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Integrating Education, Group Support, and Case Management for Diabetic Hispanics

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Abstract

Objectives—Culturally tailored diabetes self-management education (DSME) improves glycemic control and other health outcomes in Mexican Americans but sociocultural barriers to health improvements remain. This study explored the feasibility of adding a nurse case manager (NCM) to DSME to foster DSME attendance and increase utilization of other available health care services.

Design, Setting and Participants—The setting was a rural community on the Texas-Mexico border in one of the poorest counties in the United States. Using a repeated measures pre-test, post-test control group design, we enrolled 165 Mexican American adults into: 1) an experimental group that received a DSME intervention plus access to a NCM; or 2) a control group that received DSME only.

Results—Both experimental and control groups received the DSME intervention, reported positive changes in diet and physical activity, and showed improved clinical outcomes; there were no significant group differences. A statistically significant reduction in body mass index was seen in women compared to men, regardless of group or number of NCM contacts. For individuals having the most NCM contacts, DSME attendance rates were greater. Participants expressed acceptance of the NCM; they preferred face-to-face contact rather than by telephone.

Conclusions—Our previously tested, culturally tailored DSME continues to be an effective strategy for improving glycemic control in Mexican Americans. This feasibility study provided partial support for the NCM model for underserved border communities, but additional research is needed on resource utilization and the nature of NCM contacts.

Keywords

Diabetes Self-management; Hispanic; Case Management

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Introduction

Culturally tailored diabetes self-management education (DSME) improves glycemic control and other health outcomes in Mexican Americans and other ethnic groups.[1–8] The Starr County Border Health Initiative, conducted in an impoverished Texas-Mexico border community and ongoing since 1988, has involved the testing of culturally-tailored, community-based DSME interventions designed for Mexican Americans. Results demonstrated statistically significant improvements in HbA_{1c} and fasting blood glucose (FBG), with HbA_{1c} reductions ranging from 1.0%–1.7%-age points.[1,2] A dosage effect of the DSME was detected, with HbA_{1c} decreasing from ≥11.0% at baseline to 9.2% in individuals who attended ≥50% of intervention sessions.[1] Ongoing sociocultural and personal barriers, including the challenges of living in poverty, low health literacy, and lack of experience and skill in accessing healthcare services, remain significant obstacles in the region. Along the Texas-Mexico border, these challenges are compounded by the fact that individuals employ disease self-management alone, taking medications and alternative remedies without any monitoring by a healthcare professional.

The purpose of this two-year study was to explore the feasibility of adding a nurse case manager (NCM) to DSME. We hypothesized that individuals receiving NCM would have higher intervention attendance and would achieve better health outcomes. Case management is typically used in large urban medical systems.[9] Prior to implementing NCM in this rural community, we conducted focus group interviews to inform modifications to the usual NCM role description. Focus group interviews were held in Starr County (Texas) with participants of previous DSME studies, physicians and other healthcare providers practicing on either side of the border, local health officials, key authority figures, and experienced NCMs.

Case management is a strategy used to coordinate healthcare services and provide more consistent levels of health care access. Case managers help patients locate and manage resources, are patient advocates within the healthcare system, and enhance communication among healthcare providers, patients, and their families.[10] While the effectiveness of the case management model has not been explored in rural border communities, a few case management studies have been conducted with minority populations with diabetes (Alaskan natives, Latinos, African Americans).[11–15] In these studies, case managers were effective in improving adherence with diabetes services (eg, eye, dental, and foot exams) and glucose control. The sizes of case manager caseloads varied but typically involved more than 350 patients.[12] Telephone case management for the purpose of educating patients with other chronic diseases (eg, asthma, hypertension) resulted in significant improvements in taking medications correctly, quality of life, and self-confidence in disease self-management.[16,17]

Methods

Design

A two group pre-test, post-test control group design was employed to compare intervention effects between: 1) an experimental group that received an effective DSME intervention tested previously in this population plus access to a NCM; and 2) a comparison group that received the DSME intervention only. Study outcomes measured at baseline and at three and six months included: HbA_{1c}, fasting blood glucose (FBG), lipids (total cholesterol, HDL, LDL, triglycerides), blood pressure, diabetes-related knowledge, health behaviors (physical activity, dietary intake, glucose monitoring), and body mass index (BMI).

