and insight into effective DSME management (Stetson, Ruggiero, & Jack,

2010). The strength or grading the evidence is important to identify the quality of evidence surrounding a study outcome (Stetson et al., 2010).

The primary outcome measure utilized in the majority of the studies reviewed was the A1C test. According to The Advisory Board Company, a global research, technology, and consulting firm partnering with over 3,700 organizations in healthcare and higher education, the A1C should be the principal method used to assess blood glucose control (The Advisory Board Company, 2007). The A1C has also become a standard evaluation tool recommended by the American Diabetes Association (ADA, 2013). Studies have shown the A1C to be an ideal predictor of glucose control (Kim & Oh, 2003; Nesari et al., 2010; Walker et al., 2011). The rate of A1C formation is based on glucose concentration. Red blood cells (erythrocytes) are freely permeable to glucose and have an average life span of 90-120 days. Therefore, a blood sample provides a glucose history for this length of time (Goldstein et al., 2004). Current A1C goals from the American Diabetes Association (ADA) recommend that people with diabetes should maintain A1C levels <7% to minimize the risk of microvascular and neuropathic related complications (ADA, 2011). In 2002, however, the Council for the Advancement of Diabetes Research and Education (CADRE) developed a treatment guideline to acknowledge that unique A1C goals should be considered for older populations, certain ethnicities, and blood dsycrasias (CADRE, 2011). Less stringent A1C goals for certain circumstances can minimize the risk for severe hypoglycemia (ADA, 2011).

The goal of utilizing a telephone-based intervention is to provide continuous education and reinforcement of diet, exercise, medication adjustment per primary care provider and frequent self-monitoring of blood glucose levels. Registered Nurses, Advanced Practice Nurses (APN's), and researchers were used throughout the various studies in conducting the telephone

interviews and in the data collection process. When an APN with prescriptive privileges conducts the follow-up, medication adjustments can be made immediately. The APN can collaborate with the physician as needed and continuity of care is not infringed (Evans, 2010).

Disadvantages found in implementing a more consistent telephone process may lie in the difficulty in reaching study participants by phone. Walker et al., (2011) attempted ten telephone calls over twelve months. Fewer phone calls resulted when participants were unable to be reached or refused a telephone call even after increased staff effort. A minimal of six completed telephone calls was associated with significant improvements in A1C values in this study (Walker et al., 2011). The value of telephone-based follow-up interventions in varied populations and settings has not been established; however, more studies are currently conducted globally in countries such as China, Japan and Korea. Additional studies are also being conducted with diverse populations in low-income and urban settings (Hendricks & Hendricks, 2000; Kim & Oh, 2003; Piette et al., 2000a; Walker et al., 2011; Wong et al., 2005).

Additional study is needed to determine if A1C reductions can be lowered to various goal levels, based on a given study duration such as 3, 6, 9, 12 months. The articles reviewed did not evaluate this area. Comparing face to face contact versus telephone follow-up was not found in the current literature reviewed. Participant attitudes may vary with face to face versus telephone follow-up. Additional research is needed to evaluate whether participants' attitudes, level of engagement, and overall responses towards self-management vary if they receive face to face follow-up versus telephone follow-up.

Conclusion

The literature evaluated in this review suggests telephone follow-up after DSME can be beneficial in reducing A1C levels. Variations of telephone frequency were found in the literature

to most often include weekly and/or biweekly contact between 3-12 months of follow-up duration. With telephone follow-up support, A1C reductions decreased by 1% in most studies. A telephone based follow-up intervention provides ongoing diabetes education and reinforces the skills needed to manage the disease in the outpatient setting. This form of follow-up in diabetes management has the potential to reinforce long-term, positive health behaviors (Piette, Weinberger, & McPhee, 2000b; Wong, Mok, Chan, & Tsang, 2005). Additional research is needed, however, to assess if A1C reductions can be sustained over a longer period of time.

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Table 1

Review of the Literature Matrix

No.	Citation (Authors +/or yr)	Purpose / Aims +/or	Study Design	Instrument (s) used	Sample Size & Statistical Methods	Results & Findings	Limitations	Conclusions / Recommendations/ Implications	Quality of Evidence
1	Cinar, Akbayrak, Cinar, Karadurmus, Sahin, Dogru, Sonmez, Tosun, Kilic 2010.	The purpose of this study was to investigate the effect of a nurse led telephone call on glucose parameters and adherence to diabetes control recommendat-ions. This was a single-center, prospective, 3-month follow-up study. IV-Nurse Led Telephone Intervention DV-A1C control & Patient Satisfaction	Single-center, prospective study Convenience sample Phone calls occurred once a week for the first month and then every two weeks for the 2nd and 3rd month. First interview avg. 30 minutes Observational, Longitudinal Analysis	Both A1C and metabolic control parameters were evaluated. Patient satisfaction was also evaluated with the use of a tool created by Hall et al. (1993).	Paired t-test, Wilcoxon signed-ranks test, and a McNemar test. The probability was statistically significance at $p<0.05$.	At the end of the study, A1C results declined by 1.1%.	Small sample size of 35 patients from a single center. Difficult to generalize findings to a large, more diverse population.	This study provided some additional telephone intervention ideas.	I

2	Duncan, Birkmeyer,Coughlin, Li, Sherr, & Boren, 2009	Two-fold study 1. To evaluate if participants in diabetes education are more likely to follow diabetes care standards then those who do not. 2. To investigate the claims of participants in diabetes education versus those who do not. IV-Diabetes education DV-Healthcare savings	Administrative Claims Data was used due to the researcher's lack of access to charts	Claims per member per month (PMPM) A1C, lipid testing, microalbumi n-uria, & eye exam	*p*-values were used throughout comparing the intervention group against the various areas (A1C, lipids, etc.) For uniformity Standard actuarial technique and risk adjustment were used.	An average of 5.7% decrease in healthcare cost occurred in commercially insured members who used diabetes education Medicare members were found to decrease healthcare costs by 14% on average upon receiving education. The *p*-value was statistically significant in both cases.	Potential bias from patients and varied provider prescribing referrals may have occurred.	Overall, this study revealed that diabetes education improves patient compliance with recommended testing and exams such as A1C, microalbumin, general labs, eye and dental exams.	II

3	Evans, 2010	In adults with type 2 DM, what is the effect of adding a follow-up telephone intervention by an APN on blood glucose control as compared to ADA's recommended standard treatment alone? IV-telephone intervention by an APN DV-glucose control	Evidence Synthesis consisting of one systematic review and five randomized control trials	ADA standards were used to conduct phone discussions Fasting Blood Glucose levels were evaluated bi-weekly for 8 weeks	An Evidence-Based Practice Protocol was implemented using an Advanced Practice Nurse (APN)	Blood glucose levels improved after APN intervention	Small sample size only 6 in each group Length of the study only 8 weeks. (FBG) levels were recorded with each phone interview, however, the length of the intervention did not allow for A1C follow-up.	This study suggests that a follow-up phone call intevention can help patients improve glucose control. The content used from the Standards of Medical Care in Diabetes is ADA approved.	I

