

Diabetes Self-Management Education (DSME) program for glycemic control

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Abstract

Purpose: The purpose of this quality improvement project was to implement and evaluate the impact of Diabetes Self-Management Education (DSME) program with type 2 diabetes mellitus (DM) patients. The goals were to improve glycosylated hemoglobin (A1C) and improve patient satisfaction.

Methods: A quality improvement project using the Iowa model was implemented in a primary care setting in Southern California to provide DSME program for adults with type 2 diabetes. A nurse practitioner conducted three DSME group sessions, which were done for 90 minutes per session in a 4-month period. The American Association of Diabetes Educators (AADE) 7 self-care behavior guidelines were used to develop the DSME program. Five patients with type 2 DM participated in the program. Patient satisfaction and A1C levels were collected at baseline and after the completion of the program.

Results: The average A1C for patients at the initiation of DSME was 9%. After the completion of DSME program, the mean change in A1C was 1.44%, and the range change was 1% to 1.8%. Twenty percent of total participants met the objective of decreased A1C level below 7%. Five patients, (100%), had 10% decrease in their A1C levels after completing the program and scored highly satisfied with the DSME program.

Conclusion: As the prevalence and incidence of diabetes increase, a coordinated model of care can meet the growing demand for access and utilization of DSME programs. Health care providers in primary care settings can replicate DSME programs focusing on chronic conditions to improve outcomes.

Introduction

Diabetes mellitus and the sum of its associated complications were the leading cause of death, accounting for \$174 billion in direct and indirect cost in the United States in 2007. The majority of direct costs were attributed to hospital admissions, medications, glucose monitoring supplies, and use of health care. Indirect costs were attributed to work absenteeism, reduced or loss of productivity because of early morbidity or mortality, and reduced quality of life among patients and their family members who care for them. Implementation of an evidence-based project (EBP), such as diabetes self-management education (DSME) program, is a model of care that will improve patient health care outcomes [1].

The projected annual diabetes mellitus-related spending is expected to increase from \$113 billion to \$336 billion between 2009 and 2034. An estimated 25 million people in the United States have diabetes mellitus, and the number is expected to double by 2050 [2].

In 2012, the prevalence of Americans with diabetes increased to 29.1 million or 9.3% of the population. Of the 29.1 million, 21 millions were diagnosed, and 8.1 million were undiagnosed. New cases accounting to 1.4 million Americans are diagnosed with diabetes every year. Diabetes alone, without adding its complications, was the seventh leading cause of death in the United States in 2010. At that time, 69,071 death certificates listed it as the underlying cause of death, and a total of 234,051 death certificates listed diabetes as a contributing cause of death [3].

Expected outcomes

Healthy People 2020 established 16 objectives to reduce the

disease and economic burden of diabetes mellitus and improve quality of life for all people who have, or are at risk for, DM [4,5]. One objective is to increase the number of patients participating in DSME. Expected outcomes for the quality improvement project at the time of implementation were based on American Diabetes Association's (ADA, 2016) standard of medical care to decrease A1C [3].

Review of the literature

The search for the evidence began with accessing the PubMed database using the MeSH terms "diabetes self-management education," "DSME," and "diabetes mellitus." Search criteria were limited to human within 10 years. Five studies were selected for inclusion in the literature review for high relevance to the clinical question.

The implementation of DSME interventions within a multidisciplinary team generally included trained nurse-led care in close consultation with the patient's treating physician and families. Most interventions consisted of educational sessions delivered within a 6-month period to groups of no more than 10 patients. A meta-analysis of 34 published randomized clinical trials (RCTs) and a combined population size of 5,993 patients concluded that the DSME program showed a significant mean reduction in A1C by -0.70% in

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the intervention group. The strength of the study was the selection of electronic databases from PubMed and ISIS knowledge for relevant RCTs between 1999 and 2009, yielding 34 RCTs. The implementation of DSME interventions addressed the specific needs of diabetic patients from different cultural ethnic groups. With the increasing cost of diabetes care, limited human resources were burdensome to the healthcare system in some other countries. Endorsement of DSME was promoted to optimize evidenced-base practice (EBP) to meet the needs of diabetic patients [6].

