

Diabetes Self-Management Education and Support: Referral and Attendance at a Patient-Centered Medical Home

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Abstract

Background: Although evidence shows that diabetes self-management education and support (DSMES) is an effective tool to help individuals with type 2 diabetes (T2DM) improve their health outcomes, there remains a large number of individuals not attending DSMES. Understanding how frequently patients receive referrals to DSMES and the number of DSMES hours they receive is important to determine, as well as patients' health outcomes of utilizing DSMES. This will help us understand patterns of utilization and the outcomes that occur when such a valuable resource is utilized. **Methods:** Secondary data analysis was conducted of patient electronic medical records at a primary healthcare federally qualified clinic and 2 area hospitals. We identified 105 adult patients with a new T2DM diagnosis with at least 2 A1c lab results 3 to 12 months apart during the study period. **Results:** Only 53.5% were referred to DSMES. Out of those who were referred, 66% received no DSMES, 17% received 1-hour assessment, 4% received partial DSMES, and 13% received 8 or more hours. Linear regression of percent change in A1c and number of DSMES hours received, revealed that receiving 1 ($P=.001$) or 8 or more hours of DSMES ($P=.022$) had a significant negative relationship with the percent difference in A1c compared to the group who received no DSMES. Patients who had an hour of assessment had a similar percent reduction in A1c to those who had partial DSMES. **Conclusion:** Referral rates and enrollment in DSMES remain low. Those who enrolled often dropped out after the one-hour assessment session. Results suggest making the one-hour assessment session more educationally comprehensive or longer to retain patients. Improving the DSMES referral process and further investing physicians' decisions on whether to refer or not refer patients to DSMES are key for future studies.

Keywords

chronic, diabetes, DSME, referral, self-management

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Introduction

Diabetes is a debilitating and progressive disease with serious, but preventable health complications. Growing evidence supports the effectiveness of diabetes self-management education and support (DSMES) in helping individuals with diabetes improve their health outcomes, specifically glycemic control and prevention of diabetes complications.^{1,2} Although evidence shows that DSMES is an effective tool to help individuals improve their health outcomes, there remains a large number of individuals not receiving DSMES.^{3,4} The phenomenon of low attendance rates in these programs is not fully understood. However, some studies have found that certain patient-related factors associated with attendance include program length, logistic barriers

such as transportation,⁵ full-time work,³ and shame associated with diagnosis.⁶ In addition to the high diabetes diagnosis rates among socioeconomically disadvantaged individuals, diabetes health outcomes in this population remains worse than their counterparts with higher education or income.^{7,8} Multiple studies show that disadvantaged populations benefit from DSMES in achieving glycemic

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control; however, attrition rates remain high among this population causing them not to receive the recommended hours of DSMES.^{9,10} Understanding how frequently disadvantaged individuals are receiving referrals to DSMES at diagnosis and the number of hours they are attaining is important to determine. This will help us understand patterns of utilization and the outcomes that occur when such a valuable resource is utilized.

DSMES is a general term for the ongoing process of delivering diabetes-related information and knowledge that focuses on empowering individuals with diabetes to self-manage their disease. This process encompasses obtaining knowledge and setting goals in collaboration with the patient's healthcare team to improve patients' diabetes-related health outcomes and their overall quality of life.¹¹ The American Diabetes Association (ADA) and the Association of Diabetes Care and Education Specialists (ADCES) offer guidelines and endorse DSMES programs. Accredited DSMES programs typically contain 10 hours of education delivered either individually or in a group setting. The 10 hours must be attained during the first year of diabetes diagnosis. Medicare and Medicaid cover up to 10 hours of initial DSMES: 1-hour of individual assessment and 9 hours of group training.¹²

According to the ADCES, for a patient to qualify for DSMES referral, the patient must be diagnosed with type 1, type 2, or gestational diabetes using the following criteria:

- Fasting Blood glucose of 126 mg/dL on 2 separate occasions
- 2-h Post-Glucose Challenge of ≥ 200 mg/dL on 2 separate occasions
- Random Glucose Test of >200 mg/dL with symptoms of unmanaged diabetes

