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Evaluation of a Primary Care Based Diabetes Education Program

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Doctorate of Nursing Practice Inquiry Project Report

Evaluation of a Primary Care Based Diabetes Education Program

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Dedication

My DNP Practice Improvement Project is dedicated to the patients and employees of El Milagro Clinic in McAllen, Texas who introduced to me my future career in health care over fifteen years ago. My experience working there planted the seed to pursue an education that would simultaneously prepare me to provide direct patient care and create systemic change. This practice doctorate in nursing is the manifestation of that desire to function as both a policymaker and direct care provider. My hope is to be an advocate for the most vulnerable patients as they navigate the health care system. My motivation for this project has been my family, especially my husband Josh and my children Molly and Simon. I love them beyond measure and am grateful for their support, sacrifice, and encouragement on this three-year journey.

Acknowledgements

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Abstract

The improved management of diabetes is a critical clinical and economic challenge facing our healthcare system. Educating patients with diabetes to self-manage their disease is a vital component of diabetes care. The purpose of this DNP practice improvement project was to evaluate an innovative health care delivery method of individualized diabetes self-management education (DSME) in primary care. The approach combined individual DSME with a registered dietician and routine diabetes care with the primary care provider into one patient appointment. System data was reviewed to compare referral and attendance patterns of group and individual methods. Changes in clinical indicators of A1C, BMI, and blood pressure were evaluated in three DSME cohorts: individual, group, and none. Qualitative analysis including a focus group and provider survey were conducted to reveal facilitators and barriers to education.

Results favored higher referral and completion when education was offered as an individual appointment in the primary care office. System data analysis showed a twofold increase in referrals and a threefold increase in completion of education with the new method. One hundred and eighty-six charts were reviewed for clinical indicators of change. Each education cohort had a statistically significant reduction in A1C, but no significant differences were found between cohorts. No significant changes were found in BMI or blood pressure. Health care workers cited accessibility as the foremost factor affecting education completion. The increase in DSME completion with the individual method adds to the understanding of how health care system design can reduce barriers to diabetes education. Over time, this patient-centered design could improve the health of patients with diabetes and reduce costs spent on complications.

Evaluation of a Primary Care Based Diabetes Education Program

Introduction

Diabetes mellitus type 2 (DMT2) is a chronic disease that can result in multiple complications including loss of vision, limbs, kidney function, and life if poorly controlled. The current estimate of the prevalence of diabetes is 29.1 million Americans, or 9.3% of the population (ADA, 2015). In addition, 86 million Americans have prediabetes (ADA, 2015). In the United States diabetes is growing at an alarming rate. According to the American Diabetes Association (2015), if present trends continue one in three Americans will have diabetes by 2050. The prevalence of diabetes in Kentucky has surpassed the national rate as 13.4% of adult Kentuckians are living with the disease as of 2015 (Kentucky Cabinet for Health and Family Services, 2017). The improved management of diabetes is a critical clinical and economic challenge facing our healthcare system. Estimates show that 23% of total U.S. health care dollars are attributed to diabetes care. Of those dollars, 43% are spent on inpatient care, the most expensive care setting (ADA, 2013). Quality improvement efforts to improve diabetes outcomes and reduce costs include the patient centered medical home (PCMH) and diabetes self-management education (DSME). The purpose of this DNP practice improvement project is to evaluate a new method of individual DSME in primary care.

Background

One evidence-based strategy to improve diabetes management and prevent costly hospitalizations due to poor control is diabetes self- management education. Diabetes self-management education (DSME) is the process of facilitating the knowledge, skill, and ability necessary for diabetes self-care (Powers et al., 2015). Registered dieticians, nurses, and chronic

disease educators provide DSME in both individual and group educational settings. The American Diabetes Association advocates for DSME at first diagnosis, annually, with complications, and during care transitions (ADA, 2017). DSME includes patient centered training on medication management, blood glucose monitoring, nutrition, physical activity, coping strategies, and reducing complications (Powers et al., 2015).

Research has shown that patients who participated in DSME have demonstrated improved clinical outcomes, including lower hemoglobin A1C scores, lower self-reported weight, and reduced costs of care (Chomko, et al, 2016, Chrvala, et al., 2016, & Powers et al., 2015). This improvement in clinical outcomes has important implications for reduction in diabetes related morbidity and mortality. The relationship between higher A1C and increased risk of cardiovascular disease has been extensively researched. Seventy percent of 2,853 patients hospitalized for an acute myocardial infarction had A1C levels corresponding to diabetes or prediabetes (Arnold et al., 2014). Researchers have found that among older adults with diabetes there is an increased risk in mortality with A1C greater than 8% compared to A1C less than 6.5% (Palta et al., 2017).

Strong evidence supports utilizing DSME to improve clinical outcomes. Liu and authors (2014) showed a reduction in A1C of 1.2 percentage points after the completion of DSME group sessions by a group of 380 patients. Notably, the authors found that of 1000 referred patients, 170 were "no-shows", many completed one or two sessions, and only 380 completed three or four sessions of the four-session series (Liu et al., 2014). Finding the method of DSME that corresponds with the highest level of completion ensures that patients receive the full benefit of DSME. Determining the education delivery method that results in the best clinical outcomes while using the least amount of resources is a next step in DSME research.