4	Handley, Shumway, Schillinger, 2008	The purpose of this study was to evaluate "the cost-effective-ness of automated telephone self-management support (ATSM) with a nurse care management intervention for patients with type 2 diabetes IV-ATSM and nurse-led phone intervention DV-Improved Chronic Model Outcomes & decreased cost	Randomized Controlled Trial Diverse population of English, Spanish & Cantonese speaking patients Patients in the ATSM group were called weekly, given interactive patient education and one-on-one counseling for 9 months. Phone interaction took approximatel y 5 minutes.	Quality-adjusted life years (QALYs) 12-item Short Form Health Survey Evaluated at baseline and 12 months	The outcomes of the study were based on the Chronic Care Model and included structures/ processes of care, behavioral, metabolic, and functional categories specific to diabetes. The cost associated with each outcome was calculated.	One year improvements in health behaviors and functional outcomes with the use of the automated telephone self-management support (ATSM) occurred in this trial.	No significant differences in metabolic outcomes such as AIC or blood pressure occurred. Some of the cost effective calculations may not be quantifiable especially to other ethnic groups. The calculations section of the article is challenging to read. Questions during sessions were not shown.	This study demonstrates a potential cost saving process in managing diabetes. It also emphasizes the importance of providing resources and education to other ethnic groups that are affected by diabetes.	I

5	Hendricks & Hendricks, 2000	To evaluate whether clinical, patient performance, quality-of-life, and subjective outcomes differ among African American men with type 2 diabetes. These men received a phone follow-up intervention either monthly or every three months over a 6 month period after participating in a structured diabetes self-management class. IV- Evaluate the frequency of a telephone intervention DV-A1C levels	Convenience Sample with randomization into two groups Pre-test/Post test 6 month study Telephone Intervention	Telephone based intervention	15 (monthly phone calls for 6 months) 15 (phone calls every 3 months for 6 months) *p*-values, paired *t*-test, chi-square test	This study demonstrated that 3 month interval telephone follow-up calls may be just as effective as monthly calls to assist with positive diabetes health outcomes. Evaluated Pre & Post A1C levels.	Small sample size, one gender, and one ethnicity were used which makes it difficult to generalize findings. Information bias may have been present due to participant's subjective reports and payment for participation being made available.	Provided cultural and gender specific diabetes information helpful to diabetes educators. 1.2% decrease in A1C in 8 of the participants who received monthly calls. 0.5% decrease in A1C for those who received phone calls in 3 month intervals or twice in 6 months.	I

6	Kim & Jeong, 2007	To evaluate if an internet-based intervention using the short message service (SMS) of a cellular phone by a nurse would improve A1C, fasting plasma glucose, and 2 hours post meal glucose in Type 2 diabetes patients over a six month period. IV-SMS Cellular Phone Message DV-A1C, FPG	Pre-test/Post test design 6 month study A1C, FPG*, and 2HPMG** measured before, 3 mos., and at 6 mos. Control group met with Endocrinolog-ist 1-2 times during six month period. **fasting plasma glucose* ***2 hours post meal glucose*	Based on patient responses, the researcher sent weekly recommendat-ions to the patient via cellular phone or internet. Goal was to provide continuous education, reinforce diet, exercise, medication adjustment and encourage at home monitoring.	Randomly assigned 60 patients, only 51 patients competed the study 25 intervention group 26 control group Chi square test, t-test, and Fisher's exact test ANOVA, Paired t-test with Bonferroni correction	AIC changed in the intervention group 8.09% pre-test to 6.94% at 3 mos. and to 7.04% at 6 mos. FPG did not differ. 2HPMG did differ over time. Intervention group= $p<0.05\%$ with a mean drop in glucose of 85.1 at 3 mos, 63.6 at 6 mos.	Participants did not input their diet, exercise, and adverse effect data into the website. Requested BG values were not maintained by the experimenta l group Not all appts. were kept by the control group. .	Overall, this study showed that a SMS cellular phone could improve A1C and 2 HPMG values over a 6 month period	I

7	Kim & Oh, 2003	To evaluate whether a nurse led telephone intervention would improve A1C levels and treatment adherence in patients with type 2 diabetes mellitus. IV-nurse telephone intervention DV- A1C	Randomized Control Study	Pre and Post Test	50 participants (36 completed) Control Group- received routine care by MD every 3 months Intervention Group- telephone intervention biweekly for first month then weekly for 2nd & 3rd months	Outcomes from this study revealed improved adherence in blood glucose testing and diet in the intervention group. A1C levels decreased by 1.2% after 12 weeks.	This study was a small sample size consisting of a majority of women. Difficult to generalize findings from this study.	Additional testing, a larger sample size, and a more diverse population are needed to further generalize the findings from this study. This study revealed that a telephone intervention can improve A1C levels and adherence in patients with diabetes.	I
8	Maljanian, Grey, Staff & Conroy, 2005	The purpose of this study was to evaluate the value of an intensive telephone follow-up process as an	Randomized Control Study	The intervention group received a series of 12 weekly phone calls reinforcing basic education and self-	507 patients were enrolled 336 completed both a 3 & 12 month evaluation. Patients were	ADA standards significantly improved for those that received the phone intervention. Glycemic	Improved compliance in important factors related to diabetes self-management occurred.	This study evaluated what are the best recommendations for number of phone calls, length of time to evaluate, and outcomes to measure.	I

		additional component to a diabetes disease management program, in adherence with the American Diabetes Association (ADA) standards of care and health-related quality of life (HRQOL) indicators. IV-telephone intervention DV-glucose control, adherence to ADA standards of care and HRQOL.		management skills.	18 years or older, with type 1 or type 2 diabetes referred to a hospital-based disease management program. Outcome measures included: glucose control, general and disease-specific health-related quality of life (HRQOL), symptoms of depression, adherence to self-management guidelines, and patient satisfaction.	control or HRQOL was not significantly affected by the intervention	Remains in question if overall complicat-ions such as undetected neuropathy leading to foot ulcers will be prevented.		