Recognizing the prevalence of diabetes in Virginia, where type 2 diabetes was the sixth leading cause of death, Jesse and Rutledge (2012) conducted a study to evaluate the effectiveness of multidisciplinary team nurse practitioner (NP) coordinated group visits in medically underserved Appalachia on health, knowledge, and self-efficacy of patients with type 2 diabetes. Two groups, a study group (n= 11) and a comparison group (n=15) participated in a 3-week program. The study group that participated in the DSME program had better clinical outcomes, greater knowledge, and better self-efficacy. Post intervention mean blood sugar (146.36 mg/dl) improved 50.37 mg/dl from pre-intervention (197.73mg/dl). The results suggested that the DSME program led by NPs had a positive impact on the glycemic control, diabetes knowledge, and self-efficacy. The strength of this study was the implementation of DSME with the use of nurse practitioner coordinated team (NPCT) group visits and interdisciplinary team approach that offered an innovative way to improve healthcare outcomes. Even with free care and incentives during the program, there was a struggle to enroll participants. Barriers identified were lack of transportation and fuel, work, and family obligations. Non-randomization and the small size were limiting factors in the study [7,8].

The implementation of DSME in a private outpatient clinic in Hidalgo county located in South Texas used shared medical appointments (SMAs) and yielded positive outcomes, including a decrease in A1C after the 2nd and 3rd measurements, by 58% and 55% respectively [9]. The patients who participated in the quality improvement project had improved self-management skills and reported satisfaction with the program. The strength of the study was the use of the Chronic Care Model as a framework for the development of EBP interventions. The limitation of the study was related to patients' demographics, as 96% of the patients who participated identified themselves as Mexican-American, and this subset may not be generalizable to the diverse population in the United States.

A quasi-experimental EBP intervention using a 5-week DSME program was implemented for a total of 144 diabetic patients at the border of Texas and Mexico, with two groups formed: an intervention group (n=74) and a control group (n=65). Both groups were predominantly female, aged 40 years old and older, low income, and acculturated. The interventions were patient-centered and based on the standards from the American Diabetes Association. The intervention group had a significant reduction in A1C values with a median difference of 0.3% (n=45). Patient's engagement in diabetes self-care management and increased self-confidence were demonstrated after the implementation of this culturally sensitive DSME program. The strength of the study was that the multidisciplinary team members leading the program were all bilingual, trained and experienced in diabetic care. In addition, the intervention group and control group had similar baseline demographic and physiologic parameters [10,11].

In an effort to provide the best quality care for diabetic patients, the University of Pittsburg Medical Center embarked on a quality

improvement initiative using the DSME program. Four primary care practices were involved in this program and a nurse who was a certified diabetic educator (CDE) provided the program from January 2003 to December 2006. Of the 5,344 patients in the four practices, 784 received the DSME program. The mean baseline A1C value was 7.8% at the beginning of the program. At the completion of the program, there was a significant decrease in A1C (-0.29%, $p < 0.0001$). This report demonstrated that integrating DSME into primary care clinics was an effective way to improve to glycemic control. The nurse CDE coordinated the entire group and follow up visits. Along with providing patient education, the nurse CDE also provided the clinic staff with updates and treatment algorithms in diabetes management. The patients who did not participate in the DSME program may have received.

DSME in another setting and this was recognized as a limitation of this study. At the time of the study, the nurse CDE and physicians did not routinely document DSME services and referrals. Other limitations were inadequacy in tracking billing codes and laboratory values, and poor referral patterns [12].

Description of the evidence-based interventions

The DSME was a program, which facilitated and empowered individuals to learn about diabetes mellitus and its complications. A study conducted by Sanchez (2011) had 70 participants, with an average A1C of 7.95% at the initiation of the DSME program. The Plan-Do-Check-Act cycle model was used. A physician and two nurse practitioners employed at the primary care clinic were involved in the implementation of the DSME. Ninety-minute appointments were scheduled for the patients and classes with handouts were provided in English and Spanish. Different learning formats were applied, including oral and video presentations with handouts, which were written at the fifth-grade literacy level. The baseline sample included 70 patients, 65 of whom had a second visit, and 49 had a third visit. Baseline A1C was 7.95%. The minimum A1C was 5.09% and the maximum A1C was 14.40%. Fifty-nine patients (84%) had a second A1C and 22 patients (31%) had a third A1C. On second measurement, 24 (41%) had A1C levels <7% and 52 had A1C levels <9%. On third measurement, 7 (32%) had A1C levels <7% and 19 (86%) had A1C levels <9%. For patients who had a second A1C values, 25 (42%) had an increase and 34 (58%) a decrease. For the third measurement, 10 (45%) had an increase and 12 (55%) a decrease in A1C [9]. The results showed success of the DSME program based on the statistical change in A1C value from baseline to second and third measurements [9].