Developing a format that is easily accessible for this growing population of patients is an essential question, as research shows that DSME is underutilized. Only 48% of Kentuckians report ever having had Diabetes Self-Management Education compared to a national rate of 51.3% (Kentucky Cabinet for Health and Family Services, 2017). Despite Medicare offering reimbursement for DSME since 2000, only 5% of eligible Medicare patients newly diagnosed with diabetes received self-management training in 2010 (Strawbridge et al., 2015). Reasons for the lack of completion include provider factors, patient factors, and systems factors. Providers and patients both cite the inconvenient hours of the education, cost for services, and transportation as barriers to patients completing DSME (Manard et al., 2016 & Janiszewski et al., 2015). In a Kentucky study, providers cited "lack of awareness," "difficult referral forms" and a belief that "patients weren't interested" as barriers to referral (Macy et al., 2014).

Sperl-Hillen and colleagues (2011) compared the effectiveness of group versus individual diabetes education in a randomized controlled trial. They found that the number of patients who completed all education was significantly greater (p=.005) with individual education as opposed to group education (Sperl-Hillen et al., 2011). Those receiving individual education were significantly more likely than those receiving group education to have an A1C less than 7% upon follow up at 6.8 months. This was despite the group education being for a total of eight hours compared to individual education of three hours. Finding the most accessible, efficient educational format for DSME is an important component of delivering quality, cost-effective, and comprehensive diabetes care.

The Institute for Health Care Improvement has identified that in the current health care economy, improvement efforts must reach for a Triple Aim goal (Beasley, 2009). Namely, that health care improvement initiatives should 1) improve the health of a defined population, 2)

enhance the patient experience of care, and 3) reduce or contain costs. This study will evaluate a change made to the diabetes education program at Norton Healthcare through the lens of the Triple Aim. The re-design of primary care services to incorporate a team-based medical home approach has been highlighted as one method to reach the Triple Aim (Beasley, 2009). Improved diabetes management is the result of a dynamic synthesis of efforts where the needs of the patients, the goals of the providers, and the confines of the health care system are all considered.

Norton Medical Group implemented a new approach to the delivery of diabetes education in June 2016. This was part of a quality improvement initiative to re-design primary care services and more fully implement the patient centered medical home model of care. The low group DSME attendance rate of 40% in 2014 indicated a need to change the delivery of diabetes education. Nursing leaders identified that the hospital campus location and group setting may have been barriers to patient completion of DSME (J. Singleton, personal communication, August 2, 2016). They decided to offer another option in addition to the group diabetes education. With the new DSME method, registered dieticians provide a single session of individualized diabetes education with patients in Norton primary care offices. These individual DSME sessions are 45 minutes in length and are scheduled as linked appointments prior to the patient's routine diabetes management appointment with their primary care provider. After the 45 minutes with the dietician, the patient then meets with their provider for their regular 15-minute appointment. The patient pays one co-pay which covers their portion of the cost of both visits as the provider can bill for the services provided by the registered dietician.

An essential component of evaluating this type of change in health care delivery includes assessing the attitudes, behaviors and experiences of health care workers who assist patients in accessing the education. Because the education is linked to the primary care appointment, the

perspective of the providers on the new model is essential. Provider referral behavior is impacted by the perceived facilitators and barriers to completion of DSME. The effectiveness, accessibility, and workflow impact of the new model are important to consider. Barriers experienced by patients are important to ascertain, but due to the retrospective nature of the study, the patient viewpoint was gathered by proxy through the providers.

This study will compare the clinical outcomes of A1C, BMI, and blood pressure of patients who received individual DSME, group DSME and no DSME in the primary care setting. Individual and group DSME referral and completion rates will be analyzed to determine the effect of method of DSME on completion. Since provider referral behavior affects the success of the program, this study will also evaluate the attitudes, facilitators and barriers to DSME perceived by health care workers at Norton Community Medical Associates.

There are three aims to this study. The first aim is to evaluate if the new method of DSME effects referral and completion rates. This aim will review system attendance and referral data. The second aim is to evaluate if there is a difference between groups in the amount of A1C, BMI, and blood pressure reduction after receiving no education, individual education, or group education. The second aim will use retrospective chart review. The third aim is to describe health care workers' attitudes and practices related to DSME referral and completion. The third aim will be achieved through a provider survey and health care worker focus group.

Methods

Design

This is a descriptive study that includes analysis of aggregate referral and attendance data, pre-post analysis retrospective chart review, a mixed methods provider survey, and healthcare worker focus group.

1) System Data Analysis

    a. Review of number of referrals to education by both methods

    b. Review of scheduled and completed education by both methods

2) Pre-Post Analysis Chart Review

    a. A1C, BMI, and BP from pre-and post-education office visits

        i. Individual

        ii. Group

        iii. None

    b. Collection of demographic data, date of education, and diabetes regimen

3) Primary Care Provider Survey

4) Health Care Workers Focus Group

All aspects of this study were approved by the University of Kentucky Institutional Review Board and the Norton Healthcare Office of Research Administration prior to implementation.

Setting, Sample and Recruitment Methods

System Data and Chart Review: This was a multiple site study that reviewed data documented as part of usual care for patients in 27 primary care and 4 endocrinology offices within Norton Medical Group encompassing Jefferson, Bullitt, and Oldham Counties in

Kentucky and Floyd County in Indiana. In October of 2017, there were 21,933 patients aged 18-75 who sought care for T2DM at a primary care, immediate care center, or endocrinology office of Norton Medical Group.

Provider Survey: Fifty-three primary care providers including physicians, nurse practitioners and physician assistants working in nine primary care offices covering a diverse patient population in Jefferson and Bullitt County, Kentucky were offered participation in the study. These nine offices were selected with assistance from the Ambulatory Care Management Department at Norton Medical Group.