9	Mollon, Holbrook, Keshavjee, Troyan, Gaebel, Thabane, & Perera, 2008	This study evaluated the effects of a telephone reminder system in patients with diabetes without direct patient provider telephone contact. The goal was to see if medication and appointment adherence would improve. IV-automated telephone appointment reminder system DV-increased appointment adherence	Randomized Control Study	Web and paper-based individualized diabetes tracker	253 adults (original # of participants randomized to the intervention group)	Phone reminders were able to be delivered to 184 of 193 intervention patients at least once.	Even though the automated telephone reminder system was able to make additional calls when participants were unable to be reached, there were still a number of times when contact could not be made. The cost of providing this service was expensive. A survey method was used to evaluate the program.	The results of this study revealed that an automated telephone system could be effective for patients, including the elderly. The direct benefits from the ATRS, however, were not determined.	I

							Inaccurate or bias responses could have been reported.		
10	Nesari, Zakerimoghadam, Rajab, Bassampour, & Faghihzadeh, 2010	The objective of this study was to evaluate whether "a nurse telephone follow-up service" could improve the level of adherence to a diabetes therapeutic regimen in patients with type 2 diabetes. IV-Nurse telephone intervention	Simple Random Sampling	A sheet was used to record A1C values and a self-reported questionnaire constructed by the researchers. Blood testing was determined by a high performance liquid chromatography technique. Questions were asked using a Likert-type scale in the areas of demographics, disease, and level of adherence to:	61 participants The first month participants received calls twice per week and then weekly until the end of the study. Each telephone session took approximately twenty minutes to address health behaviors	Improved A1C levels were seen in the experimental group	Conducted in Iran with a group from one diabetes society, thus making it difficult to generalize the findings from this study.	This study demonstrated that a nurse telephone follow-up intervention could improve glycemic control. A1C's and adherence levels did improve for the experimental group but not the control group.	I

		DV-improved A1C values and diabetes adherence		diet, exercise, medications, foot care and frequency of blood glucose monitoring.					
11	Oh, Kim, Yoon, & Choi, 2003	This study investigated the effect of a telephone delivered intervention on glycemic control and body mass index (BMI) in Korean type 2 diabetic patients. IV-telephone intervention DV-changes in A_1C, fasting blood glucose (FBG), 2 hour postprandial glucose, and BMI	Randomized Controlled Trial	A1C and BMI pre and post intervention	20 in the intervention group 18 in the control group	The findings from this study revealed that a telephone-delivered intervention could improve A1C but not BMI results.	This study used a very small sample size. Participants were from one ethnicity. From this total, 12 people did not complete the study, thus generalizing the study's findings to a larger population would be difficult. The phone calls were	Additional studies with a larger sample size are needed. The study also suggested that internet based systems be considered to possibly increase participants ability to complete the study. A1C levels decreased by 1.2% in the intervention group.	I

							conducted by a researcher. It was not clear as to whether the researcher was a nurse		
12	Piette, Weinberger, McPhee, Mah, Kraemer, & Crapo, 2000a	The purpose of this study was to evaluate the effects of an automated telephone assessment and self-care education calls with nurse follow-up. IV-Automated telephone assessment and self-care education DV-self care, glycemic control,sympt-oms	Randomized Control Study	Measured at 12 months: survey-reported self-care, glycemic control, and symptoms (hypo/hypergly-cemia)	280 English/ Spanish speaking adults Teleminder Model IV automated telephone messaging computer-health status was evaluated biweekly with 5-8 minutes assessments Each week, a nurse would prioritize call backs based on responses.	The results of this study suggest that automated telephone assessments and self-care education calls with nurse follow-up can improve patients' self care and glycemic control.	The study was conducted at a single site thus making generalizat-ion to a more diverse population potentially difficult. Many of the outcomes reported in the study were self-reported.	The results of this study suggest that automated telephone assessments and self-care education calls with nurse follow-up can improve patients' self care and glycemic control. Based on the findings, these improvements were achieved with an average of less than 6 minutes per month of nurse-patient contact.	I

13	Piette, Weinberger, & McPhee, 2000b	To evaluate the impact of an automated telephone disease management (ATDM) calls with a telephone nurse follow-up IV-ATDM with nurse telephone follow-up DV-Effects on depression, self-efficacy, days in bed, satisfaction, anxiety (HRQL)	Randomized Control Study	Automated telephone disease management (ATDM) with follow-up by a diabetes nurse educator 1. CES-D depression screener 2. Anxiety subscale 3. DQOL scale 4. Employee Health Care Value Survey 5. SF-36 subscales for general HRQL 6. # of days in bed 7. # of days cut down on activity d/t illness	248 adults English & Spanish *p*-values Cronbach Alpha *t*-tests χ^2 tests ANCOVA	At 12 months, patients in the intervention group reported improved self-care and fewer DM symptoms then the control group. ↓ A1C and serum blood glucose values	Generaliz-ing findings may be difficult Primary participants were from lower-socioecomic states One site with a singe nurse educator Secondary outcomes evaluated had the potential for occuring by chance.	Patients who received the ADTM and nurse telephone follow-up reported better self care, glycemic control, and few diabetic symptoms. An all encompassing study that emphasized how patient moods can be affected with diabetes. Patients reported increased satisfaction post intervention.	I

14	Piette, Weinberger, Kraemer, & McPhee, 2001	The purpose of this study was to evaluate the use of automated telephone disease management (ATDM) with a telephone nurse follow-up IV-ATDM DV-self-monitoring, A1C values	Randomized Control Study	Automated telephone disease management (ATDM) vs. telephone nurse follow-up	272 Veterans patients *p*-values Pre and Post intervention	At 12 mos. follow-up the intervention group had increased numbers of self-monitoring and foot care practices A1C values improved and fewer symptoms were reported.	The information communicat-ed in ATDM is not mentioned in the study Specifics of the information discussed by the nurse is limited to "established protocol." In order to develop a new follow-up process this information is needed.	Lack of self-care can lead to hospitalization and increased costs. The use of automated telephone messaging is an interesting idea that has been used in several studies.	I

15	Rhee, Slocum, Ziemer, Culler, Cook, El-Kebbi, Gallina, Barnes, & Phillips, 2005	This study analyzed the effects of adhering to appts. and medication adherence on A1C levels. IV- appointment & medication adherence DV- A1C levels	Retrospective Evaluation	Appointment record keeping and adherence to medication prescribed at last visit was tracked.	A large sample size of over 1500 urban, indigent, largely African American patients ANOVA Chi-Square Multivariable linear regression analysis *p*-value	This study demonstrated that improved A1C levels could be achieved with appointment adherence with over 12 months of monitoring. A1C levels decreased from 9.1% to 7.6% with 6-7 intervening visits versus increased to 9.7% with no visits.	The topic analyzed is one that has not been widely researched. Additional studies are needed in this area with a wider array of participants.	Increased medication adjustments can occur when appointments are kept regularly. Healthcare savings occur when conditions are followed on a regular basis	II

