Diabetes Self-management Education Program for Medicaid Recipients: A Continuous Quality Improvement Process

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Diabetes Self-management Education Program for Medicaid Recipients

A Continuous Quality Improvement Process

Purpose

Diabetes self-management education (DSME) is the cornerstone in effective management of diabetes. The continuous quality improvement process was used to identify the problem, collect and analyze data, and develop and implement a DSME program for Medicaid recipients, and subsequently, the program was evaluated to assess its effectiveness.

Methods

A DSME program consisting of a 1-hour initial assessment of individual needs followed by 12 hours of group education on nutrition and self-management was provided to 212 Arkansas Medicaid recipients over 1 year. Key clinical measures were assessed at the end of the period.

Results

Over 1 year, mean HbA1c declined by 0.45% among the DSME participants who completed the full program. Multivariate analyses found that after controlling for age, gender, race, preperiod diabetes drug use, and preperiod costs, DSME participants were found to have fewer hospital admissions, emergency department visits, and outpatient visits. Changes from baseline clinical values for DSME participants were used to project changes in diabetes-related costs using the Gilmer model. An estimated savings in diabetes-related cost over 3 years

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was $415 per program completer. Over 10 years, completers were estimated to experience 12% fewer coronary heart disease events and 15% fewer microvascular disease events using the United Kingdom Prospective Diabetes Study risk models.

Conclusions

A DSME program for Medicaid recipients can reduce health care use among Medicaid recipients with diabetes within 1 year and over longer periods of time is likely to reduce costs associated with reduced use of health care. Plans are in place to explore the possibility of sustaining the program.

Diabetes self-management education (DSME) is the cornerstone in the effective management of diabetes. A systematic review of published studies addressing the effectiveness of population-based diabetes-related interventions recommends DSME.[1] With the evolving burden of diabetes[2] and increasing health care expenditures attributed to this condition,[3,4] DSME plays a vital role in combating the escalating costs. Several economic studies have evaluated the role of DSME in decreasing the diabetes-related hospital costs[5,6] in different populations. Prior studies have concluded that for every dollar invested in DSME, a median reduction of $2 was observed in hospital costs. This does not take into account any potential reduction in long-term health care costs.

In this article, the authors share their experiences in implementing a DSME program for Medicaid recipients by using a continuous quality improvement (CQI) process[7] and the evaluation results of the participants' clinical outcomes and health care costs.

Identifying the Problem

Although a wealth of literature exists on the efficacy and effectiveness of DSME, not all individuals with diabetes receive DSME, particularly Medicaid recipients with diabetes. With Medicaid budgets increasing at alarming rates and the federal government's share of those costs decreasing, state Medicaid programs face a growing financial crisis. In response to increasing costs among Medicaid recipients with diabetes, the Arkansas Medicaid director called for proposals to test strategies with the potential to reduce those costs. The Arkansas Diabetes Prevention and Control Program (ADPCP) along with Eli Lilly and Company formed a coalition of public and private partners, comprising the Arkansas Department of Human Services, Arkansas Foundation for Medical Care, Health Information Design, Arkansas Chapter of American Diabetes Association, and Arkansas Minority Health Commission, to respond to this proposal.

The coalition's objective was to implement a DSME program for Medicaid recipients with diabetes, with an ultimate goal of demonstrating that DSME could improve diabetes care and decrease overall health care costs among Medicaid recipients with diabetes.

Collect and Analyze Data

In 2003, only 54% of people with diabetes in the United States had ever attended a DSME class.[8] During the same year, only 42% of people with diabetes in Arkansas reported that they had ever received DSME.[8] This failure to receive DSME may be due to several factors including access to and affordability of care as well as patient knowledge and motivation to adhere to self-care practices. Reimbursement for DSME is a major factor influencing affordability. While reimbursement for DSME is common among private insurance providers, not all public insurance providers reimburse for DSME.[9] Medicare recipients were reimbursed for DSME[10] after the Balanced Budget Act of 1997.[11] However, the Medicaid reimbursement policy for DSME is determined at the state level. More than half of the states do not cover DSME under Medicaid.[9] This lack of coverage poses a substantial threat to the health of those persons with diabetes who are dependent on Medicaid (ie, those who have low income or are blind or disabled). This public health challenge is compounded by the disproportionately high burden of diabetes among persons in low socioeconomic strata.

