Self-Management Goal Setting in a Community Health Center: The Impact of Goal Attainment on Diabetes Outcomes

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Abstract

Objective. This study sought to evaluate the details of self-management goal setting in a largely Hispanic population of patients with type 2 diabetes, to evaluate the impact of various factors on goal attainment and to assess the impact of self-management on glycemic control.

Setting. The intervention was conducted at Community Health Center, Inc., a large, multisite federally qualified health center in Connecticut caring for an ethnically and racially diverse population of medically underserved patients.

Methods. Patients with type 2 diabetes participated in a diabetes self-management program delivered by diabetes educators. We evaluated factors associated with successful goal attainment and the impact of goal setting on glycemic control.

Results. During a 3-year period, 488 patients participated in the self-management program and set a total of 2,133 goals. Hispanic patients and those with depression were as successful as others at setting and attaining goals. Goals focusing on medications and healthy eating were more often successfully attained. Successful goal attainment was independently associated with achieving or maintaining an A1C value of < 7.0%.

Conclusions. Underserved, largely Spanish-speaking patients successfully set and attained specific goals, with a preference for those focused on healthy eating and medication taking. This evaluation suggests an association between the successful achievement of individual goals and glycemic control.

Self-management education is a crucial element of diabetes care. Current diabetes care guidelines recommend that all patients receive self-management education that focuses on behavior change.[1,2] This emphasis on behaviors separates the self-management approach from more traditional diabetes education programs. In the past, diabetes education has taken a more didactic approach, emphasizing the acquisition of knowledge about diabetes. Although such programs can improve patients' level of diabetes knowledge, they are less successful at improving diabetes outcomes than programs focused on behaviors.[3]

There is growing evidence that self-management emphasizing empowerment, self-efficacy, and specific health behaviors can improve diabetes outcomes.[4–6] Whether delivered in group settings or on an individualized basis, self-management can improve glycemic control, which over time can prevent or delay serious diabetes-related complications. Among Spanish-speaking patients, diabetes self-management programs designed with language and cultural considerations can improve health status, glycemic control, and health behaviors.[7–9]

One unique aspect of self-management is its patient-centered approach to behavior change. Patients are encouraged to choose their own goals and in particular to choose only those goals that they feel they can realistically achieve. It has been suggested that for self-management goals to be successful, patients

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should express a confidence level of at least 7 on a scale of 1 to 10.[10] Most successful studies of self-management demonstrate benefit in the aggregate but provide little detailed information about the goal-setting activity of the participants. There are few published data regarding the specifics of patient goal setting: What types of goals do patients set? How many goals do they set? Are they successful at attaining each specific goal? Does attainment of goals, rather than simply participating in a program, lead to better outcomes?

We developed a diabetes self-management program in a community health center, tightly integrated with medical practice, for a largely Spanish-speaking, low-income population of patients with diabetes. The purpose of the study was to examine in more detail the goal-setting behaviors of the participants to determine which patient factors were associated with successful goal attainment and to see whether goal setting and/or goal attainment were related to glycemic control. Our hypothesis was that such a program could improve behavioral and clinical outcomes and promote successful goal attainment. In addition, we hypothesized that actual goal attainment, rather than just program participation, would be better associated with improved clinical outcomes.

Methods

Program setting

The Advancing Diabetes Self-Management (ADSM) Program was conducted over a 3.5-year period at Community Health Center, Inc. (CHC). CHC is the largest federally qualified health center in Connecticut, with primary care clinics located in cities and towns across the state. CHC cares for ~ 50,000 patients, more than 3,000 of whom have a diagnosis of type 2 diabetes. Forty-three percent of the patients are Hispanic (largely of Puerto Rican descent), and 13% are African American. Nearly half speak a language other than English at home. Eighty-eight percent are at or below 200% of the poverty level, and 25% have no medical insurance. CHC provides comprehensive primary care services in a manner that is culturally appropriate and sensitive to the unique needs of its patient population. Primary medical care is provided by primary care doctors and nurse practitioners. Onsite mental health, podiatric, and dental care are available as well.