16	Walker, Shmukler, Ullman, Blanco, Schollan-Koliopoulus, and Cohen, 2011	To compare a telephone based intervention to a print intervention IV-telephone and print intervention DV- A1C values	Randomized Control Study A one year study of up to 10 calls. Phone calls were placed every 4-6 weeks. Calls were individualized but focused on adherence and lifestyle changes (nutrition and exercise)	A manual guided the telephone call content but participants were encouraged to choose topics for each call. Both the print and telephone group received self-management materials by mail after randomization	526 Spanish and English speaking participants Confidence interval Probability	A1C and medication adherence improved w/ a phone vs. a print intervention. A1C levels in the intervention group decreased 0.23% The control group A1C levels rose 0.13%	Participants were minority, middle-aged, and foreign born. The reliability of the mail in A1C testing cards was questioned in the study. Over 15% of the kits were not returned.	The goal of this study was to contact participants with at least ten phone calls in a twelve month period. A telephone intervention allows participants to be involved who may not normally be able to attend a meeting or discussion with a healthcare provider.	I

17	Wong, Mok, Chan, & Tsang, 2005	To compare the outcomes of diabetic patients receiving early discharge or routine care IV-early discharge vs. routine care DV- A1C values and hospital costs	Randomized Control Study	Clinical data sheet, self-care adherence (medication, exercise, blood glucose monitoring, and diet) assessment form, and a patient satisfaction questionnaire	101 patients from a regional hospital in Hong Kong	A diabetes nurse specialist called patients in the intervention group every 1-2 weeks until glycemic control was obtained. Data was collected at baseline, twelve, and twenty-four weeks post discharge.	Cultural and Geographic location of the study is one of the main limitations of this study.	This study indicated that a nurse-led early discharge program had better scores for glycemic control, adherence to blood sugar monitoring, and exercise. This study emphasized that the telephone is an effective way to reach people because in-home computer access may still be limited. With this type of program in place, a substantial cost savings could occur due to reduced hospital days.	I

Note: Level of Evidence Graded using Rosswurm & Larrabee (1999)

DNP Capstone Scholarly Project Results

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Abstract

The use of telephone follow-up is receiving increased attention in chronic disease management. Research has shown that ongoing reinforcement of diabetes self-management concepts immediately following education/training can impact overall glucose control. The purpose of this pilot study was to determine if increased telephone frequency immediately following DSME impacts improvements A1C values versus those who receive standard routine telephone follow (*N*=60). The control group (*n*=30) received routine follow-up (one telephone call 4-6 weeks after class). The intervention group (*n*=30) received intensive telephone follow-up consisting of 8 telephone calls. Based upon the evidence in the literature, it was decided that participants receive one call weekly for the first month then every other week for the second and third month following Diabetes Self-Management Education (DSME). There were no statistically significant differences between the intervention and control regarding A1C levels. A larger sample size over a longer duration of time is needed to evaluate if reductions in A1C results can occur with this evidence-based telephone follow-up intervention.

Keywords: type 2 diabetes, education, outpatient education, follow-up, telephone calls

Improving an Outpatient Diabetes Program Telephone Follow-up Process: Evaluating its Impact on Glycosylated Hemoglobin Levels

Introduction

Diabetes is a growing epidemic. There are 800,000 new cases diagnosed each year or 2,200 new cases per day (CDC, 2010). Currently there are approximately 94 million Americans affected by pre-diabetes and diabetes (CDC, 2011). Diabetes is listed as the seventh leading cause of death in the United States (CDC, 2011; National Conference of State Legislatures, 2010), and Kentucky ranks the 4th highest state in the nation for diabetes (Kentucky Diabetes Prevention and Control Program [KDPCP], 2011). In Kentucky alone, approximately 10% or 370,000 adults have diabetes, compared to 8.7% nationwide. Additionally, 233,000 people in Kentucky have pre-diabetes (CDC, 2012; Kentucky Diabetes Network, 2012) and another 100,000 undiagnosed cases are estimated throughout the state (KDPCP, 2011).

With the rate of diabetes continuing to grow, diabetes self-management education (DSME) has become an essential component to successful disease management (Grassia, 2013). Equally important is the ongoing support needed to implement disease specific recommendations for lifelong behavioral changes including healthy eating, exercise, and blood glucose monitoring. When the American Diabetes Association (ADA) and American Association of Diabetes Educators (AADE) most recently convened, they emphasized the use of support as an essential component in the National Standards for Diabetes Self-Management Education (DSME) revisions that are updated yearly (Grassia, 2013).

Background

In an effort to provide ongoing support, motivational interviewing (MI) has become the primary focus in chronic disease management (Welch, Rose, & Ernst, 2006). MI encourages

those with a chronic disease such as diabetes to perform their own self-assessments on what is most important or necessary for them to achieve. The healthcare provider (HCP) assumes the position as a facilitator helping the individual determine what is most important for them to change (Welch, Rose, & Ernst, 2006). When used within the DSME approach, careful listening, empowerment, and collaboration with one another ensue. The HCP can promote change by actively listening, discussing reasonable goals, and planning ways to help the individual overcome perceived or potential barriers (Heisler & Resnicow, 2008). Ongoing behavioral reinforcement through the use of MI can be implemented with increased telephone follow-up (Wu, Forbes, Griffiths, Milligan, & While, 2010). Based on the literature, individualized, ongoing reinforcement of teaching can improve A1C levels and minimize or delay the development of chronic conditions associated with diabetes such as retinopathy, nephropathy, and neuropathy (CDC, 2011).

Valetine (2000) and Mease (2000) analyzed the Diabetes Control and Complications Trial (DCCT) and United Kingdom Prospective Diabetes Study (UKPDS) and identified, from these studies, that a telephone follow-up intervention, after an intensive self-management class, led to individualized teaching and improved diabetes self-management outcomes. The principle benefit of a telephone follow-up intervention is the extended information and support provided by the healthcare professional. Behavioral reinforcement and potential adjustments in therapy, between office visits, can also be implemented (Wu, Forbes, Griffiths, Milligan, & While, 2010). When used by Diabetes Nurse Educators, a telephone follow-up intervention provides medical management, ongoing support, and education on diet, exercise, blood glucose monitoring, and medications (Boucher, Pronk, & Gehling 2000). A study of 35 participants found that monitoring progress between visits, reinforcing health behaviors, and identifying problems before they

worsened could also occur with telephone follow-up (Cinar et al., 2010). Piette et al. (2000b) found that an older population favored a more personalized verbal communication that a telephone could provide. After attending a comprehensive outpatient diabetes class and receiving extensive telephone follow-up, improvements in A1C values, increased use of primary and preventative services, and decrease use of acute, inpatient hospital services have been reported (ADA, 2013). Overall, better outcomes have been reported when follow-up support has been implemented beyond DSME.