Identify Possible Solution; Develop and Implement the Program

The coalition discussed different strategies to overcome this potential problem of lack of DSME reimbursement for Medicaid recipients. The strategies include advocacy, financial support from nonstate entities to Medicaid recipients for DSME, and an effective DSME program exclusively for

Medicaid recipients. Because of a lack of literature about the effectiveness of DSME among Medicaid recipients, the former 2 strategies proved not feasible. The coalition decided to develop a DSME program as a CQI process exclusively for Medicaid recipients with diabetes, follow the American Diabetes Association guidelines for DSME, evaluate its effectiveness, and plan on sustaining the program.

Control Diabetes Services (CDS), a quality improvement organization formerly affiliated with Eli Lilly and Company, worked with the Arkansas Medicaid program to recruit the DSME program participants. To assess the effectiveness of the DSME program offered, eligibility rules were created by the coalition for participant selection. To be eligible, Medicaid recipients had to have been diagnosed with diabetes for at least 1 year and enrolled in Medicaid for 11 continuous months. Children (younger than 19 years), people with end-stage renal disease, and pregnant women were excluded from participation. Of the 1968 eligible Medicaid recipients with diabetes, 212 agreed to participate and attend DSME classes (convenient sample) when contacted.

The coalition, using grant funds provided by Eli Lilly and Company, paid for the diabetes education, gave each participant a $20 Wal-Mart gift certificate, and assisted with transportation to and from diabetes education visits.

DSME was provided by a registered nurse and a registered dietician who followed the American Association of Diabetes Educators' core curriculum for diabetes education.[12] In addition to an initial needs assessment, participants received 12 hours of diabetes education, including 3 hours of medical nutritional education. Education was provided over 3 visits: an initial visit, shortly after the educational needs assessment; a second visit, scheduled at 6 months, and a final visit after a period of 1 year from the first visit. Diabetes education was provided through group sessions, and the curriculum addressed 10 content areas: diabetes disease process, nutrition, physical activity, medications, monitoring/using results, acute complications, chronic complications, goal setting and problem solving, psychosocial adjustment, and preconception care, pregnancy, and gestational diabetes.[12] During each visit, educators administered a questionnaire to document participants' demographic characteristics, self-care skills, preventive care practices, and health care use.

Key clinical measures, including glycosylated hemoglobin (HbA1c), systolic and diastolic blood pressures, weight, and body mass index, were collected at the initial and final visits (baseline and 12 months). Questionnaire and clinical data were entered into Dia-Trac, an electronic data management system managed by CDS.

Efforts to retain the 212 participants during the 1-year period of diabetes education included follow-up telephone contacts and postcard reminders. As a result, 184 (87%) attended the midyear visit and 157 (74%) attended the year-end visit. This is a good retention rate considering that previous studies on DSME that had a follow-up component had a retention rate ranging from as low as 21% to as high as 100%.[13]

Evaluate the Program

Evaluation objectives were to (1) assess changes in key clinical measures; (2) assess changes in health care use and expenditures among participants who received DSME, compared to those who did not receive DSME; and (3) use predictive models to project the impact of DSME on 3-year diabetes-related costs and 10-year disease event rates among the program participants. SAS version 8.0 was used for all data analyses. Mean changes in clinical measures were assessed using paired *t* tests.

Health care use and expenditures were compared for program participants and a matched group of individuals who did not receive DSME. A Medicaid claims database was used to identify the non-DSME group retrospectively. To enhance the statistical power to detect differences between groups, a greater number of non-DSME individuals were selected for inclusion in the analysis sample. Non-DSME records were identified using the same inclusion and exclusion criteria as DSME participants and were matched to DSME participants by age (within 2 years), gender, race, and baseline diabetes severity (use of insulin or multiple oral medications). Up to 137 non-DSME records were selected per DSME participant. Six DSME participants without matches were retained in the data set. For both groups, claims data for the 6 months prior to program initiation were abstracted to document total payments for all clinical services, total diabetes-related payments based on International Classification of Diseases (ninth revision) diagnosis codes,[14] Current Procedural Terminology codes,[15] Charlson comorbidity index,[16] and drug use. All covariates (demographic characteristics, prior period variables) were included in the multivariate models. Logistic regression was used for categorical outcomes (eg, any hospital admission or any emergency department visit), negative binomial regression was used for discrete count outcomes (eg, number of physician

visits), and both ordinary least squares and median regression were used for continuous outcomes (eg, Medicaid expenditures).

