Effect of a Bicultural Community Health Worker on Completion of Diabetes Education in a Hispanic Population

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OBJECTIVE — To determine the effect of a bicultural community health worker (CHW) on completion of diabetes education in an inner-city Hispanic patient population and to evaluate the impact of completion of the education program on patient knowledge, self-care behaviors, and glycemic control.

RESEARCH DESIGN AND METHODS — Patients were randomized into CHW intervention and non-CHW intervention groups. All patients received individualized, comprehensive diabetes education from a certified diabetes nurse educator after baseline demographic information, diabetes knowledge, diabetes self-care practices, and glycohemoglobin levels were assessed. Rates of education program completion were determined. Diabetes knowledge, self-care practices, and glycohemoglobin levels were reassessed at program completion and at a later postprogram follow-up medical appointment and compared to baseline. Logistic regression analysis and the Mantel-Haenszel χ^2 statistic were used to determine the effect of the CHW assignment on program completion. Analyses of covariance were performed with end-of-treatment behavior scores, knowledge scores, and glycohemoglobin levels as outcome variables, controlling for baseline values and testing for the effect of CHW assignment.

RESULTS — Of 64 patients enrolled in the study, 40 (63%) completed and 24 (37%) dropped out before completing the diabetes education program. Of the patients having CHW intervention, 80% completed the education program, compared with 47% of patients without CHW intervention ($P = 0.01$). "Dropouts" were younger (age 47.5 ± 12.5 years [mean ± SD]) compared with patients who completed the program (55.9 ± 9.9 years) ($P = 0.004$). Dropout status showed no significant relationship to educational level achieved or literacy level. For the program "completers," knowledge levels and selected self-care practices significantly improved, and glycohemoglobin levels improved from a baseline level of 11.7% to 9.9% at program completion ($P = 0.004$) and 9.5% at the postprogram follow-up ($P < 0.001$). The effect of the CHW assignment on program completion, controlling for financial status and language spoken, was extremely robust ($P = 0.007$). The effect of the CHW on knowledge, self-care behavior, or glycohemoglobin outcome variables was not statistically significant.

CONCLUSIONS — These findings suggest that intervention with a bicultural CHW improved rates of completion of a diabetes education program in an inner-city Hispanic patient population irrespective of literacy or educational levels attained. Our data further suggests that completion of individualized diabetes educational strategies leads to improved patient knowledge, self-care behaviors, and glycemic control.

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Received for publication 29 April 1996 and accepted in revised form 16 October 1996.

Presented in part at the American Diabetes Association Annual Meeting and scientific sessions, Atlanta, Georgia, June 1995.

CHW, community health worker; DMC, diabetes management clinic.

Results of studies assessing the impact of diabetes patient education on patient outcomes have yielded conflicting information. However, two recent meta-analyses indicated that patients who received diabetes education with interventions that included behavior change strategies, had improved knowledge, self-care behaviors, and metabolic and psychosocial outcomes (1,2). Similarly, a recent review of diabetes self-management education by Clement (3) found that studies using specific behavior change strategies demonstrated improved patient outcomes, while studies using only didactic methods without individualization or behavior modification strategies did not improve patient outcomes.

Few diabetes patient education studies have assessed important variables for completion of diabetes education programs, such as patient characteristics or social support. In addition, evaluations of diabetes education strategies have not been sensitive to socioeconomic and cultural factors, and few studies have focused on poor, low-literate, inner-city, non–English-speaking patients. Consequently, little is known about the process and outcome of diabetes education programs in these patient populations. Because type II diabetes disproportionately affects African-American and Hispanic-American communities (4), culturally relevant diabetes education strategies need to be developed in these communities. In this study, we explored factors that influenced completion of a diabetes education program in a poor, low-literacy, inner-city Hispanic patient population, including the role of various patient characteristics and intervention with a bicultural community health worker (CHW). Additionally, we determined the impact of completion of diabetes education on patient knowledge, glycemic control, and patient self-care practices.

RESEARCH DESIGN AND METHODS

Setting

The setting was a nurse-managed diabetes management clinic (DMC) at a tertiary care teaching hospital in New York City serving

the community of East Harlem, a minority community comprising Hispanic-Americans, primarily of Puerto Rican origin, and African-Americans. East Harlem is one of the poorest neighborhoods in New York City, characterized by high unemployment and low levels of educational attainment. The DMC is staffed by registered nurses who are certified diabetes educators (CDEs) with experience in diabetes education and management.