Project description

The ADSM program was funded by the Robert Wood Johnson Diabetes Foundation. This 3.5-year program brought health centers in real-world settings together with expert support to develop models for delivering diabetes self-management education to underserved populations. The ADSM program at CHC was developed to meet the needs of the largely urban, low-income, Hispanic population cared for by the health center. By design, it was intended to be flexible and to take into account the realities of day-to-day practice. Details of the development and characteristics of the program have been published previously.[11]

The intervention was provided by certified diabetes educators (CDEs), one of whom was bilingual/bicultural. All materials were developed in English and Spanish, and sessions for Spanish-speaking patients were conducted by the bilingual CDE.

The program consisted of six individual one-on-one sessions with the CDE, with additional follow-up sessions on a quarterly basis. CDEs had the option of providing additional sessions for patients at their discretion. The CDE sessions were designed to meet the needs of individual patients and to occur approximately every 1–2 weeks. A checklist was developed to ensure that key topics were covered, but sessions varied in their content based on the needs and expressed interest areas of each patient.

For didactic points, patients received handouts with visuals written at a 6th-grade level. To help patients with behavioral change, a tri-fold pamphlet titled "Managing Diabetes: You Can Do It! Are You Ready?" was given to each patient. This tool helped patients select and set their own goals by providing examples of commonly set diabetes goals.

The focus of each session was on identifying a specific area in which participants believed they could change a behavior and to have them set a specific goal. Patients were encouraged to set highly specific goals with a start date and a measurable quantity or outcome. In addition, patients were asked to rate on a scale from 1 to 10 their confidence in being able to achieve their goal (self-efficacy). Patients with a confidence rating of < 7 were encouraged to adjust their goal or adopt a new goal.

Depression screening

Recognizing that the target population had a very high incidence of comorbid depression, program staff screened members at intake for the presence of depressive symptoms using the Patient Health Questionnaire 9 (PHQ9).[12] This validated instrument has been shown to be effective in both English and Spanish and is ideal for use in a busy clinic setting.[13]

Patients who had a preexisting diagnosis of depression and were already being treated were not screened. These patients continued to receive care from their established mental health provider. Those without a diagnosis of depression completed the PHQ9. Patients found to have at least moderate depressive symptoms (PHQ9 score ≥ 10) were referred for mental health evaluation and treatment.

Mental health services were provided onsite from bilingual psychologists and licensed clinical social workers. Mental health providers used the same chart as the medical staff and communicated closely with the care team to ensure a collaborative approach to management.

Recruitment process

All new and established adult patients with type 2 diabetes at three of the largest CHC sites were eligible to participate in the diabetes self-management program. Because this was a new program, patients had not received self-management education at CHC in the past. Participation was solicited through flyers, posters, direct mailings, and onsite recruitment via referral by provid-

ers, nurses, and medical assistants. Patients willing to participate gave informed consent and had an intake session with one of the CDEs.

Data collection and follow-up
During the intake session, baseline data were collected from patients and from their charts, including demographic, medical, and laboratory data. At each subsequent session, patients were encouraged to set at least one self-management goal. Although the CDEs provided direction and guidance to patients, goals were chosen by the patients themselves based on the areas they identified as wanting to change. Details of each goal were recorded in a database with as much specificity as possible, with emphasis on quantity, duration, start date, and frequency. To better understand the types of goals being set, each goal was categorized into one of the seven self-management outcome domains as defined by the American Association of Diabetes Educators (AADE): healthy eating, being active, self-monitoring, reducing risks, taking medications, healthy coping, and problem solving.

Goals were also tracked in a self-management log kept in a conspicuous location in each patient's chart. At each follow-up visit with a CDE, previously set goals were reviewed and patients' success at achieving each goal was recorded using a four-point attainment score. The scores were assigned by the CDEs based on the patients' reports. The attainment score was derived empirically based on the finding that patients generally reported four different degrees of success at attaining their goals: 4 = complete success, 3 = partial success, 2 = attempted but limited success, and 1 = no success/did not start.