The 3-year diabetes-related costs were predicted using the Gilmer model,[17] which projects differences in treatment cost over a 3-year period based on differences in clinical measures (particularly HbA1c). Because not all patients enrolled at baseline completed the program, the projected change in cost was estimated in 2 ways: (1) differences in projected costs among those who completed the program (completers) and (2) projected values using the last observation carried forward method to create HbA1c values for those who did not complete the program (eg, the value observed at 6 months is carried forward and assumed to be the value at 12 months). The costs reported in 1995 dollars in the Gilmer model were inflated to 2003 dollars using the consumer price index. Changes from baseline to end date in HbA1c and blood pressure were used to predict changes in the risk of microvascular and macrovascular complications of diabetes over a 10-year period for the program participants. Because 95% of the participants had been diagnosed with type 2 diabetes, risk models derived from the United Kingdom Prospective Diabetes Study (UKPDS) were used to predict changes in risk of macrovascular and microvascular complications. Using participants' characteristics (such as age, race, and baseline diabetes severity), the UKPDS risk models[18,19] predict changes in coronary heart disease (CHD) events and stroke risk. Risks are based primarily on changes in lipids and blood pressure.[20,21] Unfortunately, lipid values were not collected for the program participants. To address this lack of data, mean values for lipids from the National Health and Nutrition Examination Survey (NHANES 1999-2000)[22] were used in the UKPDS risk prediction equation, assuming no change from baseline. This is a very conservative assumption in that, if successful, the types of behavior change engendered by the self-management education program would likely improve lipid profiles. In that case, the impact of the improvement in lipids would not be reflected in projected event rates. Furthermore, to adjust estimates of the expenditure differential for covariates, ordinary least squares regression was applied to a square root–transformed cost model. A square root transformation was used to adjust for the skewed distribution of costs in the data, coupled with the presence of some individuals in both groups with apparent expenditures of zero over 1 year.

A total of 212 Medicaid recipients were enrolled in the DSME program. As shown in Table 1, most (67%) were between 45 and 64 years of age, female (78%), and white (58%). Approximately half (49%) had at least a high school education. One in 5 (21%) were visually impaired, and 1 in 4 (24%) had low literacy levels. Ninety-five percent had been diagnosed with type 2 diabetes.

Table 1

Characteristics of the Diabetes Self-management Education Program Participants (N = 212)

Characteristic	n	%
Age, y		
<19	0	0.0
19-44	52	25.0
45-64	142	67.0
≥65	18	8.0
Gender		
Female	166	78
Male	46	22
Race		
White	128	58.0
Black	86	40.6
Other	3	1.4
Education		
Less than 8th grade	32	15.1
Some high school	76	35.9
High school graduate	67	31.6
Some college	32	15.1
College graduate	5	2.4
People with special needs		
Visually impaired	44	21.0
Hearing impaired	14	0.7
Low literacy	50	24.0
Diabetes type		
Type 1	11	5.0
Type 2	201	95.0

Over the period of 1 year, mean HbA1c and both systolic and diastolic blood pressure levels were reduced among DSME participants (see Table 2). Changes in HbA1c and systolic blood pressure were statistically significant ($P < .01$). No changes were observed in mean weight or body mass index.

Table 2

Changes in Key Clinical Measures Among the Diabetes Self-management Education Program Participants

Clinical Measure	Baseline*	Year End*	*P* Value
Glycosylated hemoglobin (HbA1c), %	8.00 ± 2.05	7.55 ± 1.68	<.01
Systolic blood pressure, mm Hg	141.2 ± 21.7	136.6 ± 20.3	<.01
Diastolic blood pressure, mm Hg	79.8 ± 11.8	78.4 ± 10.4	.09
Weight, lb	230.7 ± 60.3	230.9 ± 57.8	.95
Body mass index, kg/m^2	38.3 ± 10.7	38.3 ± 10.3	.94

*Mean ± standard deviation.

Table 3

Comparison of Baseline Characteristics Between the Diabetes Self-management Education (DSME) Participants and the Non-DSME Participants

Characteristic	DSME Participants (N = 212)	Non-DSME Participants (N = 21 886)
Age	51.63	52.34
Female	0.783*	0.904
African American	0.382	0.329
Prior: insulin only	0.179	0.142
Prior: insulin and oral	0.292*	0.182
Prior: metformin	0.467*	0.359
Prior: sulfonyl urea	0.420	0.390
Prior: triazolidone/ other oral	0.245	0.216
Prior: costs, total, $	3767	3876
Prior: costs, diabetes, $	500*	369

*$P < .05$.