Additionally, a referral from the treating physician or a qualified non-physician practitioner is required.¹³ A consensus report of diabetes-related and healthcare professional bodies, identified 4 critical times when the need for a referral should be assessed: (1) at diagnosis, (2) annually and/or when not meeting treatment targets, (3) when complicating factors arise, and (4) when transitions in life and care occur.¹⁴

While accredited organizations can adapt the DSMES curriculum to fit the needs of their patients, the curriculum must cover the following core content areas: diabetes pathophysiology and treatment options, healthy eating, physical activity, medication usage, blood glucose monitoring and management, preventing, detecting, and treating acute and chronic complications, healthy coping, and problem solving.^{5,11} Traditionally, DSMES programs have been delivered in multiple short sessions progressing from one distinct topic to another.¹¹ Given that diabetes rates and its dire medical complications disproportionately affect disadvantaged populations and that DSMES is a tool that could

be utilized to curb these negative consequences, in this study we examined the completion of DSMES hours by newly diagnosed type 2 diabetes mellitus (T2DM) patients at a federally qualified patient centered medical home (PCMH). We also examined whether the number of completed DSMES hours predicts any changes in A1c during this first year after diagnosis. To date, it is unknown the extent to which primary care providers are following referral guidelines and whether the number of DSMES hours completed by patients is associated with better glycemic control. The goal of this study is to address this gap in knowledge.

Methods

This retrospective study consisted of a secondary data analysis of patient electronic medical records obtained from a federally qualified clinic and 2 area hospitals that provide laboratory testing and DSMES courses. Exemption from Health Insurance Portability and Accountability Act (HIPAA) for protecting patients' sensitive information and Human Subject Institutional Review Board approvals were obtained from a Midwestern academic primary healthcare clinic and the 2 participating hospitals.

A chart review was conducted of 706 adult patients of the family practice division in the PCMH. Out of the 706 patients, we identified 142 patients with a new T2DM diagnosis in a 4-year period. Patients were excluded if they did not have at least 2 A1c lab results 3 to 12 months apart during the study period ($n=37$), leaving 105 patients in the final sample. The PCMH provides comprehensive care to all persons regardless their insurance status or ability to pay. All of our sample patients were recipients of Medicaid, Medicare, or both at the time of diagnosis.

Demographic data collected included age (years), gender (male/female) and race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, and other). The age and gender variables were exported from the clinic medical records. The race/ethnicity variable was self-reported and exported from hospital medical records. DSMES referrals and participation information was not available in the clinic electronic medical records system. Therefore, the data was abstracted manually from patients' medical records then exported into our electronic database. A1c values were exported from hospital medical records and measured in percentage. Baseline A1c values were defined as A1c results taken within 1 to 3 months before attending the first DSMES session. Follow-up A1c values selected were the first A1c collected 3 to 12 months after completing the last DSMES session. To be included in the study, the time difference between the first and second A1c value could not exceed 12 months. Because A1c values were highly skewed and to account for differential baseline A1c values, change in A1c was defined as a percent change. This was calculated by

Table 1. Demographics and Referral Rates of Patients (N= 105).

	Referred (n=56)	Unreferred (n=49)
Gender (female)	36 (57.1%)	27 (42.9%)
Race	39 (69.6%)	35 (47.3%)
White	15 (26.8%)	14 (48.3%)
Black	2 (3.6%)	—
Hispanic		
DSMES hours		
None	25 (44.6%)	44 (89.8%)
Assessment (1 h)	13 (23.2%)	5 (10.2%)
*Partial (1.5-7.5 h)	4 (7.1%)	—
Full (≥8h)	14 (25%)	—
Baseline A1c (median)	6.8	6.6

*Excluded from final analysis.

subtracting baseline A1c values from follow-up A1c values then dividing the difference by baseline A1c values and multiplying by 100. Hours of DSMES attained were obtained as well. Furthermore, we categorized the hours into 4 groups: (1) no education—patients who did not receive any DSMES, (2) assessment—patients who received 1 h of DSMES that was spent on assessment only, (3) partial education—patients who received 1.5 to 7.5 DSMES hours, (4) full education—patients who received 8 or more hours of DSMES. Due to the bimodal distribution of the data and small size of the partial education group (n=4), this group was excluded from the final regression analysis. Referral was analyzed as a binary variable that identified individuals who were formally referred by their health care provider to DSMES program during the study period (referred, not referred).