Setting

The study site, Starr County, located on the Texas-Mexico border halfway between Brownsville and Laredo, has been described previously.[1,2] Starr County has a population of

62,249, predominantly Spanish-speaking Mexican Americans.[18] It is the poorest county in Texas and one of the poorest in the nation, with the highest rate of unemployment in the state, the lowest personal income, some of the state's poorest housing, and one of the highest diabetes rates and diabetes-related death rates in Texas.[19,20]

Sample

We recruited 165 Mexican American adults (83 participants and 82 supporters) from rosters of ongoing genetic and epidemiological studies conducted by one of the authors (Hanis). Three cohorts of 2 to 3 concurrent groups were constituted with a target of 8 to 10 individuals per group. The sample size was chosen to demonstrate feasibility of the NCM intervention as opposed to testing the hypotheses. This sample size allowed us to examine data trends and conduct exploratory analyses.

Individuals were: 1) aged 35–70 years; and 2) diagnosed with type 2 diabetes verified by 2 FBG test results of ≥140 mg/dL, or taking or having taken insulin or hypoglycemic agents for more than one year. Individuals were excluded if they participated in any of our previous intervention studies, were pregnant, or had medical conditions for which changes in diet and physical activity would be contraindicated (eg, peripheral vascular disease severe enough to preclude walking three times per week). Eight groups of approximately 10 participants plus family members/supporters were constituted. Individuals were grouped according to the area of the county in which they lived to foster neighborhood support between sessions and reduce the likelihood of contamination. Groups were randomly assigned to experimental or control conditions. We expected less attrition than in our previous studies (10% to 19%), since the time between the intervention and final data collection was shorter (ie, 6 vs 12 months). Consent forms informed participants that their laboratory data would be shared with Texas and/or Mexican physicians; 95% of invited individuals agreed to participate. Field office staff provided transportation, if required.

Description of the Intervention and Control Conditions

An experienced NCM was employed for the experimental intervention to provide: additional information and answers to questions on diabetes self-management to augment the DSME intervention; individualized health guidance and assistance with overcoming cultural and environmental barriers to improving health; guidance on locating, accessing, and navigating healthcare services, particularly services available for indigent populations, and; enhanced coordination of health care and communication with physicians and other healthcare providers.

The NCM did not conduct DSME intervention sessions but followed up on DSME intervention sessions, providing individualized guidance. Research has shown that five contacts with a case manager increased clinical follow-up.[21] In this study, the NCM's goal was to contact participants at least five times, including office appointments, telephone calls, or home visits, in addition to attending weekly DSME intervention group sessions. An advisory panel of three experienced NCMs provided input into the NCM role.

Both experimental and control groups received a DSME intervention that has been tested previously in this border community.[1] The curriculum involved eight consecutive weeks of education followed by a support group session at three and six months. Emphasis was on practical aspects of nutrition and physical activity, food preparation demonstrations, field trips to local grocery stores, and 30 minutes of stretching and walking during each weekly group session. Group sessions were informal, open discussions of goal setting and strategies for overcoming barriers, complemented with healthy, culturally appropriate snacks and food preparation demonstrations. Random observation visits were made by the NCM, previously certified as a diabetes educator and an intervention team member in our previous studies, to foster relationships with study participants and to verify the fidelity of the DSME intervention.

All intervention team members —the NCM, nurses, dietitians, and community health workers (CHWs) — were bilingual Mexican-American residents of the Texas-Mexico border region. The CHW arranged DSME intervention locations, contacted patients and their families weekly, organized equipment/supplies, provided transportation when necessary, recorded attendance, and assisted dietitians in food preparation. The Research field office in Rio Grande City, Starr County, and the community-based sites that were used for the DSME component (eg, schools, churches, and health clinics) were used by the NCM to meet with study participants from the experimental groups.