Methods

Implementation of iowa model

Diabetes mellitus is a chronic and disabling disease that affects many patients across the nation. The Iowa model focused on improving quality of care and emphasized a collaborative, multidisciplinary team approach that enabled continuity of care (Figure 1). The steps used in the Iowa model were concise, with step-by-step problem solving methods, and included an important element with the use of multidisciplinary approach throughout the process. The Iowa model provided guidance and direction from the identification of a relevant clinical question in a current practice setting up to the dissemination of results. The model was specific and systematic. The hallmark of Iowa model was the integration of services, which involved considerable interaction among the team members and involving continuous open communication between patients and health care providers [13].

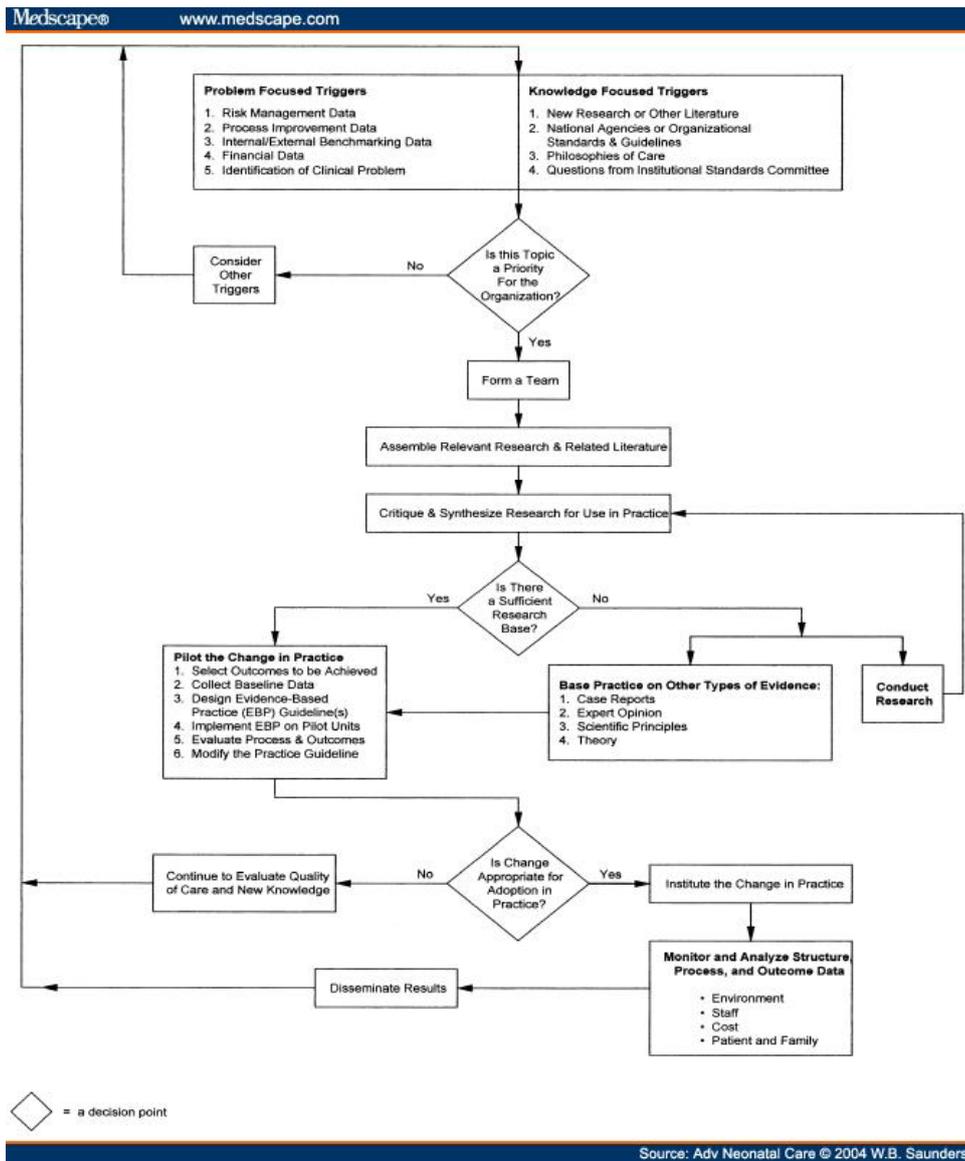


Figure 1. Iowa Model.

Implementation of AADE 7 self-care behaviors

The American Association of Diabetes Educators (AADE) 7 Self-Care Behavior guidelines were used to develop the DSME program, which provided an ideal framework for the concept of self-care management (Figure 2). Seven core behavioral guidelines were used to develop the essential EBP therapeutic interventions in the care of patients with diabetes [14].