Descriptive analyses included calculations of means, standard deviations (SD), medians and percentages. Statistical comparisons of groups were conducted using Pearson Chi-Square test for categorical data and linear regression analysis to compare percent change in A1c (continuous outcome variable) by hours of DSMES (categorical variable), race, and gender. The alpha level was set at 5% for statistical significance while performing two-sided hypotheses. IBM SPSS statistics version 19 (Armonk, NY: IBM Corp.) was used for analyses.

Results

Out of the final sample of 105 patients, 66% (n=69) received no diabetes education, 17% (n=18) received 1 h of assessment, 4% (n=4) received partial education (excluded from the remaining analyses), and 13% (n=14) received full education (at least 8 h). Demographic characteristics of our patients (n=105) are shown in Table 1. The majority of

patients were female (63%), white (69.5%), had an average age of 50.5 (SD ± 12.8, range=25-76).

When examining referral rates for the total sample, we found that only 53.5% (n=56) were referred to DSMES. Out of those referred (n=56), 55% (n=31) received at least some hours of DSMES. Forty-two percent of patients who received DSMES completed 1 hour, 7% completed 1.5 to 7.5 hours, and 45% completed 8 or more hours with the majority of them being women (86%). This compares to 44 (90%) out of the 49 unreferred that received no DSMES. The baseline A1c median for those who did not receive any type of diabetes education was 6.6 (SD=1.9), compared to 7.5 (SD=2.6) for patients who received 1 hour of DSMES and 6.6 (SD=2.4) for patients who received 8 or more hours of DSMES. Baseline and follow-up A1c values were non-normally distributed with skewness of 1.8 (SE=0.24), 1.8 (SE=0.24) and kurtosis of 1.5 (SE=0.34), 1.89 (SE=0.34), respectively. The median value of baseline A1c was 6.7 (n=105) with a 25th percentile and 75th percentile values of 6.2 and 8.3 respectively. The median value for follow-up A1c was 6.4 (n=105) with a 25th percentile and 75th percentile values of 6.1 and 7.6 respectively as shown in Table 1. A1c values were further explored by the number of DSMES hours, which are shown in Table 2. Patients who had an hour of assessment, with a 16% reduction, had a similar percent reduction in A1c to those who had partial DSMES with a 14.3% reduction, as shown in Table 2.

Linear regression of percent change in A1c values (continuous dependent variable) and number of DSMES hours received (categorical independent variable), revealed that receiving one (P=.001) or 8 or more hours of DSMES (P=.022) had a significant negative relationship with the percent difference in A1c values compared to the group who received no DSMES as shown in Table 3. Also, those who had an hour of assessment, with a 16% reduction, had a similar percent reduction in A1c to those who had partial DSMES with a 14.3% reduction as shown in Table 3.

Discussion

Amidst the growing number of diagnosed and undiagnosed individuals with T2DM, our study examined DSMES referrals and attendance as well as patient outcomes related to attendance at a federally qualified clinic among newly diagnosed T2DM patients. We found that only a little over 50% of our patients were formally referred by their healthcare provider. Referred patients were more likely to attend DSMES than those who were not referred; however, almost half of those referred did not attend any DSMES sessions. Additionally, those who attended DSMES had better outcomes than those who received no hours. Those who had only 1 hour of assessment had similar results to those who received 8 or more hours.

Table 2. Selected Characteristics of Patients of a Family Practice Patient-Centered Medical Home Based on Number of DSMES Hours Received (N= 105).