Data Management and Analysis

The research field office staff had been trained to: manage patient flow through the office; conduct basic measurements, such as weights and blood pressures; and manage organizational activities. Instruments were administered in one-to-one interviews with trained data collectors reading each question aloud in Spanish. A database using SPSS Version 17 statistical software was created for managing the data.[22] Data were screened multiple times for accuracy by comparing original data against a computerized list and examining univariate descriptive statistics to determine if values were within expected ranges and means and standard deviations were plausible. SPSS was used for basic descriptive analyses (means, frequencies) and comparing the two study groups. For further exploration, we used hierarchical linear and nonlinear modeling to perform individual growth curve analysis, using multilevel models.

Results

Participants were aged 49 years on average and 69% of the sample was female (Table 1). Individuals were treated primarily with oral hypoglycemic agents for their diabetes, Spanish speaking (scoring low on a language-based acculturation scale), lacking in diabetes-related knowledge (scoring 58% on a test of basic diabetes knowledge), obese, and in poor glycemic control. The most commonly reported comorbidities were hypercholesterolemia and hypertension. With the exception of HbA_{1c}, there were no statistically significant differences at baseline between experimental and control groups.

Both the experimental and control groups showed improvements in FBG levels at three and six months. For HbA_{1c} the control group had greater clinical improvements at both intervals. The overall trend in the data was that both the experimental and control groups improved in outcomes or the control group achieved better outcomes than did the experimental group (Table 2).

Results of repeated measures ANOVA indicated that overall, there were no statistically significant group differences in HbA_{1c}, FBG, or BMI. Since our sample size was small in this feasibility study and severe local weather events negatively affected study participation, we used exploratory growth curve analyses rather than ANOVA as growth curve analyses can maximize the amount of data analyzed. A two-level analysis was conducted where the outcome as measured at three time points (baseline, three months, six months) was examined at Level 1 and covariates of interest (eg, sex, DSME attendance, NCM contact) were modeled at Level 2. Full maximum likelihood procedures were used and all 83 cases were considered in the analyses.

Growth Curve Analyses

Glycosylated Hemoglobin (HbA_{1c})—At baseline the experimental group had lower glycosylated hemoglobin (HbA_{1c}) levels on average than the control group (*t-ratio* = 2.28, *P* = .025). Over time, individuals in the experimental group experienced an increase in HbA_{1c} (*t-ratio* = 4.53, *P*<.001). After controlling for covariates, group status (experimental vs control) was significantly related to the intercept (baseline), as was the percentage of sessions completed. That is, individuals who completed a higher percentage of program sessions had lower baseline HbA_{1c} values (coefficient = −.02, *t-ratio* = −1.95, *P* = .05). The rate of change in HbA_{1c} over time did not differ significantly by sex (coefficient = −.06, *t-ratio* = .25, *P* = .806) or percent of overall DSME attendance (coefficient = −.003, *t-ratio* = 1.106, *P* = .31). Although the finding on DSME attendance was not statistically significant, trends in the data showed that higher attendance resulted in greater reductions in HbA_{1c} levels.

Fasting Blood Glucose—Over time, there were no statistically significant differences in FBG between groups (coefficient = 5.48, *t-ratio* = .818, *P* = .416). Participants who had more contacts with the NCM had FBG levels that were significantly higher than average at baseline (coefficient = 6.11, *t-ratio* = 2.42, *P* = .018). This finding was likely due to the fact that the NCM, out of necessity, had more contact with individuals whose glycemia was least controlled. Participants who completed a higher percentage of intervention sessions had lower FBG at baseline compared to those who completed fewer sessions (coefficient = −.594, *t-ratio* = 2.312, *P* = .023). Although not statistically significant, women had lower FBG levels than men at baseline (coefficient = −8.86, *t-test ratio* = .573, *P* = .568) and those in the experimental group also showed lower than average FBG levels than those in the control group (coefficient = −14.314, *t-ratio* = −.889, *P* = .377). FBG declined significantly over time for those who completed a higher percentage of program sessions (coefficient = −.207, *t-ratio* = −2.193, *P* = .029).