After setting a goal, patients were encouraged to have a follow-up visit with a CDE to evaluate their goal attainment and to set new goals. These follow-ups were every 2–3 weeks until a minimum of six encounters had been made. However, not every patient attended the requisite follow-up visits. In all, 667 of the 2,133 goals set received no follow-ups. The mean number of follow-up visits per goal set was only 1.2. The mean length of follow-up per goal was 3.1 months. There was no restriction placed on the number of goals patients could set, and the number ranged from 0 to 23. Time between first and last goals for a given person varied from 0 to 3.2 years (1,151 days).

Laboratory testing
After enrollment in the program, CDEs encouraged participants to have repeat A1C tests at least every 6 months and more frequently in patients with poor glycemic control. Providers were also sent reminders if patients were overdue for such testing. However, although encouraged, not all participants adhered to the recommendation to obtain such laboratory testing, and for some, this information could not be obtained.

Statistical analysis
Statistical analyses were performed using the SAS version 8.2 statistical software (SAS Institute, Cary, N.C.) and STATA, version 10 (StataCorp, College Station, Tex.). In this study, we were concerned with the following three major outcomes.

Success in goal setting and attainment. This was measured by several variables, including number of goals set, number of goals attained (receiving an attainment score of ≥ 3), proportion of goals attained, mean of first follow-up scores for each goal (with and without 0 assigned for missing scores), mean of maximum scores for each goal (with and without 0 assigned for missing scores), mean of the average scores for each goal, maximum score in any goal, and a yes/no indicator of whether the individual attained any goal. Demographic characteristics were tested for association with these measures by linear regression or logistic regression depending on outcome measure, adjusted for age. Differences in goal attainment (yes/no) by goal category were assessed by overall χ^2 tests, and pair-wise comparisons of mean goal scores between categories were performed with a general linear models analysis with the Scheffe adjustment for multiple comparisons.

Overall rate of change in A1C levels for each patient during the entire goal-setting period. This was obtained by subtracting baseline A1C from final A1C values and dividing by the length of time between the two. Rate of change, rather than absolute change, was chosen to take into account different lengths of time patients were engaged in the self-management program. Baseline A1C was defined as the result of the latest laboratory test in the interval between < 6 months before and < 1 month after the first goal-setting date. Final A1C was obtained from the result of the first laboratory test in the interval 3–15 months after the last goal was set. The mean span between these two dates was 496 ± 18 (standard error [SE]) days, and individuals ranged from 1,377 days (3.8 years), for a patient who set 18 goals, to 91 days for a patient who set one goal.

Unadjusted linear regressions were performed of this A1C rate-of-change outcome on demographic characteristics, A1C level, and self-management goal attainment measures. Assumptions of linearity were checked with lowess curves, and we used leverage vs. studentized residual plots to test for unusually influential observations. Two-predictor models were used to check for confounding and collinearity among the variable set.

Finally, selected variables were included in a multiple regression model to assess adjusted associations with A1C rate of change. The variables chosen were those that retained a significant association after adjustment ($P < 0.05$), covariates that confounded the associations of the significant predictors (changing their coefficients of association by ≥ 15%), and age, sex, and depression (chosen a priori).

Number of patients able to either achieve or maintain an A1C at the target level (≤ 7.0%), as opposed to remaining in the moderate-risk (A1C > 7.0 and < 9.0%) or high-risk (A1C ≥ 9.0%) categories. We created an outcome indicator variable equal to 1 when A1C remained ≤ 7.0% or improved by at least one risk category across a person's entire

goal-setting period and equal to 0 otherwise. Through logistic regression, we identified factors that increased or decreased the odds of A1C category improvement or maintenance, first in unadjusted regressions and then in multiple regression models. Age, sex, depression, and baseline A1C level were included a priori in all multivariable models.