DSMES hours (N)	None (69)	Assessment (18)	Partial (4)	Full (14)
Baseline A1c median	6.6	7.5	6.3	6.7
Follow-up A1c median	6.6	6.4	5.4	6.2
Percent reduction in A1c	0.6%	16%	14.3%	11.4%
Uncontrolled baseline A1c*	25 (36%)	12 (67%)	1 (25%)	5 (36%)
Uncontrolled follow-up*A1c%	27 (39%)	4 (22%)	1 (25%)	2 (14%)
Gender (females)	37 (54%)	12 (67%)	2 (50%)	12(86%)
Race:				
White	49 (71%)	13 (72%)	3 (75%)	9 (64%)
Black	19 (28%)	5 (28%)	1 (25%)	4 (29%)
Hispanic	1 (1%)	—	—	1 (7%)

*Uncontrolled A1c value: A1c >7%.

Table 3. Linear Regression of Association Between Hours of DSMES and Percent Change in A1c Values of Patients at a Family Practice.

Confidence intervals				
	β	Upper bound	Lowed bound	P-value
Hours of DSMES				
No hours (reference)	Reference group			
1 h-assessment	-0.34	-24.8	-7.15	.001
8 or more hours	-0.22	-21.2	-1.67	.022

The low referral rate of only about 50% of our sample reaffirms the historically low referral rates that other studies have identified as a barrier to utilizing DSMES. A study in a rural setting found that only 24% of their sample was referred to DSMES despite physicians' awareness of the availability of DSMES in their area.¹⁵ A needs assessment study conducted among 8 clinics serving the uninsured and Medicaid recipients found that patients are referred to DSMES with little or no referral follow-up by their physicians.¹⁰ The ADA standards of medical care in diabetes and the ADCES identify 4 critical points at which patients with T2DM should be referred to DSMES.¹⁴ Despite the fact that the first critical point in the algorithm is "at diagnosis", referrals of newly diagnosed patients remain low.¹⁴ A study that surveyed 305 primary care physicians (PCP) at a clinic found that only 67% of newly diagnosed patients were referred to DSMES by their PCP and that referrals varied based on patients' diabetes severity. That study also found that only 38% of their surveyed PCPs reported following any referral guidelines.¹⁶

There is scarce literature examining the reasons behind the historically low referral rates. However, a few older studies examined physician-based barriers. For example, a study surveyed physicians at the national level, found that physicians reported barriers to referrals such as not knowing and not understanding at what point to refer a patient in addition to the complicated process of referrals.¹⁷ Another study

revealed that physicians did not refer patients out of fear of patients' refusal to attend DSMES in addition to the fear of losing the established patient-physician relationship.¹⁸ Some physicians may also prefer to manage their patients' diabetes themselves rather than refer them to a specialist as a study in which 43% of surveyed physicians reported that preference.¹⁹ Perhaps physicians tend to refer patients at a high risk for complications as opposed to those who already have a controlled A1c value. This may be true given the fact that the median baseline for our unreferred patients was 6.6, which from a clinical perspective is a controlled value for an individual with T2DM. Despite the limited literature on DSMES referrals, results of multiple studies confirm the important role physicians play in encouraging their patients to attend DSMES.^{20,21} Further exploration of physicians' referral barriers in addition to the process of referral should be a target focus to increase referrals to DSMES. Furthermore, it is important to note that according to the ADA and ADCES guidelines, qualified non-physician practitioners can refer patients to DSMES.^{11,13} However, our study examined physician referrals only. Further studies should examine differences in referral patterns between different healthcare practitioners such as advanced practice nurses and physician assistants as our literature search did not reveal any studies examining these differences.

When further examining referred patients by the amount of DSMES hours they received, we found that approximately

a quarter of them each received only 1 h of assessment or 8 or more hours of education while less than 10% received partial education. These patients' rate of attendance is similar to national data and other studies that show a very low percentage of people with diabetes receive any DSMES regardless of the type of health insurance or health coverage they have. As a matter of fact, only 7% among individuals with private insurance and 4% among those with Medicare coverage received DSMES.²² Another study that examined the accessibility and availability of DSMES for vulnerable populations found that only 8% of Medicaid participants attended a DSMES program.¹⁰ While a few studies examined referral patterns among Medicaid recipients, little is known about attendance and utilization of DSMES among this population; a topic worth of further exploration.