Healthcare Workers Focus Group: Employees working in a primary care office in a semi-rural setting located 19 miles south of Louisville, Kentucky were the sample for the focus group. This office has nine providers including five physicians and three nurse practitioners. This office was chosen because the principal investigator had a clinical rotation there and it has 1646 patients with diabetes in its panel. The focus group took place during the regular lunch hour. All staff in the office were offered lunch and invited to participate.

Procedures

System Data To determine referral rates, Norton clinical information analysts worked with care management employees to run reports through the electronic medical record (EMR) system listing the number of patients referred to education of both methods. A true referral rate was not able to be calculated because the system was unable to collect the number of missed DSME referral opportunities.

The new individual DSME method started on June 1, 2016. It was decided to compare referral patterns six months after implementation to ensure that providers had adequate

awareness and experience with the individual option. Two spreadsheets listing all patients referred to each type of education was compiled for January 1, 2017 to May 31, 2017.

To determine completion rates, two spreadsheets with data from June 1, 2016 to May 31, 2017 were reviewed. One listed patients who were scheduled, patients who attended, and patients who failed to attend group classes. The second spreadsheet listed patients who scheduled, patients who failed to complete, and patients who completed individual education. Patients from the spreadsheet who were scheduled but failed to show up to the appointment were noted as "No Shows." Patients who canceled their appointment were included in the total number of patients scheduled. The electronic medical record does not capture the cause of cancellation and since some cancellations may be due a barrier of accessibility, cancellations and "No Shows" were combined into one group.

Chart Review Outcome of change in A1C, BMI, and blood pressure was assessed through a convenience sample of patients from over 28 primary care offices who had received individual education, group education, and those who had no documentation of having attended any education. A stratified sampling plan was done to match for age and gender within the three education cohorts from an initial dataset of 557 patients. The dataset was developed by clinical information analysts at Norton Healthcare in collaboration with care management employees. Charts provided were grouped by education received. Inclusion criteria included being over age 18, diagnosis of type 2 DM, A1C documented in the chart at a minimum of two data points, and no prior attendance at DSME classes. Exclusion criteria: patients with gestational diabetes, pregnant patients, patients with type 1 diabetes, patients who used an insulin pump, patients who had been hospitalized due to diabetes during the study period, patients under the age of 18, patients that had not completed an appointment for diabetes management in the past 12 months,

and non-English speaking patients. Patients who participated in both group and individual sessions of DSME were excluded from the study as it would be impossible to determine which education correlated with any change in results.

Variables including race, age, gender, ethnicity, type of provider, primary care office of origin, involvement of endocrinology in diabetes management, and type of diabetes management regimen were collected. Diabetes management regimen was categorized as use of no medications, oral medications, insulin, injectable agents or a combination of those categories. A1C, BMI, and blood pressure as recorded at two or three different data points were collected. The dates corresponding to each of those data points and when education occurred was collected.

Provider Survey The attitudes of primary care providers were assessed through the voluntary completion of a confidential paper survey. The survey contained 15 Likert style questions and four open ended questions. Providers were personally approached by the PI, given a cover letter of explanation, and asked to submit their completed surveys in a secured drop box at the front desk. The drop box was picked up two days post distribution. Demographic data was not collected on the provider survey to encourage unbiased responses.

Healthcare Workers Focus Group Informed consent was obtained from all participants, who were given four open ended questions to prompt the discussion. The PI led a focused discussion of the facilitators and barriers perceived to patient completion of DSME. These four questions were the same open-ended questions included on the provider survey. An independent third party served as a dedicated research scribe taking notes on the conversation.

Data Analysis

System Data The show rate was calculated by dividing the number of patients who attended education by the number of patients who were scheduled for each type of education. Patients who left without being seen or completed one day out of a two-day session were counted as not being in attendance.

Chart Review Statistical analysis including descriptive statistics, paired T test and ANOVA were run in IBM SPSS version 24. Paired T test was performed to analyze the change in A1C, BMI and blood pressure values through a least squared means analysis. ANOVA was performed for mean A1C at baseline and number of days elapsed between values collected for all three groups.

Provider Survey The 15 Likert style questions had five categories of Strongly Disagree, Disagree, Agree, Strongly Agree and Unknown that were collapsed into three categories. Frequency distributions were run in IBM SPSS version 24 to determine the percentage of providers that agreed, disagreed or did not know the answer to each question. Open ended responses were reviewed by the principal investigator and validated by an independent third party for categorical themes.

Healthcare Workers Focus Group The principal investigator and research scribe reviewed the hand-written notes from the discussion together directly after the discussion for consistency. The principal investigator transcribed the notes into a word document. The content of the notes from the focus group and the open-ended question responses were analyzed and synthesized for emerging categorical themes. An independent third party experienced in qualitative methods reviewed the analysis for validity.

Results

Sample

System Data There were 830 patients who were scheduled for a Type 2 Diabetes Education Group class between June 1, 2016 and May 31, 2017. Of these 220 completed the education. There were 1,138 patients scheduled for individual education between June 1, 2016 and May 31, 2017. Of those, 894 completed the education and 244 cancelled or failed to show up for the appointment. Between January 1, 2017 and May 31, 2017 there were 954 referrals to individual education and 405 referrals to group education.