The baseline characteristics of the DSME participants and non-DSME participants are summarized in Table 3. The comparison of health care use and expenditures for the 2 groups is summarized in Table 4. Without adjustment for covariates, the rate of hospital admissions was 34% lower and the rate of emergency department visits was 38% lower among DSME participants compared to non-DSME participants ($P < .05$). Physician visits were 15% lower among DSME participants compared to the non-DSME group. Analyses using logistic regression and negative binominal regression adjusting for prior diabetes drug treatment, prior period Medicaid costs (diabetes and total), gender, race, age, and age squared confirmed these findings. After adjustment, the odds of any ER visit were 33% lower among DSME participants. Likewise, DSME participants had fewer hospital admissions and fewer physician visits overall than the non-DSME comparison group did ($P < .05$).

When health care expenditures related to diabetes and expenditures overall were compared for the 2 groups, without adjustment for covariates, the DSME participants experienced higher diabetes-related mean costs compared to the non-DSME group at the end of 1 year ($P < .05$). There was no difference in mean overall expenditures. There was no statistically significant impact of DSME participation on Medicaid expenditures after these adjustments.

Based on the Gilmer predictive model,[16] applying the observed 1-year change in HbA1c for each of the 157 program completers yields a mean estimated savings in diabetes-related costs of $415 per program completer over a 3-year period (see Figure 1), exclusive of DSME program costs. DSME program costs are estimated to be $335 per participant. Thus, the total DSME costs for the 212 Medicaid recipients who initiated the program are estimated as $71 020 ($335 × 212). Assuming no diabetes cost savings for noncompleters, total diabetes cost savings over 3 years are projected as $65 155 ($415 × 157), resulting in an estimate of $28 in net cost per participant over 3 years ($5865 ÷ 212). If all 212 participants are included in the Gilmer model projections (with the last observation carried forward for noncompleters), the mean estimated savings in diabetes-related costs is reduced to $246 for the 3-year period, again exclusive of DSME program costs. Using this cost offset estimate, the estimated net cost per participant rises to $89 over 3 years.

Using observed changes in HbA1c and systolic blood pressure, the UKPDS risk model predicts that over 10 years, CHD events would be decreased by 12% and microvascular complications by 15% among DSME program completers.

Table 4

Comparison of Health Care Use and Expenditures Between the Diabetes Self-management Education (DSME) Participants and Non-DSME Participants at the End of the 1-Year Period

	Unadjusted		Adjusted*	
Domain	DSME Participants (N = 212)	Non-DSME Participants (N = 21 886)	Ratio (DSME/ Non-DSME)	Estimated DSME Effect
Health use utilization (1 year)				
Hospital admission				
Probability >0	0.28	0.31	0.92	0.87†
Number	0.44	0.67	0.66‡	–0.37‡,§
Emergency department visits				
Probability >0	0.43	0.54	0.80‡	0.66†,‡
Number	1.89	3.06	0.62‡	–0.36‡,§
Physician visits: diabetes, no.	2.55	2.58	0.99	–0.10§
Physician visits: all, no.	5.60	6.57	0.85‡	–0.12‡,§
Health care expenditures				
Expenditures: diabetes, $\bar{x}$	500	369	1.35‡	–0.19‖
Expenditures: any diagnosis, $\bar{x}$	3767	3876	0.97	–3.26‖

*Adjusted for prior diabetes drug treatment (insulin only, insulin + orals, sulfonylurea, metformin, thiazolidinedione or other oral), prior period Medicaid costs (diabetes and total), gender, race, age, and age squared.
†Odds ratio from logistic regression.
‡$P < .05$.
§Estimated coefficient from negative binomial regression.
‖Estimated coefficient from square root–transformed cost ordinary least squares regression.

Maintain the Program

The CQI process is the first of its kind among Medicaid recipients, and the findings shed new light on the effectiveness of DSME. The evaluation has several limitations, however. The small number of DSME participants and short duration of follow-up for a disease with relatively slow progression poses a substantial challenge when attempting to estimate changes in clinical measures, health care use, and expenditures. The Medicaid recipients who agreed to participate in the program engaged in more care-seeking behavior than nonparticipants did and may not be representative of Medicaid recipients with diabetes overall. The 3-year and 10-year projections are based on the assumption that observed changes in clinical parameters over the 12-month program period affect the trajectory of clinical values over the entire time horizon. Also, because lipid values were not assessed, were estimated from a comparable population, and were assumed to be constant in the projections, the beneficial effect of improved diabetes management on lipid values may have been underestimated.