Results

Baseline characteristics of participants

A total of 1,783 patients were eligible to participate in the diabetes self-management intervention. Of those, 488 patients (38% male; 64% self-identified as Hispanic) enrolled in the study. Mean age was 51.5 years, and the mean education level completed was 9th grade. A large proportion of patients (61.9%) either had a history of depression, were receiving treatment for depression, or screened positive for depressive symptoms using the PHQ9 (score ≥ 10). The time since diagnosis of diabetes was highly variable but averaged 6.3 years. Other characteristics of the population are shown in Table 1.

Factors associated with success in self-management goal attainment

Of the 488 enrollees, 429 (87.9%) set at least one goal, and among these, the number of goals per individual ranged from 1 to 23, for a total of 2,133 goals overall. Of all personal characteristics examined, age had the most consistent impact on self-management goal attainment across several measures. There was a slight but statistically significant trend for older people to set fewer goals (mean decrease 0.4 per decade of age), but older patients achieved significantly higher mean attainment scores both at the first follow-up and during the entire goal period (mean difference 0.1 per decade of age). Because of these effects, all other factors examined were adjusted for age.

Relatively few other characteristics of participants had any association with measures of self-management goal attainment (Table 2). Self-identified Hispanics set fewer goals than non-Hispanics but did

Table 1. Baseline Characteristics of Population Enrolled in Self-Management Goal Program (Mean ± Standard Deviation or Percent)

Age (*n* = 488) (years)	51.5 + 10.8
Sex (*n* = 488)	
Male (%)	37.7
Female (%)	62.3
Hispanic (*n* = 483)	
Yes (%)	64.4
No (%)	35.6
Primary language (*n* = 322)	
Spanish (%)	52.5
English (%)	41.6
Bilingual (%)	5.9
Education completed (*n* = 462) (years)	9.0 ± 3.9
Employment status (*n* = 358)	
Employed (%)	20.4
Unemployed (%)	79.6
Current smoker (*n* = 482)	
Yes (%)	26.3
No (%)	73.7
History of smoking (*n* = 313)	
Yes (%)	56.5
No (%)	43.5
Ever felt need to cut alcohol use (*n* = 353)	
Yes (%)	17.3
No (%)	82.7
Current illegal drug use (*n* = 358)	
Yes (%)	2.5
No (%)	97.5
History of illegal drug use (*n* = 358)	
Yes (%)	22.1
No (%)	77.9
Depression (*n* = 488)	
Yes (%)	61.9
No (%)	38.1
Time since diabetes diagnosis (years) (*n* = 441)	6.3 ± 7.5
Baseline A1C (*n* = 487) (%)	8.4 ± 2.2

not differ in the proportion of goals successfully attained. Hispanics also had a significantly lower mean attainment score at the first follow-up, but only when missing scores were assigned as 0 (1.5 ± 0.1 vs. 1.7 ±0.1), perhaps simply indicating that they missed more appointments. People who acknowledged some degree of alcohol abuse tended to set more self-management goals during the program, but they did not differ in the proportion of goals attained. Likewise, people who had a history of smoking set somewhat more goals than those who had never smoked but did not differ in goal attainment. Patients with depression or depressive symptomatology were more likely to achieve at least one goal than participants who were not depressed (odds ratio [OR] 1.59, 95% confidence interval [CI] 1.03–2.46).

Goal categories

As mentioned above, the goals set by participants were classified into seven goal categories as defined by AADE: healthy eating, being active, self-monitoring, reducing risks, taking medication, healthy coping, and problem solving. Only three goals were classified as problem solving, and only one of those had any follow-up visits, so this category was dropped from the analysis of the effect of goal category on successful goal attainment.