Chart Review Norton Clinical Analytics office provided an initial dataset of 557 patient charts, 90 who had received individual education, 209 who had received group education, and 258 who had no education. Patients were stratified by age and gender within each educational intervention. Random sampling was done within the stratified sample to meet the targets of 12 males and 12 females in three age categories: under 50, 51-65 and over 66. Exclusion criteria were applied within the stratified sample. Final group sizes were individual n= 67, group n=54, and none n= 65.

Provider Survey Twenty-six of 53 possible primary care providers completed confidential surveys for a response rate of 49%. No demographic data was collected to protect provider confidentiality.

Healthcare Worker Focus Group Nine out of 25 possible participants were in the focused discussion. The sample included three licensed practical nurses, two nurse practitioners, one registered nurse, one scheduler, one office manager and one medical assistant.

Procedures

      System Data The number of patients that attended each type of education method was tabulated based on spreadsheets compiled from attendance reports in the EMR. This number was divided by the total scheduled for that education method to determine the percent show rate. This method combines no shows and cancels into one category, as the EMR does not capture the reason for the cancellation. The number of referrals from January 1, 2017 to May 31, 2017 was compared for both individual and group education.

      Chart Review Individual charts from the identified sample were reviewed for inclusion criteria and at least two data points with A1C, BMI, and BP documented within the time frame. The values of the clinical indicators, dates of documentation of those indicators, date of education, and demographic variables were abstracted from the chart into the data collection tool. The diabetes regimen was determined by reviewing the medication list for any anti-diabetic agent prescribed to the patient between the dates of the two recorded data points.

      Provider Survey Surveys were distributed in the nine offices in August and September of 2017 on the days when the registered dieticians were normally visiting each respective clinic. In two of the nine offices, the manager assisted with distribution of surveys by leaving them on the providers' desks. One office had no completed surveys left in the lock box.

      Healthcare Worker Focus Group The following questions prompted the focus group discussion and open response questions on the provider survey: What factors make it more likely for you to refer patients to DSME? What factors make it less likely for you to refer patients to DSME? Do you tend to refer patients to individual DSME, or group DSME? Why? What factors

do you find within the office that affect the scheduling and completion of DSME? In your experience, what factors affect whether patients agree to and complete DSME?

Data Analysis

System Data The change in design of DSME appeared to affect the number of referrals and increase the likelihood that patients completed their education. See Table 1 for a summary of attendance results. Between June 1, 2016 and May 31, 2017, 78.5% (894 out of 1138 scheduled) of all patients scheduled for an individual session completed their education compared to 26.5% (220 out of 830) of all patients scheduled for a group session. Patients were three times more likely to complete the education when it was offered as a 45-minute linked appointment in their primary care office instead of the group class over one or two days lasting six hours total taught on a hospital campus.

From January 1, 2017 to May 31, 2017 there were 405 referrals for group education compared to 954 referrals for individual education, or 2.35 times as many individual referrals compared to group referrals. This six-month analysis suggests providers were more likely to refer to DSME in the individualized linked appointment method.

Chart Review Descriptive statistics were computed in SPSS to determine demographic data. (See Table 2). Mean age of participants was 58.61 years old. Patients with A1C less than or equal to 7 were removed from the analysis. This was because clinically, at an A1C of 7% there is little room for improvement in glycemic control. Additionally, systematic review has found that the effect of DSME is greater on those with poor glycemic control (Pillay et al., 2015). Paired T test analysis done in SPSS version 24 showed that within groups, each had a significant reduction in mean A1C between Time 1 and Time 2. Individual (n=54) went from a

mean A1C of 9.63% to 8.19% for a reduction of 1.43% (p<.0001). Group (n=33) went from a

mean A1C of 8.98% to 7.8% for a reduction of 1.18% (p=.0004). None (n=56) went from a

mean A1C of 9.24% to 7.96% for a reduction of 1.28% (p<.0001). The analysis found no

significant differences between groups in the amount of A1C reduction. There were no

significant reductions within or between groups for mean BMI or blood pressure. (See Table 4.)

Provider Survey Results from the 15 Likert questions on the provider survey were

imported into SPSS to determine frequencies of responses. (See Table 5.) Consistent themes

include that providers believe referral to formal DSME is needed due to inadequate time or

resources to cover diabetes self-management in a typical 20-minute office visit (88.9%).

Providers (77.8%) believe that patients prefer individual education. In terms of A1C

improvement, 81.5% of providers reported seeing this after individual education compared to

51.8% with group education. The ease of accessing education was reported to be higher for

individual (59.2%) than group (37%). Since the introduction of the linked appointment model,

59.2% of providers perceive that this has reduced the number of "no shows" and cancellations of

both education and diabetes management appointments. Only 11.1% of the providers surveyed

agreed that the linked appointment model negatively impacts office workflow. Qualitative

analysis combined the open response items of the provider survey and the focus group discussion

comments, as both methods used the same prompting questions.

Healthcare Worker Focus Group

Qualitative analysis enabled a more in depth understanding of the barriers and facilitators

to DSME completion as perceived by health care workers. Content was reviewed and

thematically grouped into six categories: Accessibility (40.5%), Time (30%), Patient Motivation

(23%), Clinical Factors (20.7%), Location (13%) and Cost (9%). The inter-relationship between

provider, system, and patient factors and the response themes are depicted in Diagram 1.

Frequency of response was assigned a percentage based on the total number of participant

responses: survey (20) and focus group (9). Key quotes by category are noted in Table 6.