Body Mass Index—Body mass index (BMI) levels at baseline were higher for the experimental group than for the control group (coefficient = 2.43, *t-ratio* = 1.72, *P* = .088), although this finding was not statistically significant. There were no statistically significant group differences in BMI change over time. After controlling for covariates, the data showed that women had baseline BMI levels that were significantly higher than men (*t-ratio* = 7.844, *P* = .006). By sex, the rate of BMI change was significant, with women experiencing a decline in BMI over time compared to men (coefficient = −.27, *t-ratio* = 1.982, *P* = .048). None of the other covariates (intervention group, number of NCM contacts, intervention attendance) was significantly associated with the rate of BMI change.

Since the NCM spent more time with individuals who had the most significant diabetes problems, we tested a series of hierarchical linear models in which we modeled time and quadratic trends at Level 1 and participant level characteristics at Level 2 (eg, intervention group, sex). These exploratory results showed that when nonlinear factors were accounted for, sex and intervention group were not significantly related to BMI. In addition, no significant quadratic trend in BMI was found (coefficient = .04, *t*-ratio = .366, *P* = .715). This suggests that the trajectory for BMI across the three time points was relatively stable over time. A similar pattern emerged when examining nonlinear trends in HbA_{1c} and FBG. None of the Level 2 factors significantly predicted HbA_{1c}. However, tests for quadratic trends in HbA_{1c} (coefficient = .46, *t-ratio* = 2.510, *P* = .049) and FBG levels (coefficient = 12.1, *t-ratio* = 2.239, *P* = .018) were significant. These findings suggest that after controlling for nonlinear trends, Level 2 factors were not statistically significant predictors of HbA_{1c} and FBG over time, but significant nonlinear trends were present. Thus, our supposition that the data were curvilinear was validated but the analyses that accounted for nonlinear trends did not detect any group differences.

Behavioral Outcomes: Physical Activity and Diet

We hypothesized that, if the NCM followed up on the DSME educational sessions with more individualized guidance, study participants with NCM access would have greater improvements in behavioral outcomes. Self-reported physical activity and fat intake improved for both experimental and control groups. The addition of the NCM did not appear to affect self-reported improvements beyond what was achieved by the DSME intervention alone.

Additional Analyses

Based on Attendance at Intervention Sessions—In our previous studies, one of the most important factors in improving outcomes was a dosage effect of the DSME intervention. In the analyses reported above, intervention attendance was a factor in health improvements. Here, we analyzed outcome data from individuals who attended ≥50% of the DSME sessions, regardless of group status (experimental or control) (Table 3). Subjects in both groups achieved reductions in FBG, but HbA_{1c} improvements were larger in the control group. Slight weight loss and increased knowledge were seen over time in both groups.

Severe Weather Events—There were several major weather events that occurred during the months between the end of the intervention for the experimental groups and outcome measurements. In July 2008 Hurricane Dolly affected the Lower Rio Grande Valley and the area, which is characterized by very flat terrain, was saturated with rain. Then, one month later, significant rainfall totaling 25 inches or more in one week affected the area where we conducted the study. Flash flooding resulted in thousands of damaged homes and some of our study participants being displaced. The flooding occurred six to eight weeks before final outcome data were collected from three of the four experimental groups. Given these weather events, we examined intervention effects in individuals whose timing of outcome data measurements were least affected by the floods. Two groups, one experimental and one concurrent control group, completed the intervention and all data collection points (3 months and 6 months) prior to the flooding. Both groups had improved HbA_{1c}, FBG, and diabetes-related knowledge but there were no statistically significant differences between groups.

Discussion

The purpose of this feasibility study was to augment a previously tested DSME intervention with a NCM who would address remaining barriers using an individualized approach. All participants received the DSME intervention; the experimental group also received access to an experienced NCM. Since case managers tend to be employed in urban areas within large hospital systems, development of the NCM responsibilities for this study was guided by research literature, an advisory committee of experienced NCMs, including one who worked in community clinics for Mexican Americans, and focus groups held with key individuals from the study site.