The percentage of goals set (n = 2,133) that had follow-up (n = 1,608) (at least one attainment score assessed) did not differ significantly by goal category. However, in overall χ^2 tests, goal category did make a difference in self-management goal success as defined by attainment of a score of ≥ 3, both at the first follow-up visit ($P < 0.0001$) and at any visit during follow-up ($P < 0.0001$). Goal attainment at the first follow-up visit was significantly lower ($P < 0.05$) in the reducing risks category (27%) than in the healthy eating (57%) and taking medication (60%) categories after adjustment for multiple comparisons (Figure 1). Attainment of a goal at any follow-up visit was significantly lower in the reducing risks category (39%) and in the being active category (64%) than in the

Table 2. Mean Number of Goals Set and Proportion of Goals Attained

Characteristic	Mean number of goals set	*P* value*	Mean proportion attained	*P* value*
Age (years)				
< 50	5.0	0.01	0.42	0.26
≥ 50	3.9		0.44	
Sex				
Male	4.2	0.53	0.44	0.81
Female	4.5		0.43	
Education completed (years)				
< 10	4.2	0.52	0.46	0.71
≥ 10	4.6		0.40	
Hispanic				
No	5.1	0.01	0.43	0.89
Yes	4.0		0.44	
Smoke now				
No	4.4	0.64	0.44	0.54
Yes	4.4		0.41	
Ever smoked				
No	3.7	0.06	0.45	0.44
Yes	4.3		0.49	
Employed now				
No	3.8	0.88	0.47	0.32
Yes	4.0		0.42	
Use illegal drugs now				
No	3.9	0.40	0.47	0.21
Yes	3.1		0.31	
Ever used illegal drugs				
No	3.7	0.27	0.45	0.38
Yes	4.3		0.49	
Depression				
No	4.3	0.87	0.43	0.54
Yes	4.4		0.44	
Alcohol problem				
No	3.7	0.01	0.46	0.36
Yes	4.8		0.50	
Time since diagnosis of diabetes (years)				
< 3	3.9	0.44	0.45	0.43
≥ 3	3.4		0.42	
A1C level at baseline (%)				
≤ 7.0	4.3	0.72	0.43	0.47
> 7.0	4.4		0.43	

*Probability that the characteristic has no association with the goal outcome, as determined by age-adjusted regression.

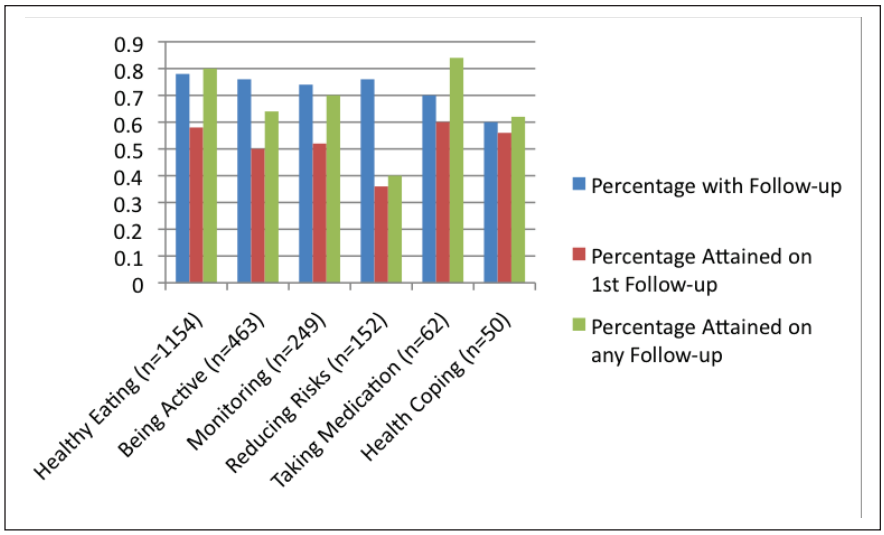

Figure 1. Follow-up and goal attainment by goal category. Attainment measures reflect percentage of goals with follow-up that received a score of 3 or 4. n, number of goals set.

monitoring (69%), healthy eating (80%), and taking medication (86%) categories.

Factors associated with rate of change in A1C scores

Because laboratory tests were at the discretion of the patients' physicians and not required for participation in the self-management program, we were able to obtain valid baseline and final A1C measurements (and therefore rates of change) for only 263 patients. Participants in the program on average had a decrease in A1C of 0.9% per year. Not surprisingly, patients with a higher baseline A1C had greater improvements in glycemic control. In addition, patients with a more recent diagnosis of diabetes showed greater improvement.