Purpose Statement

The purpose of this pilot study was to determine if increased telephone frequency immediately following DSME impacts diabetes self-management success as evidenced by improvements in A1C values.

Research Questions

Question 1. After an outpatient DSME class, will participants who receive weekly follow-up phone calls for 1 month, followed by bi-weekly follow-up phone calls for 2 months, show a greater reduction in A1C level compared to a pre-class baseline level than those who received standard care?

Question 2. After an outpatient DSME class, will a greater percentage of participants who receive weekly follow-up phone calls for 1 month, followed by bi-weekly follow-up phone calls for 2 months, result in an A1C level below 7% as recommended by the American Diabetes Association than those receiving standard care?

Stakeholders

Several significant stakeholders would find benefit from an intervention that could decrease A1C results, minimize cost, and limit the risk of morbidity associated with diabetes

related complications. Individual views from healthcare consumers, purchasers, healthcare providers, staff members, and policy makers can assess quality indicators related to diabetes care to help determine best practice guidelines for people with diabetes (Markhorst, Martirosyan, Calsbeek, & Braspenning, 2012). According to the National Standards for Diabetes Self-Management Education and Support (2012), external input is essential in maintaining the quality of a DSME program. Individuals with diabetes, healthcare professionals and community interest groups, such as a local diabetes educator association, are ideal stakeholders that can provide input on programs such as a follow-up process that would best serve the community. They also provide ideas to improve DSME programs (Haas, et al., 2012). Additional input is often needed from key hospital stakeholders such as a Quality Director, Chief Nursing Officer, and the Coordinator for the Diabetes Program.

Theoretical Framework

This study was guided by the Theory of Caring by Kristen Swanson (1991), which focuses on the needs of individuals in a way that fosters dignity, respect, and empowerment. The Theory of Caring is based on five principles: *maintaining belief, knowing, being with, doing for, and enabling*. *Maintaining belief* is the foundation to the practice of caring (Swanson, 1993). The educator provides encouragement to individuals receiving a new diagnosis of diabetes to facilitate successful disease management after DSME. *Knowing* is considered the anchor that assists individuals to strive and understand events as they have meaning in one's life (Swanson, 1993). Telephone follow-up allows the educator to discuss one-on-one with the individual what areas of diabetes management they need clarification and concentration on. *Being with* demonstrates to the individual that the educator is emotionally present with them (Andershed & Olsson, 2009; Finley, 2012; Swanson, 1993). This principle of caring can occur in physical

absence which occurs in a telephone conversation (Swanson, 1991). *Doing for* occurs when the educator assists individuals in their health until they are physically and mentally ready to manage the condition (Andershed & Olsson, 2009). In this stage, the educator may demonstrate how to perform an insulin injection and may administer the first injection (Swanson, 1993; Walker et al., 2011). In the fifth principle, *enabling*, the educator assists individuals to make informed self-management decisions, explains, and offers alternatives favorable to the person. According to Meeto & Gopaul (2005), enabling is a form of empowerment that begins with information, education, and goal setting. Andershed and Olsson (2009) concluded that when individuals are shown how to self-manage their health and feel understood, informed, provided for, validated, and believed in, they are better prepared to adjust to new challenges (health conditions) in their lives. The Standards of Medical Care in Diabetes (2011) support the patient-centered care approach that the Theory of Caring promotes because it encourages individuals to make informed self-management choices with the education and guidance provided by the healthcare professional.

Study Methods

Norton Healthcare's (NHC's) Outpatient DSME class is based on the recommendations of the American Association of Diabetes Educators (AADE) and the 7 self-care behaviors (Table 1). These behaviors include: healthy eating, being active, taking medication, blood glucose monitoring, problem solving, healthy coping, and risk reduction (AADE, 2011). In order to effectively reinforce these concepts, a more extensive telephone follow-up process (ADA, 2011) and aspects of motivational interviewing (MI) were provided. This form of follow-up approach has previously been shown to improve self-management outcomes through reductions in A1C values (Heisler & Resnicow, 2008).

Human Subjects Protection. This study received NHC, Bellarmine University Institutional Review Board (IRB), and the University of Louisville IRB approval. While protected health information was accessed in the course of the study, no identifiable data were included with the reported results. Records were maintained on a password-protected file on NHC's computer server.

Design. A quasi-experimental design using a convenience sample was used to obtain the intervention group participants. Retrospective chart reviews were conducted to obtain participants for the control group.

Population. The target population was those who received formal Diabetes Self-Management Education (DSME) training at Norton Audubon Hospital's Outpatient Diabetes Education Program from weekly classes beginning on April 16, 2013 to June 11, 2013.

Procedure. Inclusion criteria for the control or intervention group required participants to: have a diagnosis of type 2 diabetes mellitus, be 18 years of age or older, have telephone access, and have attended a Norton Audubon Hospital Outpatient DSME class and referred to class by a healthcare provider who utilizes the same electronic medical record (EMR) system used throughout the NHC System so that laboratory results could be more easily obtained. Additionally, participants were included if they had an A1C greater than 6.5% drawn no more than four months prior to attending class, have participated in the follow-up process consisting for the control group of 1 telephone call within 4-6 weeks of attending class or intervention group consisting of 5 out of 8 telephone calls received over a 3 month period, be fluent in the English Language and have obtained a repeat A1C approximately twelve weeks after class. Individuals were excluded from either group if they had pre-diabetes or type 1 diabetes mellitus, an A1C less than 6.5% prior to class or a baseline A1C greater than 4 months old. Individuals

were excluded from the control group if they did not have an A1C repeated within 4 months post intervention. After individuals met the inclusion criteria and volunteered to be part of the study, the study intervention began the following week. At the time of consent, participants were also asked the most convenient time and phone number to use throughout the duration of the study.

At the end of each class, participants were given a sheet with nine pre-written goals and were instructed to choose one goal to focus on until follow-up; however, many participants selected more than one goal. After the goal(s) were determined, the participant and educator signed the goal sheet as a means of developing a contract. A copy of the signed goal sheet was given to each participant. Whether the participants were in the control or intervention group, they were reminded and encouraged to work on incorporating their chosen goal(s) throughout the follow-up period.

The control group received the current routine telephone follow-up of 1 telephone call within 4-6 weeks after DSME. The intervention group received a total of eight telephone calls over a twelve weeks immediately following DSME. They received a weekly call for one month following class, then every other week for the next two months.