The major finding was that experimental and control groups, both of whom received a DSME intervention, had improved health outcomes, particularly FBG levels by three (t = 3.7, n = 78, P = <.001) and six months (t = 2.8, n = 75, P = .007). In general, health outcomes of those receiving NCM services were no better than those receiving the DSME intervention alone, although there were positive trends in key variables, in particular DSME attendance, which support the potential benefit of NCMs.

Severe weather events may have confounded the results of this study. Major flooding occurred in Starr County six to eight weeks before three out of the four experimental groups were scheduled for final data collection. We analyzed these data in a variety of ways, but we were unable to show that the DSME plus a NCM intervention was superior to the DSME intervention alone. It is possible that the weather events differentially affected experimental group outcomes and our analyses were unable to control for these confounding effects.

The NCM intervention may not have been sufficiently intensive, given the overwhelming problems faced by border residents. Many study participants did not have health insurance and their health and personal problems were considerable, beyond the additional challenges caused by the floods. The NCM was experienced in case management and diabetes care. Her assigned caseload was 48 individuals and she was hired at a 20% full time equivalent position; this was comparable to a full time caseload of 240 patients. Studies of case management involved caseloads of 360+ patients per NCM.[12] The NCM in the Starr County study expressed feelings of being overwhelmed by the number of problems individuals had and their need for constant individualized attention in order to achieve any beneficial effects. Daily logs kept by the NCM documented the disproportionate amount of time she spent trying to contact study participants, either to discuss their progress and challenges over the phone or to make face-to-face appointments.

Current trends in case management, as expressed by the members of the study's case management advisory group, focus on telephone contact as the most cost-effective method of providing health guidance. While we employed telephone contact early in the study, we quickly learned that this approach was not acceptable to many study participants. They preferred face-to-face interactions after several initial group meetings were held to establish trust. The diabetes self-management intervention that both the experimental and control groups received also involved some degree of case management by intervention teams. For example, in the first session intervention team members reviewed locally available diabetes-related resources. Some NCM activities could be assumed by community workers (*promotoras*) that have always been members of our intervention teams. Given that some participants were self-administering medications without any monitoring by a healthcare professional, access to a healthcare professional knowledgeable about diabetes care is required. The case manager and members of the intervention team would benefit from more electronic resources that would link, in a time sensitive manner, the results of the glucometer and laboratory testing. This would be a challenge in rural communities, particularly along the U.S.-Mexico border, where electronic resources may be limited.

In summary, the following lessons were learned from this feasibility study: 1) The culturally tailored DSME intervention that we tested in previous studies continues to be effective in improving glycemic control in under-served Mexican Americans. One of the control groups in this study had a remarkable 5.6%-age point decrease in HbA_{1c}; 2) Higher levels of NCM contact resulted in increased DSME attendance. Similar to our previous studies, greater DSME attendance resulted in reductions in HbA_{1c} and FBG. Our previous studies demonstrated that greater DSME attendance had a dosage effect and resulted in significant improvements in clinical outcomes; 3) Women had higher baseline BMI levels and experienced greater decreases in BMI than men, regardless of group status; 4) Both groups reported increased physical activity and healthier dietary habits; 5) NCM was an acceptable model from a cultural perspective, but study participants preferred face-to-face contact rather than case management by telephone, and; 6) This feasibility study provided partial support for employing the NCM model in underserved border communities. Additional research is needed to identify more specific information on resource utilization and the nature of NCM contacts. A further area of interest for research is the effect of environmental disasters, such as the flooding that occurred during this study, on diabetes treatment, self-management, and health outcomes. It seems logical to posit that a NCM could play a key role in helping individuals cope with such events in the context of limited resources and health issues such as diabetes and other chronic conditions.