Patients with and without valid laboratory measurements were similar in age and sex distribution and in all other factors listed in Table 1 with the exception of education level and time since diabetes diagnosis. Those with laboratory results had achieved a lower grade level (mean grade 8.6 $\pm$ 0.2 (SE) vs. 9.5 $\pm$ 0.3 , $P = 0.03$, Wilcoxon rank sums test) and had known of their diabetes for a longer time (7.0 $\pm$ 0.5 vs. 5.5 $\pm$ 0.5 years, $P = 0.02$, Wilcoxon).

The mean rate of change in A1C for the 263 goal setters who had laboratory tests in the appropriate intervals before and after their goal-setting period was –0.90 $\pm$ 0.18 (SE) per year. This study was not designed to include a control group of people who did not set goals for comparison. However, in our study, 59 people who enrolled did not set goals, and of these, 39 had A1C tests over a comparable time interval, with a mean rate of change of –0.21 $\pm$ 0.35 per year, which was appreciably smaller than the change seen among goal setters.

Factors that showed unadjusted associations ($P < 0.05$) with faster A1C improvement over a participant's entire period of participation in the self-management goal program were (younger) age, (greater) education, (shorter) time since diagnosis, (non-) Hispanic ethnicity, (higher) baseline A1C levels, (no) high blood pressure, (no) high cholesterol, and (no) current illegal drug use. Also, participants without a preexisting diagnosis of depression or a positive PHQ9 score tended to improve their A1C level more rapidly than depressed participants (difference = 0.66 points/year, $P = 0.08$). Current drug use was not included further in multiple models because the sample size of people responding to the question was small (26% missing), and only three people admitted to current drug use, one of whom accounted for the entire association, with an increase in A1C from 8.8 to 13.5%. Factors that had no significant association with rate of change in A1C level were a history of smoking, alcohol abuse, current smoking, employment status, and all measures of self-management goal attainment.

After testing associations of all factors in multivariate models, we arrived at a model containing age, education level, sex, Hispanic identification, depression, time since diabetes diagnosis, and baseline A1C level. Two of these factors were significantly associated, in this adjusted analysis, with the rate of change in A1C levels: *1*) the baseline level of A1C (the higher the baseline level, the greater the rate of decrease) and *2*) time since diagnosis of diabetes (the longer the time since diagnosis, the less the rate of decrease in A1C) (Table 3).

Factors associated with improving or maintaining A1C category

Overall, among the 263 goal setters with A1C results, 135 people remained in the same A1C category, and significantly more people improved ($n = 92$) than worsened ($n = 36$) (sign test and signed-rank test; $P < 0.0001$ under the null hypothesis that the number improving equals the number worsening). We defined a good outcome in A1C category as maintaining the target category (A1C $\leq$ 7.0%) or improving by at least one category from the moderate- or high-risk categories. Bad outcome was defined as remaining in one of the two at-risk categories or moving to a higher-risk category.

Unadjusted logistic regressions of good outcome versus bad outcome, as well as models adjusting for age, sex, education, depression, baseline A1C, time since diagnosis, and the number of self-management goals attained, revealed the same three factors significantly associated with improving or maintaining a good A1C category: *1*) the time since diagnosis of diabetes (the longer the time, the less the probability of a good outcome), *2*) baseline A1C level (being in the middle category of A1C at baseline decreased the odds of a good outcome), and *3*) the number of self-management goals attained (the more goals attained, the greater likelihood of a good outcome) (Table 4).