Discussion

This study demonstrated that health care systems can increase DSME completion through

a more patient-centered design. Patients were three times more likely to complete diabetes

education when it was offered via the new method of a linked individual 45-minute appointment

in the primary care office. Providers referred twice as many patients to the individual education,

and the qualitative analysis added in depth understanding of the factors perceived to effect

completion of DSME. Statistical analysis showed that there was a significant decrease in A1C

for all patient groups, with individual education showing the highest mean reduction of A1C

(1.43%). However, the between groups comparison of the amount of A1C reduction did not

show significant differences. Therefore, the sample in this study was not able to demonstrate

that individual education resulted in a more significant A1C reduction than group education.

The decrease in A1C in the group that received no education was a surprising finding.

The no education cohort continued to have their diabetes managed, but failed to complete

recommended education. Unknown and confounding variables that were not controlled for in

this study such as the time since diagnosis and differing medication regimen may explain this

result. The effect of education is difficult to isolate from other components of diabetes

management in a retrospective review. It is important to note that both group and individual

participants in this study received a single DSME session. The literature shows somewhat mixed

results for A1C reduction with single DSME sessions. Systematic review found that significant

A1C reduction occurs with programs that combine multiple encounters of more than 10 contact hours (Pillay et al, 2015).

Understanding the sustained effect of education has been identified as a gap in the literature. Pillay and colleagues (2015) noted that only eight of 112 trials examined A1C outcomes more than six months post DSME intervention. Therefore, the effect of DSME needs to be studied over longer periods of time and appears to be moderated by the intensity of the "dose".

The significant effect of DSME on A1C reduction occurs primarily in the subgroup of the population with A1C greater than 7% at baseline (Pillay et al., 2015 & Duke et al., 2009). Ackroyd & Wexler (2014) performed meta-analysis of 60 quality improvement initiatives and found a reduction of 0.57% in A1C in those that promoted diabetes self-management. The effect was noted to be greater in those with baseline A1C greater than 8% and less in those with baseline A1C less than 8%. This study sample replicated the results reported in two meta-analyses that showed DSME had minimal effect on blood pressure or BMI reduction (Duke et al., 2009 & Ackroyd & Wexler, 2014).

Limitations

There were several limitations to this study. The time since diagnosis of diabetes for each patient was not collected, therefore there is no way to know if this was a comparison of newly diagnosed patients or those experienced with self-management. Another limitation was the small sample size and differences between groups in mean A1C at baseline. At baseline, mean A1C for individual was 9.1% (n=66), group was 7.9% (n=55), and none was 8.9% (n=65). ANOVA and post hoc analysis showed that the individual cohort had a 1.15% higher mean A1C

at baseline which differed significantly than the group cohort mean A1C (p=.002). To control

for this difference, all those with A1C less than 7 were removed in the paired T test analysis.

This resulted in mean A1C of 9.63% for individual (n=54), 8.98% for group (n= 33), and 9.23%

for none (n=56). With this adjustment, the group cohort had over 20 fewer patients than the

other cohorts which limited the between groups comparison.

The difference in baseline A1C mean could suggest that patients with higher A1C are

more likely to complete individual education than group education, but that conclusion may be

dependent upon the inter-relationship between clinical factors and provider referral behavior.

This is supported by the survey comment of one provider that stated, "I send all patients to group

class once and those with A1C greater than 9 to individual." Further research could attempt to

specify the characteristics of those who complete DSME of each type, which was not a primary

aim of this study.

The diabetes regimen of each patient was collected, but any medication adjustment made

between A1C draws was not captured which is a significant limitation in the between groups

comparison. Additionally, the number of days that elapsed between when lab values were drawn

was not consistent. The no education cohort had significantly more time pass between the dates

of A1C collection, 71 more days than individual and 60 more days than group (p=.000). This

discrepancy in the number of days is an important limitation because A1C values reflect the level

of glycemia during the previous 56 to 84 days, depending on the lifespan of circulating

erythrocytes (Gore & McGuire, 2016). The confounding variable of time whether since

education, diagnosis, or last drawn A1C was hard to control for since this was a natural

experiment and not a randomized clinical trial. Isolating the effect of education is difficult when

so many variables can affect glycemic control. It is also important to note that a presumption of

this study is that knowledge acquired through DSME corresponds to change in self-management behavior, as measured by A1C reduction. The outcome of patient knowledge of diabetes after DSME should be evaluated independently from A1C reduction by future researchers. Knowledge gained by the patient does not always translate to behavior change.

This project evaluated patients from across a health care system who originated from 28 different primary care offices. The variability in provider practice is a limitation not controlled for in the study. In addition, provider perspective was assessed based on 26 providers working in nine different offices, and may not be a true representation of the diversity of provider viewpoints. The high response rate of 49% for the provider survey implies that this is a topic of interest to them. Some providers may have been biased towards individual education because the researcher distributed the survey on the days when individual DSME occurred in the office. The fact that office managers in two offices assisted in survey distribution by placing them on providers' desks may have elevated the survey response rate.

Practice Implications

Viewing the overall results of this study through the lens of the Triple Aim, this new model of primary care based diabetes education shows promise. The Triple Aim measurements for quality improvement in health care include improved patient experience, improved population health, and reduced costs of care. With three times as many patients completing individual education, it appears that this model enhances the patient experience of care based on attendance. Increased completion of DSME in the new design is significant because DSME underutilization has been well documented in the literature (Torres et al., 2015 & Strawbridge et al., 2015). The patient perspective was gathered by proxy based on attendance, focus group, and provider survey. Future research should directly explore patient satisfaction with the new

method of DSME and identify explicit barriers to completion through direct patient interviews. This would ensure a more comprehensive assessment of the patient perspective.