Population and setting

The population of interest for the DSME program was adults with type 2 DM in a private primary care internal medicine clinic in Southern California, with five physicians and two nurse practitioners. Potential participants were randomly selected from the electronic database using a variable of A1C more than 8%. Initial telephone conversation was conducted to discuss their participation. Five patients agreed to participate. Informed consent was obtained from each participant before the start of the program. The clinic medical board and the University of San Diego Institutional Review Board approved



Figure 2. AADE 7-Self-Care Behaviors.

the implementation of this DSME program. Most patients in the clinic population were adults over age 45, and sources of insurance included private insurance, Medicare, and Medicaid.

Program intervention

The coordinator of this EBP conducted a comprehensive

community assessment to learn about the existing diabetes education resources and the self-perceived needs of target population. Other activities included organizing human, material, and financial resources needed for establishing a DSME program, engaging existing partners and key stakeholders by informing them about the DSME program, educating them about its benefits and discussing the structure, scope, and evaluation methods of the DSME program. Exploring methods for sustaining and disseminating the DSME program were beneficial for the implementation of this EBP.

Educational materials based on standards of care, which were culturally relevant, available in English, and written at the 5th grade literacy level, were provided to the patients. Topics that were included were signs and symptoms of acute and chronic complications of diabetes, lifestyle modification with diet and exercise, compliance with medications and treatments, preventative and regular follow-up visits, and coping behavior. The program coordinator collected data from the electronic medical record (EMR) for two weeks, enrolled the target population to the program, and obtained their most recent A1C within three months of the start of the DSME program. The program coordinator conducted a total of three DSME group sessions in a 4-month period and each session was conducted for 90 minutes. The final evaluation was done after the third session. Variables measured were the patient's A1C and satisfaction with the program.

Data collection

Data was collected on each of the five patients who participated and completed the DSME program between October 2015 and February 2016 (Table 1). Outcome interpretation was based on the ADA standards of care for glycemic control. The program evaluation tool was developed by the author of this program and was approved by the clinic management.

Data analysis

Descriptive statistics were used to determine the percentage of patients who were able to maintain the clinical recommendation for A1C of 7% or lower. Post-evaluation comments were collected and transcribed in verbatim format to capture the satisfaction of patients at the end of the program.

Results

Figure 3 indicated the percentage of patient's initial and post A1C in this DSME program. The average A1C for patients at the initiation of DSME was 9%. After the completion of DSME program, the mean change in A1C was 1.44%, and the range change was 1% to 1.8%.

Twenty percent of the participants met the objective of an A1C level below 7%. All five patients, which accounted to 100%, had at least a 10% decrease in their A1C levels after completing the program. All five participants indicated they were "highly satisfied" with the DSME program.

Table 1. Patient Demographics (n=5).

	Total Participants: 5	Results
Age	30-59	3
	60-74	2
	75 or above	0
Years with DM	4 or less	4
	5-10	1
	11 or above	0
Sex	Female	3
	Male	2

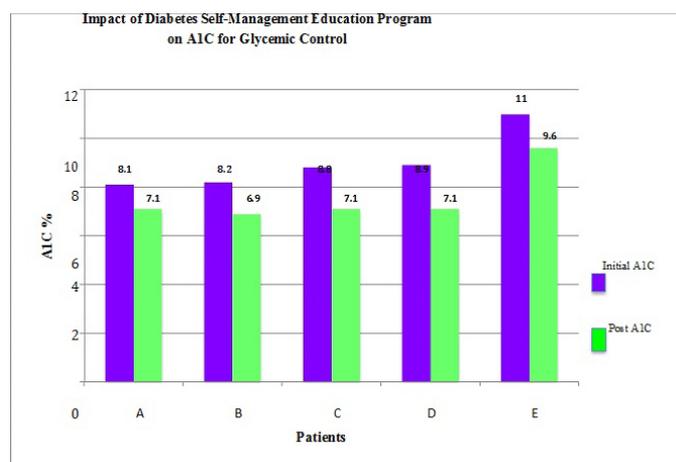


Figure 3. Results of Initial and Post A1C.

Table 2. Comments from Patients.

Patients	Comments
A	"I am glad I came to this class, It eased my concerns about my diabetes."
B	"Diabetes is indeed a journey."
C	"I learned the value of diet, exercise, medication, and treatment compliance..."
D	"Now I know the importance of reading food labels."
E	"I will take control of my diabetes from now on."

Table 2 indicated the actual statements from the patients after the completion of the program and this demonstrated positive feedback.

Discussion

Diabetes self-management education (DSME) program was found to be appropriate for patients who were willing and motivated to self-manage their health condition to improve their outcomes. Although the program had a small sample size of only five patients, the project was consistent with the literature regarding the benefits and sustainability of DSME. The patient population who participated in the DSME had similar outcomes in A1C and patient satisfaction as previously reported. Standards of diabetic care were reviewed, implemented, and evaluated. The data obtained was interpreted as having a positive impact on glycemic control and patient satisfaction.