Table 3. Adjusted* Changes in the Annual Rate of Change in A1C Associated With Several Characteristics of Goal-Setting Individuals (*n* = 233)

Characteristic	Change in Annual Rate of Change of A1C [95% CI]
Age (per 10 years older)	0.02 [–0.34 to 0.38]
Education (per grade)	–0.09 [–0.20 to 0.02]
Male sex	–0.25 [–0.95 to 0.44]
Hispanic ethnicity	0.39 [–0.47 to 1.24]
Depression	0.51 [–0.21 to 1.24]
Time since diabetes diagnosis (per year)	0.08 [0.04 to 0.13]**
Baseline A1C (%) ≤ 7.0 (reference group) > 7.0 and < 9.0 ≥ 9.0	 0 –1.22 [–2.05 to –0.39]** –3.69 [–4.57 to –2.80]**

A negative effect indicates faster improvement in A1C levels.
**Adjusted by multiple linear regression for all other variables in the table.*
***Probability < 0.005 (under null hypothesis that change = 0).*

Table 4. Adjusted* Odds Ratios for Good Outcome (Maintenance in Target A1C Category or Improvement From an At-Risk Category) for Several Characteristics (*n* = 233)

Characteristic	Odds Ratio [95% CI]
Age (years) 20–29 (reference group) 30–39 40–49 50–59 60+	 1 0.73 [0.12–4.50] 0.94 [0.18–4.85] 1.45 [0.27–7.76] 2.89 [0.50–16.59]
Education (per grade)	1.04 [0.96–1.13]
Male sex	1.11 [0.60–2.03]
Depression	1.11 [0.59–2.07]
Time since diabetes diagnosis (per year)	0.92 [0.88–0.96]**
Baseline A1C (%) ≤ 7.0 (reference group) > 7.0 and < 9.0 ≥9.0	 1 0.19 [0.09–0.41]** 0.80 [0.36–1.78]
Number of self-management goals attained (per goal)	1.17 [1.03–1.34]†

**Adjusted in multiple logistic regression for all other variables in the table.*
***Probability < 0.001.*
†Probability < 0.05 (under null hypothesis that odds ratio = 1.0).

We further examined the two aspects that make up this last predictor (the number of self-management goals set and the proportion of them that were attained) by substituting each one separately into the model in place of the number of self-management goals attained. Each, although weaker than the original variable, was a moderately strong predictor of good outcome, showing that both setting goals and successfully meeting them contributed to a favorable outcome. Of note, patients being treated for depression did not differ from patients without depression with regard to improving or maintaining good glycemic control in this analysis.

Discussion and Conclusions

This study provides a more detailed look at the goal-setting behaviors of a largely Hispanic, low-income population engaged in a diabetes self-management program. In a busy, real-world setting, these patients were able to participate meaningfully in diabetes self-management, set and attain goals, and improve their glycemic control.

In this program, in which patients were guided to choose their own goals, they chose diet/nutrition-related goals twice as often as other types of goals and were more successful at attaining these types of goals than those from other categories. Exercise-related goals were the second most commonly chosen goals but were less frequently successful. This may reflect the difficulty of promoting exercise, particularly in a population that is older, overweight, and living in an urban environment. Goals from the reducing risks category were much less commonly chosen and were much less successfully attained both at the first follow-up and at any subsequent follow-ups. Goals in this category tend to focus on things such as foot care, dental care, and home blood pressure monitoring. Problem-solving goals (for example, seeking financial counseling, seeking pharmacy assistance services, or returning to school or job training) were almost never set.

The preponderance of diet-related goals suggests that patients are most concerned with learning how to eat with diabetes. It also suggests a need for programs to find ways of teaching the importance of other types of goals, especially problem-solving goals and those focusing on risk reduction. Although these areas may be less familiar to patients, they are equally important, particularly in high-risk patients, who tend to face more challenges and problems

to overcome with fewer resources to do so.

A broad range of patients were able to successfully set and achieve individual goals. The only patient characteristic that was significantly associated with successful goal attainment was age, with older patients having slightly but consistently more success. In this study, after adjustment for age, there was no statistically significant association between ethnicity or education level and goal attainment. Hispanic/Latino patients achieved goals at rates comparable to other groups, as did patients with lower versus higher educational levels.