In terms of improved population health, the sample in this study did not demonstrate that either educational method reduced A1C more than no education. Changes in physiological measures due to improved diabetes self-management may take more time to capture. In addition, repeated sessions of DSME may be necessary for patients to gain the full benefit (Chrvala, et al., 2016). Many of the limitations in the chart review analysis can be attributed to the retrospective review design. The evidence supporting DSME has been well established by other researchers and it is a recommended standard of care. The Institute for Clinical Systems Improvement clinical practice guideline for the diagnosis and management of T2DM in adults found high quality evidence and made a strong recommendation for offering DSME by qualified health care professionals (Redmon et al., 2014). The contribution of this study lies more in understanding how a change in education delivery method can improve completion, rather than furthering the already established evidence that DSME reduces A1C.

From a population perspective, this systems level health care delivery design intervention will require greater utilization and expansion to fully observe its effects. Only 6.4% or 1,411 of 22,119 of adult primary care patients with T2DM have received education in the new individual model to date (M. Barriger, personal communication November 7, 2017). Future research should investigate any correlation between DSME and improvement in multiple diabetes related outcomes. Brunisholz and authors found that patients who had received DSME were more likely to also achieve all five components of a diabetes bundle which included retinal eye exam, nephropathy screening, blood pressure, cholesterol, and A1C control (2014).

From an economic perspective, the individual method needs assessment for both cost-effectiveness and revenue generation. The linked appointment individual method of DSME is consistent with the team based approach of the patient-centered medical home (PCMH) model of care. The cost effectiveness of both DSME and PCMH interventions have been estimated in the literature through both real financial data review and predictive modeling.

Duncan and authors (2011) reviewed financial data in longitudinal cohorts comparing those who received DSME and usual care (2011). They found that in commercially insured patients, the cost per member per month rose $154.65 in those with no DSME compared to $48.79 with those who received DSME from 2005-2007 (Duncan et al., 2011). While patients who received DSME had initial higher costs, the rate of cost increase was lower after two years for the educated cohort. Analysis showed that the DSME cohort had higher spending on outpatient and primary care visits, and the no DSME cohort incurred more costs through inpatient care. With diabetes, savings come from cost avoidance due to reduced complications from uncontrolled disease, such as nephropathy, amputation, and blindness. These complications emerge after a lifetime of poor control. Justifying the upfront cost can be hard for a health care organization that needs to show a quick return on investment. However, estimates of long term gains in both cost reduction and improved diabetes outcomes show promise.

Pagan and Carlson used an Archimedes model of disease progression and health care utilization to simulate the health and cost outcomes for patients with poorly controlled diabetes (A1C > 9%) after twenty years treated in the PCMH model and standard care (2013). The model assumed that PCMH intervention could reduce A1C to less than 9% in 49% of the patient dataset n=1961. The upfront costs for the PCMH model were based on the Centers for Medicare and Medicaid Services, $20 per beneficiary per month care management payment. The reduction in

costs due to decreased rates of death, myocardial infarction, bilateral blindness, and foot amputation in the PCMH simulation group led the authors to conclude that the PCMH model is a cost-effective way to reduce complications in diabetes. Costs were saved over time after the initial investment in self-management for those aged 50-64 years old (Pagan & Carlson, 2013).

In terms of return on investment, the threefold improvement in completion rate in this project equates to an increase in billable services. While there is an increased capacity for attendance in the group class, this is irrelevant if patients do not attend. Reimbursement for services in the new model must be evaluated to understand the return on investment. Appendix A estimates the revenue generated from group and individual methods based on attendance rates during the study period. Revenue generated in the group method is based on reimbursement of $103 per patient. With the linked appointment method, the 45-minute DSME session cost is included in the providers charge capture, which elevates the visit level and reimbursement. Assuming a typical diabetes management visit is a level 3, the services of the dietician added into the visit could advance the visit to a level 4 or level 5. With 674 more patients completing individual education this produces an estimated increase between $6,705.32 and $38,531.72 (See Appendix A). Actual provider billing practices and level assignment may vary.

Implications for practice include expanding the accessibility of the individual appointments by adding to the team of registered dieticians in the primary care offices. See Appendix B for a cost benefit analysis. This may decrease the six to nine-month delay in obtaining an appointment which is frustrating for providers and patients. Both the increased completion rate and provider survey responses demonstrate a clear preference for the linked appointment model. If there is great demand for this method of education, then increasing the supply is an organizational move that should satisfy both patients and providers. The focus

group and provider survey offer an expanded glimpse into the practical implementation of this program change that care management directors should review when planning future programs. Since accessibility was a chief barrier, administrators may consider offering extended hours or shared medical appointments in the primary care offices to expand capacity without adding personnel. Future researchers should determine which component of the new method contributed the most to the increased completion rate: individual care, convenient primary care location, or reduced duration.

Discovering any synergistic effect that individual DSME has on the overall quality of diabetes care is an important next step in research. Future efforts should track any correlation between individual DSME sessions and all components of the Healthcare Effectiveness Data and Information Set criteria for diabetes. This set of diabetes quality metrics includes the following components: retinal eye exam, A1C less than 8%, blood pressure less than 140/90, LDL less than 100 mg/dL, and screening for nephropathy or prescription of recommended blood pressure medications for kidney protection (Brunisholz et al., 2014).