Despite these limitations, the results clearly suggest that DSME decreased health care use among Medicaid recipients, particularly hospital admissions and emergency department visits. In 2003, the average hospital in-patient stay for a person with diabetes cost approximately $12 900 in Arkansas.[23] With a reduction of 0.23 admissions per patient per year, the savings for 100 persons with diabetes would be an estimated $297 000 per year. Similar cost savings would accrue from reduced emergency department visits.

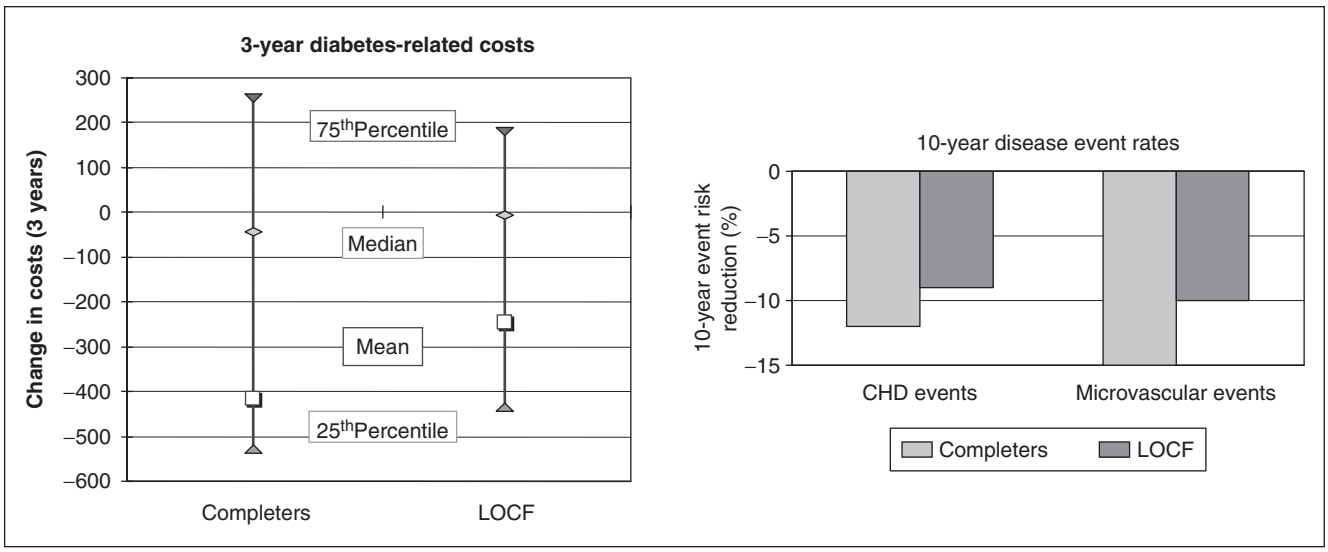

Figure 1. Projected change in 3-year diabetes-related costs and 10-year disease event rates among diabetes self-management education participants. LOCF = last observation carried forward; CHD = coronary heart disease.

A reduced health care use was seen (decreased hospital admissions and emergency department visits) within a short 1-year follow-up period. The 10-year projected disease event rate estimated reductions in both CHD events and microvascular complications for those who completed 1 year of diabetes education. The cost savings associated with averting a CHD event or stroke risk are not insignificant. Studies have shown that for each myocardial infarction averted, the average costs saved are $15 900 for a nonfatal event and $11 300 for a fatal event.[24] Averting a coronary artery bypass graft saves approximately $18 300, and preventing a stroke saves nearly $10 000.[25] Taken together, these findings suggest that the cost of a DSME program for Medicaid recipients with diabetes will likely be offset by short- and long-term savings in health care use.

The coalition members have shared the DSME program results with the state Medicaid director and other key stakeholders and are exploring ways to sustain the DSME program for Medicaid recipients. State Medicaid program administrators should seriously consider providing reimbursement for diabetes education in an attempt to lower the increasing Medicaid costs.

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