Study population

Patients were eligible to participate in the study if they were newly referred to the DMC for patient education, identified their cultural background as Hispanic, and were >20 years old. Of 64 consecutive patients invited to participate during their initial DMC visit, none refused participation. Informed consent was obtained in accordance with the Mount Sinai Institutional Review Board guidelines.

Instruments and data collection

Data collection instruments included a demographic data sheet, knowledge test, and patient self-report of behaviors rating scale. All tools were developed for this study and were available and administered in Spanish as necessary. The instruments were developed based on current literature and incorporated concepts considered critical to diabetes education. As such, they have high face validity. Further, experts in the field of diabetes education (diabetes nurse educators, physician endocrinologists) critiqued the instruments and agreed on the content domains. Thus, the instruments have high content validity. Content, reading level, and questionnaire structure were piloted before the study. Demographic data including age, country of origin, language spoken, educational level, literacy level, employment status, household composition, and patient-rated family support with their diabetes self-care regimen (no support, some support, good support) were obtained by the CHW at baseline. The knowledge test consisted of nine true-false responses and was given before and after the completion of the diabetes education program. A true-false format was used and was most reliable, since tests were administered orally because of high levels of illiteracy in this population. The self-report of behaviors rating scale was also administered orally and consisted of 10 questions related to performance of diabetes self-care practices. The patients' self-rated responses were based on a six-point Likert scale. The diabetes knowledge test and self-report of diabetes self-care practices were administered by the nurse at baseline and were readministered upon completion of the diabetes education program. The mean time to complete diabetes education was 3.4 months (range 0.9–5.4). Self-care practices were again assessed at a follow-up in conjunction with a scheduled medical appointment, a mean of 7.7 months (range 6–16.2) poststudy enrollment.

Labs

Total glycohemoglobin levels (range of normal 4–8%) were measured at baseline, at completion of the education program, and at the postprogram follow-up by an affinity-based column chromatography assay (Glyc-affin GHb, Isolab, Akron, OH). The same assay was used for baseline and all follow-up measurements.

Diabetes education

The diabetes education program was conducted by the CDEs on an individualized, one-to-one basis in accordance with the American Diabetes Association (ADA) Standards for Diabetes Patient Education Guidelines (5) and focused on attainment of self-care skills and behavior change strategies. Patients completed the education program when the ADA standards were met and when individualized learning objectives were completed. Thus, the time to complete the education program varied from patient to patient based on their individualized learning needs.

CHW intervention

The CHW was a bicultural, bilingual Hispanic-American of Puerto Rican heritage who lived in the East Harlem community and who had previously volunteered in a diabetes clinic. After collection of initial baseline demographic data, patients were randomized either to receive or not to receive CHW intervention. The CHW had no further contact with those patients assigned to the non-CHW intervention group. During the study period, the CHW acted as a liaison between the patients, their families, and health care providers for the CHW intervention group. The CHW attended clinic sessions with assigned patients. She served as Spanish interpreter, reinforced self-care instructions, reminded patients of upcoming appointments, and rescheduled missed appointments. For the non-CHW intervention group, encounters took place only between the nurse and the patient and, in some cases, the family member.

Family member participation

Patients were defined as having family participation in the education program if a family member attended most of the education sessions.

Statistical analysis

Paired-sample *t* tests were performed to detect statistically significant differences in the following: *1*) glycohemoglobin levels from baseline (preprogram) to postprogram and from preprogram to later follow-up and 2) knowledge-gain scores from pretest to posttest. Independent sample *t* tests were performed to detect statistically significant differences in the following: *1*) knowledge-gain scores of patients who did and did not have a CHW; 2) knowledge-gain scores of patients who did and did not have a participating family member; 3) glycohemoglobin values preprogram to postprogram of patients with and without a CHW; 4) glycohemoglobin levels preprogram to postprogram for those who did and did not have a participating family member; and 5) differences in age between the group who completed the program and the group who dropped out. The χ^2 statistics were performed to detect differences in group demographic characteristics and the likelihood of dropping out of the program for those with and without a CHW; for 1 df and small cell size, Fisher's exact test results were reported. Logistic regression analysis and the Mantel-Haenszel χ^2 statistic were used to determine the effect of the CHW assignment on program completion. Analyses of covariance were performed with end-of-treatment behavior scores, knowledge scores, and glycohemoglobin levels as outcome variables, controlling for baseline values and testing for the effect of CHW assignment.