Conclusion

The chart review investigation was too broad in its scope and was not as specific as it needed to be to isolate the effect of education among confounding variables. However, when combined with the analysis of patient attendance and provider attitudes, this project offers an insightful initial evaluation of a new approach to the delivery of diabetes education in the primary care setting. The threefold increase in completion rate shows that a health care delivery method that is patient-centered by design can improve the completion of recommended education. The positive response rate (49%) of providers surveyed suggests a high level of engagement with offering this new method to improve diabetes outcomes.

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As the health care economy becomes more consumer driven, improving the patient experience of care is an important first step that may lead to enhanced quality outcomes and controlled costs long term. Future evaluation must incorporate the effect of improved compliance with recommended education on clinical outcomes and overall health care spending on patients with diabetes in this model. Improving the health of patients with diabetes while achieving the Triple Aim remains a challenge for nursing leaders, however with thoughtful system design and inter-disciplinary collaboration progress can be made.

Table 1 Attendance Summary

Time Frame	Type	Location	# patients scheduled	# patients completed	% show rate
Jan 1-May 31 2016	Group	Four Hospital Campuses	387	126	24.6%
June 1 2016-May 31 2017	Group	Four Hospital Campuses	830	220	26.5%
June 1 2016-May 31 2017	Individual Linked Appointment	Primary Care offices	1138	894	78.5%

Table 2 Characteristics of Study Sample

Subject Characteristics			N
Gender	Female	51.6%	96
	Male	48.4%	90
Age	58.61		
	Under 35	3.2%	6
	35-50	26.7%	50
	51-65	36.9%	69
	66-80	28.3%	53
	80 +	4.3%	8
Race	White	73.7%	137
	African-American	22%	41
	Latino	2%	4
	Asian	0.5%	1
	Other	1.1%	2

Table 3 Diabetes Regimen of Study Sample

Diabetes Regimen	N= 186	% of total
Insulin Only	12	6.1%
No medications	9	4.6%
Oral Medications	98	50%
Insulin + Oral	44	22.4%
Use of Injectable	33	17.7%

Table 4 Changes in Physiological Measures by Education Group

Clinical Indicator (mean)	Group	N=	Time 1	Time 2	Change	p
A1c	Individual	54	9.63%	8.19%	↓1.43%	<.0001
	Group	33	8.98%	7.8%	↓1.18%	.0004
	None	56	9.24%	7.96%	↓1.28%	<.0001
BMI	Individual	53	36.22%	35.63%	↓1%	.26
	Group	29	36.18%	34.93%	↓1%	.43
	None	56	35.83%	35.38%	↓1.6%	.09
SBP	Individual	51	130.88	131.43	↑ 1.6 mmHg	.56
	Group	29	128.71	128.48	↓ 1 mmHg	.78
	None	51	130.57	131.21	↑ 0.04 mmHg	.99
DBP	Individual	51	72.92	74.25	↑ 1.35 mmHg	.45
	Group	29	77.03	77.48	↑ 0.45 mmHg	.85
	None	50	79.63	78.98	↓ 1.2 mmHg	.51

Diagram 1

Barriers and Facilitators to Diabetes Self Management Education
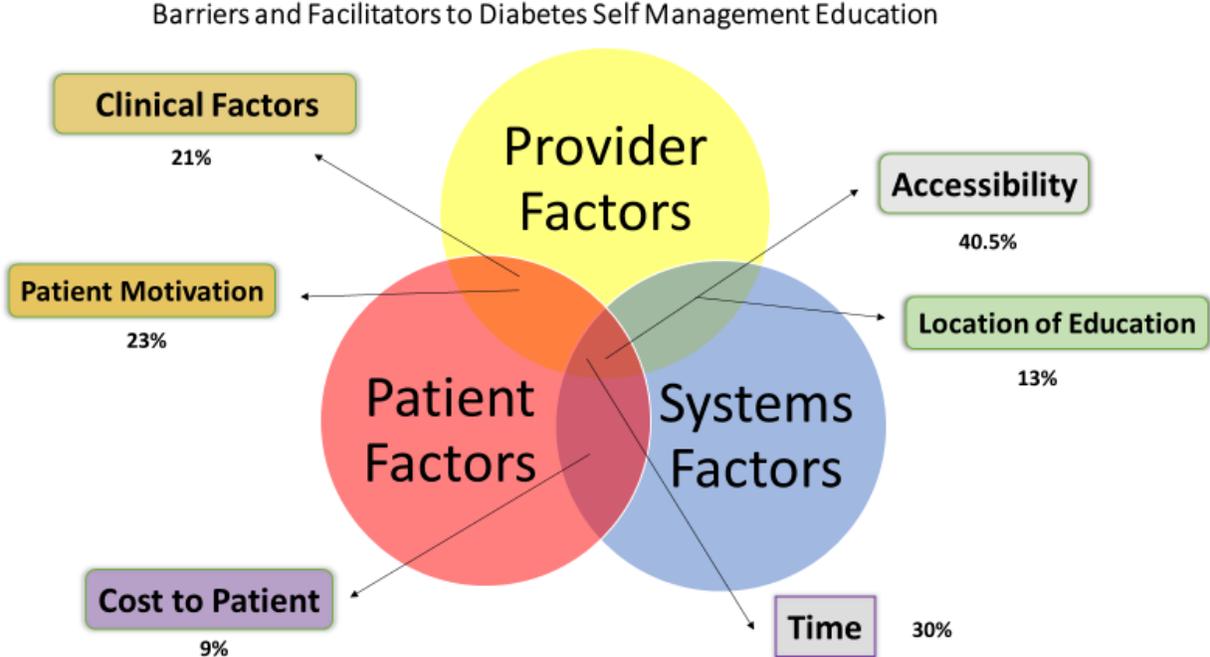
Appendix A Revenue Estimate Individual Versus Group