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Table 1

Profile of participants upon entry into the study*

Characteristics	DSME + CM	DSME ONLY	Total
n	48	35	83
Sex, women/men, *n*	31/17	26/9	57/26
Age, in years	49.0 ± 7.8	49.7 ± 9.2	49.3 ± 8.4
Age at DM diagnosis	41.7 ± 9.5	43.3 ± 11.2	42.4 ± 10.2
Diabetes duration, years	7.4 ± 6.3	6.6 ± 5.9	7.1 ± 6.1
Diabetes medication modalities, *n*	48	33	
Oral agents %	79.2	66.7	
Insulin %	4.2	15.2	
Oral and Insulin %	12.5	6.1	
None %	4.2	12.1	
Acculturation (range: 1–4)	1.1 ± 1.1	1.2 ± 1.1	1.2 ± 1.1
Preferred language: Spanish %	69	51	61
Language at home: Spanish %	77	66	72
First language: Spanish %	92	94	93
Read no or little English %	48	40	45
Co-morbidities: history of			
Myocardial infarction %	6.3	8.6	7.2
Angina %	4.2	5.7	4.8
Stroke %	4.2	0	2.4
Hypertension %	47.9	54.3	50.6
High cholesterol %	60.4	60	60.2
Gallbladder surgery %	18.8	20	19.3
Diabetes-related knowledge	14.7 ± 4.2	13.5 ± 4.5	14.1 ± 4.3
Body mass index, kg/m^2	34.6 ± 7.6	32.2 ± 5.4	33.6 ± 6.8
Glycosylated hemoglobin, HbA_{1c}	9.2 ± 2.7	10.6 ± 3.0	9.8 ± 2.9
Fasting blood glucose	196.2 ± 72.2	184.1 ± 71.3	191.1 ± 71.7
Serum cholesterol (mg/dL)	171.0 ± 53.4	179.6 ± 50.2	174.6 ± 52.0
Serum triglycerides (mg/dL)	254.4 ± 270.5	209.4 ± 187.8	235.5 ± 239.0

*Data are means ± SD, unless otherwise indicated.

In acculturation, 4 = high acculturation.

Table 2

Primary outcomes

Outcome measure	Program	3 months	6 months	Baseline-to- 3-mo. chg.	Baseline-to- 6-mo. chg.
HbA_{1c}	DSME + CM	9.4 ± 2.6 (44)	10.4 ± 2.8 (42)	+.2	+1.2
	DSME only	9.0 ± 2.1 (32)	8.6 ± 2.0 (29)	−1.6	−2.0
FBG	DSME + CM	176.0 ± 71.7 (45)	183.2 ± 79.7 (46)	−20.0	−13.0
	DSME only	158.8 ± 58.0 (33)	149.1 ± 49.1 (29)	−25.3	−35.0
BMI, kg/m^2	DSME + CM	34.0 ± 7.4 (45)	34.0 ± 7.4 (46)	−.6	−.6
	DSME only	31.9 ± 5.5 (33)	31.4 ± 5.3 (29)	−.3	−.8
Diabetes knowledge	DSME + CM	20.1 ± 3.0 (35)	20.7 ± 2.4 (46)	+5.4	+6.0
	DSME only	21.5 ± 2.4 (27)	20.3 ± 3.8 (29)	+8.0	+6.8

Data are means ± SD (*n*). Total sample, $n = 83$.

Knowledge range: 0–24

Results reflect paired comparisons for individuals for which we have data at both measurement points (baseline + 3 mo., baseline + 6 mo.)

BMI, body mass index

FBG, fasting blood glucose

Table 3

Data on participants who attended ≥50% of intervention sessions (n = 29)

Outcome measure	Program	Baseline	3 Months	6 Months	Baseline-to-3-mo. chg.	Baseline-to-6-mo. chg.
HbA_{1c}	DSME + CM	9.3	9.2	10.0	−.1	+.7
	DSME only	10.1	9.0	8.4	−1.1	−1.7
FBG	DSME + CM	198.6	162.4	166.0	−36.2	−32.6
	DSME only	170.9	148.6	146.6	−22.3	−24.3
BMI	DSME + CM	33.6	33.4	33.3	−.2	−.3
	DSME only	31.9	31.6	31.5	−.3	−.4
Diabetes knowledge	DSME + CM	14.6	21.1	21.0	+6.5	+6.4
	DSME only	13.4	21.7	20.7	+8.3	+7.3

Knowledge range: 0–24

BMI, body mass index

FBG, fasting blood glucose