RESULTS — The characteristics of the study population are shown in Table 1. A total of 64 patients were enrolled in the study, with a mean age of 52.8 ± 11.7 years (range 21–76 years). Women predominated at 74%, and 75% of patients identified their country of origin as Puerto Rico. Only 26% of patients spoke fluent English; 25% spoke only Spanish, and 49% spoke primarily Spanish. Of the patients, 43% had reached less than the seventh grade, and only 20% had completed 12 years of schooling. On the basis of the ability to read a paragraph of our patient education manual (written at a

Table 1—*Characteristics of the study population*

Characteristic	Population (%)
Sex	
Men	26
Women	74
Country of origin	
Puerto Rico	75
Mainland U.S.	5
Other	20
Language spoken	
Spanish only	25
Spanish, some English	49
Fluent English	26
Educational level	
0–6 grade	43
7–11 grade	37
12+ grade	20
Literacy	
Illiterate	26
Semiliterate	28
Literate	46
House members	
1st-degree relative	62
2nd-degree relative/friends	13
Lived alone	25
Family participation in diabetes education	
Family participation	31
No family participation	69
Diabetes education	
Completed	63
Dropouts	37

For the study population, n = 64 and age 52.8 ± 11.7. years.

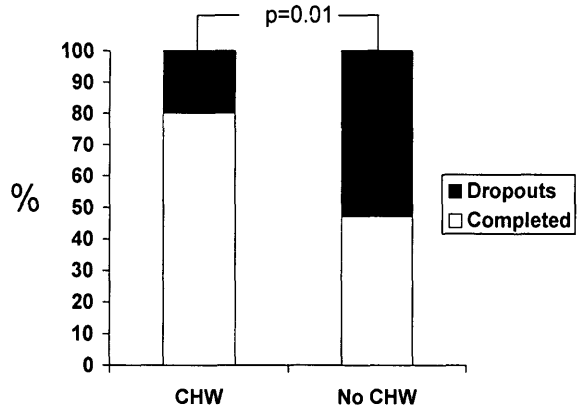

Figure 1—*Of patients randomized to receive intervention with the CHW, 80% completed the diabetes education program in comparison with only 47% of patients randomized to the group without CHW intervention.*

fifth grade level and available in English and Spanish), 26% of patients were judged to be illiterate and 28% of patients semiliterate. Even though the majority of patients lived with family, only 31% of patients attended most diabetes education sessions with a family member.

Of the patients, 30 (47%) were randomly assigned to receive CHW intervention, and 34 (53%) were randomly assigned not to receive CHW intervention. Of the 64 patients enrolled, 40 (63%) completed the program, and 24 (37%) dropped out. Intervention with the CHW had a significant impact on program completion, with 80% of patients randomized to CHW intervention completing the program in comparison with only 47% of the patients randomized to the group without CHW intervention (P = 0.01) (Fig. 1). When patient characteristics of those who completed the education program were compared with those who dropped out, only age reached significance. Dropouts were younger, with an average age of 47.5 ± 12.5 years compared with 55.9 ± 9.9 years for patients who completed the program (P = 0.004). Dropouts showed a trend for unemployment and less family support, though neither reached significance. Educational attainment level, literacy, and family participation in the education sessions were all not significant factors related to program completion.

A logistic regression analysis was performed to determine the effects of CHW assignment on program completion, controlling for variables associated univariately with this outcome. We observed that being assigned to a CHW, being a speaker of English, or having good financial status all increased the odds of completion of the program. Because this type of data lends itself poorly to logistic modeling, particularly in small data sets, we chose to examine the effect of CHW assignment on completion, controlling for financial status and language spoken, using stratified contingency tables and the Mantel-Haenszel χ^2 statistic. The effect of CHW assignment was found to be extremely robust even after controlling for these powerful predictor variables (P = 0.007).

For the 40 patients who completed the program, there was a statistically significant improvement in glycohemoglobin levels. Glycohemoglobin levels improved from mean baseline values of 11.7 ± 3.7% to 9.9 ± 2.2% at completion of the education program (P = 0.004). These improvements were sustained at the later follow-up when mean glycohemoglobin levels were 9.5 ± 3 % (P < 0.001). There were also significant improvements in knowledge scores and self-reported diabetes self-care behaviors. The mean knowledge pretest score was 74.4%, and the mean posttest score was 95.4% (P < 0.001). There were significant improvements in patient self-reports on selected behaviors, including following the meal plan (P = 0.013), carrying a fast-acting sugar (P < 0.001), and performing daily foot care (P < 0.001).

Analyses of covariance were performed with the end-of-treatment behavior scores, knowledge scores, and glycohemoglobin levels as outcome variables, controlling for the corresponding baseline values and testing for the effect of CHW assignment. Similar analyses were performed for the later follow-up behavior scores and glycohemoglobin values as outcomes. In all these cases, the effect of CHW intervention was not statistically significant.