Method of DSME	Patient Co-Pay +	Reimbursement	# patients completed	= revenue
Group	variable	$103	X 220	$22,600
Individual L4	N/A***	+ $32.78*	X 894	$29,305.32
Individual L5	N/A***	+ $68.38**	X 894	$61,131.72

Routine diabetes management appointment assumed to be coded as E & M Level 3 $68.91

*$32.78 based on moving from Level 3 $68.91 to Level 4 $101.69

**$68.38 is based on moving from Level 3 $68.91 to Level 5 $137.29

(Centers for Medicare and Medicaid Services, 2017)

***Patient is coming for their routine appointment with DSME. No additional co-pay collected.

Table 5 Provider Survey Results Bolded items are reverse scored	Agree	Disagree	Don't Know
1) It is **easy** for my patients to get an individual appointment for DSME with the RD who comes to our office.	59.2%	25.9%	11.1%
2) It is **easy** for my patients to access a group DSME class through Norton.	37%	40.7%	18.5%
3) Having the DSME occur in our office has increased the number of patients that I refer to diabetes education.	11.1%	81.4%	3.7%
4) Having the DSME occur in our office on the same day as the patient's regular diabetes appointment reduces the rate of "no shows" and cancellations of both medical appointments and diabetes education.	59.2%	22.2%	14.8%
5) Most of my patients prefer individual DSME.	77.8%	3.7%	14.8%
6) Most of my patients prefer group DSME.	0%	74%	22.2%
7) Most of my patients are not interested in DSME and are unlikely to come regardless of location or method.	22.2%	62.9%	7.4%
8) I routinely refer my patients to DSME through Norton.	85.1%	11.1%	0%
9) It is not necessary to refer patients to formal DSME because the information is covered by myself or other staff members in my office.	3.7%	88.9%	0%
10) Norton has sufficient resources and support to educate patients on diabetes management.	48.1%	44.4%	3.7%
11) I have seen clinical improvements in A1C of my patients who have had individual DSME.	81.5%	3.7%	11.1%
12) I have seen clinical improvements in A1C of patients who have had group DSME.	51.8%	14.8%	29.6%
13) My office staff and I were made aware of how to refer after the changes made to the Diabetes Education program in 2016.	81.5%	11.1%	0%
14) I know the days of the month when the RD comes to our office for individual appointments.	40.7%	55.5%	0%
15) Having the appointments with the RD linked to my appointment as the provider has negatively impacted office work flow.	11.1%	85.2%	0%

Table 6 Key Quotes from Providers and Health Care Workers						
	Accessibility	Time	Patient Motivation	Clinical Factors	Location	Cost
Provider Survey Responses n=20	"The new model requires coordination of three schedules, the providers, the patients, and the dieticians." "RD needs to be in the office daily when patients are present, not once or twice a week."	"I've heard that people in groups tend to be less engaged esp b/c the classes last so long."	"It is not me, it is the patient who will not go to the appointment."	"All my DM patients at least one time go to group education. Poorly controlled and those which need more assistance go to individual, >_9.0"	"I refer to individual – convenience for patient to come to this office. My experience is that pts no show very frequently for group classes at other locations. I like being able to consult with RD at my office"	"They are more likely to agree and complete DSME if they have the time to attend, are motivated to control their diabetes, covered by insurance"
Focus Group n=9	Scheduler: "There is a delay of in office education of up to 6 to 9 months, this makes the doctors upset that it takes so long to get their patients educated"	Office manager: "If they have to take a whole day off work for their education in a group class, they are more upset than if they can just miss a few hours and combine it with their regular appointment."	APRN 2: "Motivation is a key factor. I don't know if the dietician is effective, most don't show. A lot of the patients that work don't want to spend the time. Patients say they already know everything."	APRN 1: "If a patient is resistant to adding insulin and they say they will change their diet- I say you need to see a dietician to get the tools you need to do that."	LPN: "Patients don't want to drive downtown, they respond better if they don't have to drive that far."	RN: "One of the big barriers is a problem with prior authorization for group education. Patients can get a big bill for a group class and there can be a long hold trying to get a PA."

Appendix B Revenue/Expense Comparison of Expanding DSME in Primary Care					
Expenses					Total
Salary for RN/RD/CDE-add 2 more FTEs					
	$/hr	80 hr x 26 pay periods	Benefits 30%	Salary + Benefits	Total Annual Increased Costs X 2 FTE
RD/CDE (2 FTE)	$27	$56,160	$16,848.00	$73,008	$146,016
American Diabetes Association Accreditation (multi-site good for four year)					$1100
					-$147,116
Revenue					
PCP coding Level	Medicare Reimbursement	Increase per patient charge*	Productivity Estimate		Increase Net Revenue
L3	$68.91		5 pts per day, 20 working days per month X 11 months=1100 patients per RD		
L4	$101.69	$32.78 + than L3	X 2200 patient visits=		+$72,116
L5	$137.29	$68.38 + than L3	X 2200 patient visits =		+$150,436
Net Profit/Loss					-$75,000 L4 reimbursement +$3,320 L5 reimbursement

*Increase in charge capture when the provider bills for the RD services as part of the evaluation & management appointment are quantified as the difference in reimbursement from Level 3 to Level 4 or Level 5. Actual coding practices may vary. (AADE, 2010) (Economic Research Institute, 2017) (Centers for Medicare and Medicaid Services, 2017).

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