When further examining our referred patients based on their A1c characteristics, we found that all of the 4 groups' median baseline A1c were controlled (<7%) except for the group who attended the 1 hour assessment that had a median baseline A1c greater than 7.0, indicating that the clinic was reaching the right target population with poorest glycemic control for that group. Additionally, the 1 hour assessment group had the largest reduction in A1c, which was very similar to the reduction patients in the full education group achieved, perhaps indicating that the initial contact between the patient and educator is a very critical point in the patient's process to diabetes self-management. Of those who started DSMES, our findings suggest that those who completed 1 hour were more likely to be uncontrolled with a median value of 7.5% than those who completed 8 or more hours of DSMES who had a median A1c value of 6.7% although both groups were able to achieve a controlled A1c value by the follow-up period. Therefore, not completing the DSMES program did not prohibit those who only attained the 1 hour of DSMES from reaching a controlled A1c level.

With retention being a concerning issue for DSMES programs and a main patient barrier,²³⁻²⁵ our findings suggest the importance of accommodating patients' circumstances and needs by offering DSMES sessions in various formats. Since ADA-accredited DSMES program topics have been traditionally offered in a structured and progressive manner in multiple sessions, it is important to further examine the possibility of delivering DSMES programs in a shorter or a one-time session format. We were not able to find any studies that evaluated DSMES programs delivered in one-session. However, a study reported that surveyed patients with diabetes preferred DSMES to be delivered in 4 monthly sessions indicating that the current model of delivering 10 hours of DSMES might be too long.²⁶

One of the most important results of this study is that patients in the 1-h group achieved a one point reduction in A1c after the initial assessment, which is clinically a significant reduction as a UK national study found that a 1% reduction in A1c was associated with 37% decreased risk in developing microvascular complications, 21% reduction in

the risk of other diabetes-related complications and death.²⁷ Given our result that patients in the 1-h group achieved a 1% reduction in A1c suggests that a more comprehensive and shorter program may be a more suitable alternative to the traditional DSMES program, especially among disadvantaged, transient populations who are in dire need of DSMES, but not able to attend the full program.

Our literature search did not reveal any studies that examined the outcomes of patients who initiated enrolling in DSMES by attending the assessment session only. Given the finding in our study that those who completed one assessment hour had similar percent changes in A1c to those who completed 8 plus hours, further studies are needed to determine if this finding is replicated and, if so, what explains this result.

A major limitation of this study is that we had to exclude patients who did not have a second A1c lab value, which reduced our sample size from 142 to 105 patients. It is important to note that patients at this PCMH were most likely a transient population who either moved out of the area or changed their medical care provider; a common phenomenon among low SES populations. This issue has not allowed us to follow these patients and examine their long-term self-management of T2DM. Also, because this was a retrospective review of patients' medical charts, we were not able to look at other factors that may have impacted their attendance such as employment and readiness to change assessments that would allow us to better understand the behaviors of our patients and the reasons of them dropping out of DSMES.

Conclusion

In conclusion, we found that the rate of newly diagnosed T2DM patients referred to DSMES was low despite the documented benefits of DSMES. Even when referred, the majority of patients did not enroll in DSMES despite its availability and those who enrolled experienced high attrition rates and often prematurely dropped out of the program after the 1-h assessment session. More studies need to be conducted to understand this phenomenon and whether the bimodal distribution of hours attended is similar in comparable settings and population. Our finding that patients who attended 1-h of DSMES achieved a significant A1c reduction suggests the need to consider including additional educational substance in the first hour of assessment. Attendance at and attrition from ADA-DSMES programs remain important issues and understanding why the A1c results are similar among those with one versus full participation is key as new programs are developed.

Declaration of Conflicting Interests

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