CONCLUSIONS — Numerous factors can influence a patient's readiness for, and response to, education (6,7). Our study was conducted in an inner-city hospital clinic that serves a socioeconomically poor, undereducated, generally underserved Hispanic population. The sociodemographic characteristics of our patients are similar to those of patient populations previously identified as being of inadequate or marginal functional health literacy (8). Such patient populations have difficulty accessing health care and may be unable to adequately comprehend and perform health-related tasks. Consequently, our patients were likely to exhibit lack of appropriate follow-up, poor adherence to regimens, inadequate self-care behaviors, and ultimately poor outcomes.

Our study explored factors that can influence completion of diabetes education in this population. Additionally, the impact of completion of the education program on

short-term outcomes was evaluated. In our study, 37% of the patients dropped out before completing the education program. Dropouts were significantly younger, and there was a nonsignificant trend toward higher unemployment and less family support. Literacy and level of educational attainment showed no relationship with completion of the program. The data, however, strongly demonstrated that the CHW intervention significantly increased the likelihood of program completion. Of the patients who had the intervention of the bicultural CHW, 80% completed the program, compared with only 47% of patients without the intervention. The CHW was successfully integrated into the diabetes team and served as an important link between the patients and their health care providers and between the institution and their community. Brown (9) recently reported similar benefits from the use of a "community lay worker" in a pilot study of culturally sensitive education and group support intervention for Mexican-Americans. In our study, the CHW provided an additional source of social support and was in a critical position to identify and help patients overcome potential barriers to their care.

In this study population, completion of diabetes education was associated with improved glycemic control, improved knowledge levels, and changes in self-care behaviors, despite low literacy rates and educational attainment levels. However, improved outcomes demonstrated no significant relationship with the CHW intervention. It is possible that the number of "completers" may have been too small to detect this relationship, or it may be that the benefit of the CHW intervention was predominantly one of support for accessing the education program until its completion. Our data do suggest that if appropriate strategies are used and patients can complete individualized and culturally sensitive diabetes education, positive patient outcomes can be achieved regardless of socioeconomic status, literacy, or educational status.

This finding emphasizes the importance of diabetes education as verified by others (1–3). Unfortunately, inadequate numbers of people with diabetes receive education, and socioeconomic and educational status may play a role. The National Health Interview Survey (10) documented in 1989 that only 35% of people with diabetes in the U.S. had attended a class or program on diabetes. Mexican-Americans, who were the only Hispanic group described, were the least likely group to have received diabetes education. Patients with low incomes and low educational attainment also tended to have low attendance rates.

This study also demonstrated that the patients who dropped out of the education program were younger than those who completed the program. Other studies suggest that people who attend diabetes education programs are older than people who do not (11). These findings are of particular concern because younger patients have the most potential to benefit from improvements in glycemic control and self-care practices. Thus, factors that may hinder and factors that may enhance younger patients' involvement in education programs, and strategies that engage younger patients in self-care and diabetes prevention activities need to be explored.

This study has some important limitations. The patient population was a convenience sample, that is, those referred to us for education and management, giving rise to the possibility of selection bias. There is also the possibility of reporting bias, inherent in self-reports of self-care behaviors. Lastly, the study design did not include a strategy to follow up and evaluate dropouts from the program. Despite these limitations, the study yielded important results with implications for future design of programs to meet the educational needs of populations of marginal socioeconomic, educational, literacy, and language status.

In *Healthy People 2000: National Health Promotion and Disease Prevention Objectives,* the target goal for people with diabetes to receive diabetes patient education by the year 2000 is 75% (12). To meet this goal, much needs to be done. The numerous factors that can impact on patients' abilities to access, participate in, and complete diabetes education programs need to be further explored. Diabetes education programs need to target those patient groups with limited access to education, particularly the poor and ethnic minority groups. Culturally relevant strategies are needed. In our study, the bicultural CHW was successfully used to help patients negotiate the complex medical system, to emphasize the importance of the diabetes education program, improve compliance with completion of diabetes education and prevent attrition. We conclude that this strategy will be useful in other patient populations. Further research should explore ways to efficiently train such individuals and to cost-effectively incorporate them into the diabetes management team.

Acknowledgments— This study was supported by a grant from the Diabetes Research and Education Foundation.

We wish to thank Angelica Ortiz, who was the community health worker in this study. Without Angelica's dedication and efforts, this study would not have been possible. We would also like to thank Kate deBeer for her assistance in the preparation of the manuscript.

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