Assisting patients with diabetes to appreciate and learn the value of self-management was a critical step in the implementation of DSME. Patient empowerment and a collaborative approach among the multidisciplinary team members were imperative in the overall outcomes of the program. The DSME program improved patients' outcomes by reducing A1C. This reduction of risks and complications of diabetes improves the quality of life of patients with diabetes. Diabetic education helped the patients understand diabetes, its progression, and possible complications. It also provided encouragement and guidance to the patients to help them engage in self-care management for optimal health [15].

Limitations

Limitations of the project were related to sampling size, patient demographics, and patient learning preferences. The small number of participants, which was five patients, was limiting the credibility of results and conclusion. The average age of the participants was 59 years old with a range of 46 to 74. The age spectrum was wide with different education levels and specific individual needs. The program was only

presented in English format, limiting the possible participation of patients who speak other languages. Lack of controlled group without DSME intervention may limit the findings. There was also no long-term follow-up of A1C to monitor the duration of improved glycemic control after the program had finished.

Another limitation was the difference in clinical practice recommendations, outcomes, and quality indicators. The evidence regarding the risk reduction of diabetes with an A1C of 7% was inconsistent with the quality indicators used by payers as benchmarks, which was set at 9%. In patients with severe hypoglycemia, limited life expectancy, advanced renal disease, macrovascular complications, and extensive co-morbidities, the target goal was A1C of 8%. The National Committee for Quality Assurance [16] was the only organization that tracked and reported outcomes and process measures based on the Healthcare Effectiveness Data and Information Set (HEDIS), which was developed through a partnership among the public and private organizations representing healthcare consumers and purchasers, and health services researchers.

Recommendations

The results in the implementation of a DSME program contributed to the growing body of literature and demonstrated that this DSME program was effective in improving glycemic control with high patient satisfaction. Nurse practitioners, diabetic educators, and primary care providers benefited from evidence-based DSME programs tailored to the unique needs of patients with type 2 DM. Evaluation of the DSME program demonstrated an effective glycemic control and improved patient outcome based on the quality indicator of a decreased A1C.

As the incidence and prevalence of diabetes increase, other health care providers in the primary care setting can replicate evidence-based DSME programs. Future DSME programs should be tailored with the implementation of telephonic education and the use of electronic devices to reach out using the modern technology. Increased marketing and advertising to recruit more patients were recommended to increase participation. Future classes were suggested for patients with specific needs, such as obesity, depression, and insulin versus noninsulin treatments.

Potential for national and global impact

Diabetes self-management education is the foundation of diabetes care and is essential for improving knowledge and skills necessary to perform self-management. DSME improves A1C and patient satisfaction. Preventing complications of diabetes and maintaining glycemic control require a multidisciplinary approach, utilizing appropriate EBP interventions, in addition to optimal self-management practices and behavior changes [17]. Implementation of DSME serves as a cornerstone in the management of diabetes. Self-care management is essential to ensure patients are adhering to lifestyle changes such as diet and exercise, patient compliance with medication regimens, and are utilizing appropriate health care services.

Diabetes self-management education serves as a model of practice that should be replicated in primary care settings worldwide to meet the high demands of growing epidemic of diabetes. DSME addresses a large group of individuals with a chronic condition and a common interest. Billing codes and reimbursements for health care providers differ in every state, therefore, standardized billing guidelines are needed to track the impact of process and outcome measures.

Implications for clinical practice

Quality improvement projects, such as DSME, are opportunities to implement evidence based-interventions to improve patient outcomes and influence health care policy. Nurse practitioners who have expertise in diabetic management can apply for federal funding and have opportunities to improve health care policy through the implementation of DSME in an effort to improve diabetic outcomes. In collaboration with other healthcare disciplines, nurse practitioners have greater impact and potential to conduct quality improvement projects using EBP, focusing on the management of chronic diseases and improving patients' outcomes. The DSME program impacts a large group of patients at the same time, therefore, providing optimal use of medical and community resources.

The Agency for Healthcare Research and Quality (AHRQ) supports DSME as an innovative program to improve health care outcomes of patients with DM [18]. Recommendation to continue providing DSME programs in primary care setting was highly encouraged based on relevance, efficiency, impact, effectiveness, and sustainability. Evaluation of the program demonstrated an improvement in structure and outcome measures based on quality indicators. Qualitative indicators according to the anecdotal statements from patients were positive.

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