Sample. A total of 60 adult male and female participants (30 control/30 intervention group) were selected via convenience sampling. The researcher's log of past class participants was used to screen for potential control group participants. In order to obtain the proposed 30 control participants that met the inclusion criteria, 135 charts were evaluated from weekly DSME classes from January 4, 2012 through April 9, 2013. All charts screened received an IRB approved "Complete Waiver of Authorization" Form placed in each Electronic Medical Record (EMR) by NHC's Health Information Management (HIM) Department. In order to evaluate whether individuals met the inclusion criteria for the intervention group prior to attending DSME, 102

charts were evaluated. A "Screening/Partial Wavier for Recruitment Purposes" Form was placed in each EMR by NHC's HIM Department. A total of 30 "Subject Informed Consent Document" Forms and "Authorization for Use and Disclosure of Your Health Information for Research" Forms were placed in the EMR's of each individual consenting to participant in the study. The 30 intervention group participants were obtained from weekly DSME classes over a two month period from Norton Audubon Hospital's Outpatient DSME classes.

Setting. The primary setting for this intervention was in-home telephone follow-up or telephone follow-up at a location convenient to the participant.

Instruments. The current evidence-based instrument used to facilitate telephone follow-up throughout the NHC's Outpatient Diabetes Programs was used. These questions (Table 2) are supported by the American Diabetes Association (ADA) Standards of Medical Care in Diabetes recommendations that are updated annually (ADA, 2013). The ADA strongly supports the use of these guidelines to help individuals maintain and achieve glycemic control (ADA, 2013).

A change in the glycosylated hemoglobin (A1C) level was the primary outcome measure for this study. An A1C goal of less than 7% was utilized when evaluating the effects of the proposed telephone intervention because it is currently the most commonly used outcome criterion in the literature (ADA, 2013). Research conducted by the ADA suggests that an A1C level of 7% (average glucose 154 mg/dl) minimizes the risk of developing long-term complications (ADA, 2013; Aubert et al., 1998; Johnson, 2010). A1C levels were compared in both groups within 3-4 months prior to DSME and within 3-4 months after telephone follow-up. A repeat A1C laboratory test was requested by the consenting participants to be obtained by their referring class provider within 3-4 months following class.

Data Analysis. Data were analyzed using PASW Statistics Grad Pack Base 17.0 (2009) version. Alpha was set a priori at .05. Sample characteristics were examined using descriptive statistics; frequencies and percents were reported for categorical variables and means and standard deviations were calculated for continuous variables. A1C levels at 3-4 months were subtracted from baseline A1C levels for a calculated gain score. Comparisons of A1C levels before and after DSME were compared by using an independent samples t-test. An independent samples t-test was also conducted to compare the mean gain score between the groups. Differences in the percentage of participants who achieved an A1C level below 7% at the 3-4 month follow-up were determined using a chi-square test for independence with Yates Continuity Correction (Table 6). The relationship between number of telephone calls received (as measured by # of total telephone calls) and A1C gain scores (as measured by Post-A1C-Pre-A1C) was investigated using Spearman Rank Order Correlation (rho) for non-parametric data analysis.

Results

Sample Characteristics. Comparison of sample characteristics between the control and intervention groups is presented in Table 3. No statistically significant differences between the groups were found with regard to gender, race, referring provider or age. Most of the participants were female, Caucasian, referred by NHC affiliated providers, and over 45 years of age, with the average age of participants equal to 56.7 years (*SD*=14.5).

Goal Setting. A Chi-Square test for independence was performed individually on each of the 9 goals (with Yates Continuity Correction). No statistically significant association between the control and intervention groups was found in the participants' selected goals (Table 4). The

two most popular goals chosen from both groups overall were meal planning (45%) and physical activity (32%).

Frequency of Telephone Calls. The total frequency of telephone calls was evaluated. All participants in the control group received usual care, one telephone call 4-6 weeks after class. In the intervention group, the goal was to have participants receive at least 5 out of 8 calls. The mean number of total telephone calls received by the intervention group was 4.5 (*SD*=1.96). Only 3 (10%) out of 30 participants from the intervention group received all 8 telephone calls over the twelve week intervention period. Five (17%) of the participants completed 6 telephone calls, 9 (30%) participants completed 5 telephone calls, 5 (17%) participants completed 4 telephone calls, 4 (13%) participants completed 3 telephone calls, 1 (3%) participant completed 2 telephone calls, 2 (7%) participants completed one telephone call, and only one (3%) participant did not complete any follow-up phone calls. If participants were not reached at the time of follow-up, a message was left requesting a callback at their convenience. When a follow-up letter was mailed with a self-addressed envelope to those receiving fewer than 3 telephone calls, no response was received. Thirteen of the participants in the intervention group (43%) received 4 or fewer calls while 17 (57%) of the intervention participants received between 5-8 calls.

Length of Telephone Calls. The average length of telephone follow-up for participants in the intervention group was 10 minutes *(SD*=6.1). The minimum number of minutes on a telephone call was 2 minutes with a maximum of 35 minutes. The variation in time was based on individual needs and participant questions. The length of telephone calls for the control group was not collected per usual protocol.

Outcome. The overall mean pre-A1C level for both groups was 8.7 (range =6.45 to 14.3, *SD*=1.7). The overall mean post A1C level for both groups was 7.2 (range= 5.2 to 13.6, *SD*=1.5).

Four post A1C's were not obtained from the intervention group by the end of the study period. There was no statistically significant difference in post A1Cs between the control group and intervention group (Table 5). No significant difference in mean gain score was found between the control group (*M*=-1.3, *SD*=1.6) and the intervention group (*M*=-1.7, *SD*=1.6; *t* (54) = -.77, *p*=.44, two-tailed). The magnitude of the differences in the means (mean difference=-.33, 95% confidence interval: -1.18 to .52) was very small (eta squared=.01) and statistically insignificant (*p*=.44) [Table 5]. No significant association between group classification and A1C reductions less than or greater than 7% was identified, χ^2 (1, *n*=56) =.04, *p*= .85 with a small effect (phi= -.06) [Table 6]. A small, negative, statistically insignificant correlation between telephone frequency and gain score resulted, *rho*= -.12, *n*=56, *p*=.40. This information demonstrated that increased telephone contact was associated with A1C reductions, although this correlation was not statistically significant.

Discussion

Findings from this study did not reveal a statistically significant difference in A1C levels based on increased telephone frequency after DSME compared with usual care. Likewise, there was no statistically significant difference in the number of those with an A1C goal of less than or equal to 7% after the intervention versus after usual care. Although there was a correlation between increased telephone calls and reduced A1C levels in the total sample, it was not statistically significant. A post-hoc correlation analysis between telephone frequency and gain scores demonstrated a small effect size. It is likely that a lack of statistical significance occurred due to the small sample size and small effect size that was found after conducting this analysis.

The non-significant results may be due to inadequate power (Pallant, 2010). This pilot study had a small sample size (*N*=60). With a larger sample size, a greater likelihood of a

statistically significant outcome would have occurred (Pallant, 2010). Post A1C reductions near to 7% did occur in both groups (Table 6) and by implementing increased contact after DSME, study participants received ongoing encouragement to continue self-care behaviors over a longer duration of time. In the studies reviewed, statistically significant reductions in post A1Cs below 1% from baseline measures occurred in studies with a larger sample size and longer study duration (Kim & Jeong, 2007; Kim & Oh, 2003; Malijanian et al., 2005; Wong et al., 2005). The majority of participants attending DSME were over the age of 45 which is considered a prevalent age of onset for Type 2 Diabetes (ADA, 2013). As this disease prevalence is more common in the aging population, where 10.9 million of the estimated 27 million adult Americans with type 2 diabetes are age 65 or older (CDC, 2011), have reduced mobility, limited transportation, inability to travel long distances, and multiple health conditions, successful DSME follow-up can be most accessibly obtained via the telephone (Genev et al., 1990).

The findings from this pilot study revealed a clinically significant outcome, in spite of the lack of statistical significance in data analyses. A1C reductions occurred in both groups near the American Diabetes Associations (ADAs) recommendation of 7% or below (Table 5). With this sample size and study duration, DSME appears to be influential in impacting reductions in A1C levels. Swanson's Theory of Caring was chosen as the theoretical framework for this pilot study to promote participants well-being and to empower them to better self-manage their diabetes (Swanson, 1993). Participants remarked how the telephone sessions helped to keep them motivated to continue with their self-management goals such as healthy eating, glucose monitoring, and adherence to preventative care measures such as daily foot care, routine eye exams and vaccinations. Future studies will evaluate participant satisfaction, qualitatively identify themes from the discussions, focus on certain groups such as those newly diagnosed,

particular ages, and medications prescribed (oral vs. insulin). Overall, A1C reductions in this pilot study were clinically significant because A1C levels decreased in both groups. The A1C reductions in both groups were similar thus indicating that a change in the current telephone follow-up process is not indicated at this time.

Several additional study limitations were also identified. This pilot study used convenience sampling. Selection bias was possible because groups were created using convenience sampling which can result in an atypical population and findings that may be difficult to evaluate and generalize to a broader population (Polit & Beck, 2008). The level of motivation participants have to manage their disease may be influenced by their willingness to participate in the study, their adoption of the recommended diabetes behavioral goal(s), and the number of telephone calls they received.

Only three participants or 10% out of the total 30 intervention participants completed the full frequency of telephone calls, making it difficult to justify the time spent and feasibility of making increased telephone calls. It was challenging to keep track of the telephone calls for each participant even though an electronic calendar was used to move participants as calls were made. With participants only receiving 5 out of the proposed 8 telephone calls, the feasibility to conduct these calls was clarified with this pilot study and other forms of follow-up may be more reasonable. The duration of the study was short (three months) with a non-diverse sample (primarily Caucasian). There were difficulties in obtaining post A1C results by the study conclusion due to varying provider appointments and participant appointment cancelations; thus, conclusions were made based on 56 out of 60 post-A1C's (control group n=30, intervention group n=26). Additional factors that may have impacted either the intervention or outcome that were not controlled in this study included whether a person had previous DSME, number of

years with type 2 diabetes diagnosis, other co-morbidities, age, socioeconomic status, and medication regimen.

Recommendations

In order to heighten the generalizability of the findings from this pilot study several implications were identified. A larger sample size or an alpha adjustment if using a small group size (Pallant, 2010), longer follow-up duration, a different follow-up tool, other forms of technology (email, text messaging, and specialty software such as automated telephone answering services) and a more varied population should be considered for future study.

Future study should control for socioeconomic status, employment status, education status, years of diabetes diagnosis, medication regimen (oral versus injectable), age and other co-morbidities that may influence A1C results (Johnson, 2010). Socioeconomic status was not evaluated in either group because all individuals referred for DSME at NHC have insurance. Insurance type is only used by the diabetes educator to determine what type of glucometer to provide. Additional research is needed to determine if insurance type, employment status, and level of education may impact a person's long-term compliance not only with the proposed intervention but with general diabetes self-management recommendations such as healthy eating, blood glucose monitoring, and daily physical activity.

Additional analysis of individual telephone calls and subjective responses could be used to identify additional themes. This would allow the opportunity to conduct a qualitative study. Anticipating that not all study participants would engage in all eight follow-up phone contacts, additional studies could evaluate the minimal number of calls needed to reduce A1C levels and if there is a correlation between the number of calls and the percent decrease in A1C levels. Other types of follow-up tools and goals could also be analyzed.

Future research in this area should also consider a more individualized approach to A1C goals, especially when working with high-risk populations such as children and the elderly that may experience frequent or severe hypoglycemic reactions and/or hypoglycemic unawareness (CADRE, 2013). It would also be beneficial to evaluate the influence that telephone follow-up has on reducing diabetes associated complications and hospital readmission rates.

The summer may be a more difficult time to reach participants for all eight proposed telephone calls. Future research is needed to conduct telephone follow-up at other times of the year to see if similar contact rates occur and to determine if reductions in A1C occur with no form of telephone follow-up. If an A1C is analyzed in future research, obtaining the post A1C and a grant to cover the cost associated with this laboratory draw will be part of the IRB process.

This evidence-based practice research helped to confirm that the current follow-up frequency used throughout the NHC Diabetes Outpatient Education Program is sufficient enough for most people. Several participants needed more extensive follow-up due to new diagnosis and/or new type of medication regimen. The diabetes educator can evaluate whether certain DSME participants need additional follow-up to support their diabetes self-management success (Wong et al., 2005).

Conclusion

Telephone support has been used to provide ongoing support for individuals with Type 2 diabetes to increase their knowledge and understanding of important self-care elements needed to successfully manage the disease (Blake, 2011). No statistically significant differences in A1C's resulted with increased telephone contact (8 telephone calls over a 12 week period) immediately following DSME, when compared to standard routine follow-up (1 telephone call within 4-6 weeks) after DSME. The work of Walker et al. (2011), however, highlighted that increased

follow-up improves communication between individuals and their healthcare team. Research studies that use telephone-based counseling, with or without face to face interaction, have demonstrated improvements in A1C values (Boucher, Pronk, & Gehling, 2000). Frequent, long-term telephone contacts are needed, however, to obtain the most benefit (Boucher et al., 2000).

When developing this evidence based research study, sustainability and practice relevance were key motivators to evaluate this process. Additional research, however, is needed to determine if increased telephone frequency has greater impact on certain diabetes specific situations such as individuals newly diagnosed with diabetes, individuals on insulin therapy, or those with certain diabetes related complications. The information obtained from this study can be used to evaluate future follow-up methods in NHC's Outpatient Diabetes Education Program.

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Table 1

7 Self-Care Behaviors

Behaviors	*Behavior Knowledge*
Being Active	Type, duration, intensity, safety precautions
Healthy Eating	Effects of food on blood glucose, sources of carbohydrate, meal plan, resources to assist in food choices
Taking Medication	Name, dose, frequency, medication action, side effects, toxicity, action for missed dose effect, storage, travel, safety, efficacy recognition.
Monitoring Blood Glucose	Testing schedule, target values, proper sharps disposal, interpretation of results, use of results
Problem Solving	Signs, symptoms, cause, treatment, guidelines, prevention strategies, sick day rules, safety concerns, driving operation equipment.
Reducing Risk	Standards of care, therapeutic goals, how to decrease risks (through preventive services).
Healthy Coping	Recognizing that everyone has problems, benefits of treatment, self-care

Note. Information adapted from The Art & Science of Diabetes Education: Supplementary Course Materials handout at http://www.diabeteseducator.org/export/sites/aade/_resources/pdf/core_concepts/Supplementary_Course_Materials.pdf

Table 2

Goal Sheet/Telephone Follow-up Form

NORTON HEALTHCARE

Diabetes Education Participant Goal Sheet

In the next 4-6 weeks I will do the following to help me with my diabetes:

Please choose only one:

- Follow my meal plan
- Lose 4-6 pounds in 4-6 weeks
- Check blood sugars ____ times a day
- Walk/bike/_____ for _____ minutes _____ days a week
- Bring log book and meter to appointments
- Keep a blood sugar and/or food diary
- Check feet daily
- Carry a quick-acting form of sugar such as _____
- Eat meals/snacks on time

To meet this goal I will: _____

_____

To help me with this goal I will use the following support system(s):

- ☐ Internet/Website
- ☐ Friends
- ☐ Family
- ☐ Diabetes educator
- ☐ Diabetes magazine/publication
- ☐ Physician
- ☐ Support group
- ☐ Other: _____

Educator signature:

_____

Date: _____

Patient signature:

_____

Date: _____

NORTON HEALTHCARE

Diabetes Education Participant Goal Sheet

Follow-up Assessment: _____
_____
_____
_____

Patient Goal Achievement:

All the time	Most of the time	Half the time	Occasionally	Never
5	4	3	2	1

- Pre-meal blood glucose 70-130 mg/dl:

Yes No Not Checking N/A

If not checking why: _____

- Post-meal blood glucose <180 mg/dl:

Yes No Not Checking N/A

If not checking why: _____

- Checking feet daily: Yes No N/A
- Annual eye exam: Yes No N/A

1st follow-up date: _____ By: Visit _____ Telephone _____ Letter _____

2nd follow-up date: _____ By: Visit _____ Telephone _____ Letter _____

Lost to follow-up: _____

Educator signature: _____ Date: _____

MR.CDE

Table 3

Sample Characteristics of Diabetes Class related Categorical Variables among Group Classifications (N=60)

Characteristic	Total	Control (n= 30)	Intervention (n= 30)	Chi-square Test χ^2(p-value)
Gender				.27 (.60)
Male	41.7% (25)	44.0% (11)	56.0% (14)	
Female	58.3% (35)	54.3% (19)	45.7% (16)	
Race				2.78 (.25)
Caucasian	81.7% (49)	86.7% (26)	76.7% (23)	
African American	16.7% (10)	10.0% (3)	23.3% (7)	
Hispanic	1.7 % (1)	3.3% (1)	0% (0)	
Referring Provider				5.02 (.08)
Norton Affiliated	91.7% (55)	90.0 % (27)	93.3% (28)	
Non-Norton Affiliated	3.3% (2)	0% (0)	6.7% (2)	
Affiliation Unknown	5.0% (3)	10.0% (3)	0% (0)	
Age				.36 (.55)
< 45	25% (15)	20.0% (6)	30.0% (28)	
≥ 45	75% (45)	80.0% (24)	70.0% (21)	

Note. Percentage (frequency) given.

Table 4

Comparison of Self-Management Goals Chosen Among Groups (N=60)

Goals Chosen Among the Groups	Total	Control (n= 30)	Intervention (n= 30)	Chi-square test $\chi 2$ (p-value)
Carrying Quick Acting Sugar	0.0% (0)			
Take Log Book to Appointments	6.7% (4)	50.0% (2)	50.0% (2)	*
Keep a BS/Food Diary Log	11.7% (7)	42.9% (3)	57.1% (4)	.00 (1.00)
Check Feet Daily	18.3% (11)	63.6% (7)	36.4% (4)	.45 (.51)
Eat Meals & Snacks on Time	25% (15)	53.3% (8)	46.7% (7)	.00 (1.00)
Check Blood Sugars	26.7% (16)	43.8% (7)	56.3% (9)	.09 (.77)
Lose Weight	30% (18)	50% (15)	50% (15)	*
Physical Activity	31.7% (19)	57.9% (11)	42.1% (8)	.31 (.58)
Follow Meal Plan	45% (27)	55.6% (15)	44.4% (12)	.27 (.60)

Note. Percentage (frequency). Totals are greater than 100% due to participants choosing multiple goals.

Note. * Chi-square test not evaluated due to equal percent between control and intervention groups.

Table 5

Comparison of A1C and Gain Scores between Groups (N = 60)

	Total	Control *n*=30	Intervention *n*=30	t-test t (*p*-value)
Pre A1C	8.7 (1.7)	8.6 (1.9)	8.9 (1.5)	.59 (.56)
Post A1C [a]	7.2 (1.5)	7.3 (1.7)	7.1 (1.1)	-.57 (.57)
Gain Score [b]	-1.5 (1.6)	-1.3 (1.6)	-1.7 (1.6)	-.77 (.44)

Note. [a] Four missing post A1C values in the intervention group.

Note. [b] Gain score equals the difference between the pre A1C and post A1C values.

Note. Mean (standard deviation) and t-test reported.

Table 6

Comparison of Post A1C <7% versus ≥ 7% Categorization between Groups

Post A1C	Total	Control	Intervention	Chi-square test
	N=60	*n*=30	*n*=30	χ^2 (*p*-value)
				.04 (.85)
<7%	32 (57.1%)	18 (60%)	14 (53.8%)	
≥7%	24 (42.9%)	12 (40%)	12 (46.2%)	

Note. Number (Percent).

Note. Four missing post A1C values in the intervention group.