The program was specifically designed to meet the needs of a largely Puerto Rican, low-literacy, Spanish-speaking population. The outcomes in this study support the findings of other work showing that self-management programs can promote behavior change and improve clinical outcomes when designed to be culturally and linguistically appropriate[7–9] and geared towards low literacy levels.[14]

Most studies that have looked at health behaviors in diabetic patients with depression have found that the presence of major depression is associated with decreased adherence to self-care guidelines.[15] Even the presence of low levels of depressive symptomatology is associated with decreased diabetes self-management.[16] In our program, patients with depressive symptoms did equally as well at achieving their self-management goals as those without depression. In addition, although depressive symptoms were associated with a slightly lower rate of A1C improvement overall, when results were analyzed by A1C category, patients with depressive symptoms were as likely as those without depression to either maintain a target A1C or improve from a higher-risk to a lower-risk category.

Our program was designed from the outset to focus on the issue of comorbid depression. In addition to screening all patients at intake for depressive symptoms, every effort was made to ensure that each patient with depression received appropriate mental health care. More than 60% of the patients in this study had either preexisting depression or were found to have depressive symptoms when screened. Although some patients had an existing relationship with a mental health provider, many others were identified and treated at CHC, either by the primary care provider or by onsite mental health providers. This meant that many patients with depression were treated collaboratively with an integrated mental health model that included close communication between providers and the use of a common medical record.

This integrated approach to treatment may have contributed to the positive outcomes seen in the depressed cohort. It may also be that by identifying depression at the outset, the educators were able to focus more on psychosocial issues, which is especially important with patients who elect not to seek mental health services.

When a good outcome was defined as either reducing the A1C category or maintaining it at a level $\leq 7.0\%$, the number of successfully attained goals was significantly associated with such good outcomes. The more goals patients attained, the more likely they were to improve or maintain their level of glycemic control. This finding is particularly noteworthy and merits further study. There is good evidence that participation in self-management programs improves glycemic control and promotes behavior change.[6] Our findings suggest that within the group participating in a self-management program, those who successfully attain their self-derived goals are more likely to achieve desired outcomes. Whether this is because of the goal attainment itself cannot be determined, but this finding suggests that the attainment of goals is at least associated with improved outcomes.

One strength of this program was that it was designed to be carried out in a real-world setting. Many diabetes interventions are successful in a research setting but are either overly resource-intensive or exclude many groups of patients commonly affected by diabetes, such as those who do not speak English or those with mental illness. This project was open to nearly all patients and was carried out in a busy community health center. Patients continued to receive primary care from their primary care providers and received self-management education from CDEs who were recruited and trained from health center staff.

An additional strength was the inclusion of patients with all levels of glycemic control. Patients with higher baseline A1C levels are more likely to demonstrate short-term improvement, as was the case in this study. However, maintenance of good glycemic control is an equally important outcome given the progressive nature of diabetes over time. When our analysis included the maintenance of good control as a good outcome, results showed that goal attainment was strongly associated with a good outcome.

The busy, real-world clinic setting, although in some ways a strength, also resulted in several weaknesses. As is the case in all health centers caring for underserved populations, adherence to follow-up was unpredictable, resulting in significant numbers of patients being lost to follow-up. As a result, only 54% of patients had follow-up data, and self-management attainment scores were not obtained at the desired intervals for all patients. Furthermore, it was difficult to ensure that patients got needed laboratory testing at specific intervals. A significant portion of the cohort did not have A1C results in the time windows that would qualify them for inclusion in our analyses of glycemic control. The sample population who did have laboratory results differed from those who did not in having a slightly lower mean level of education and in knowing of their diabetes for a longer period of time. In the absence of a meaningful control group, the ability to interpret these data was limited.

The use of a tool for assessing goal attainment that relies on patient self-report is another potential weakness. This limitation is common to most studies seeking to document

adherence to lifestyle goals such as smoking cessation, diet, or exercise.

Future research should include a control group and consider the use of additional assessment tools such as pedometers or monitors enabled with global positioning systems to assess physical activity, and spot telephone recall or more detailed diet assessment tools to determine nutrition-related behaviors. However, the very nature of self-management goals—the fact that they must be specific and individualized—precludes or limits the use of more standardized tools. A simple tool such as the goal attainment scale used in this study lends itself well to the study of patient behavior across a wide spectrum of goals. Because the theory behind self-management is based on the importance of building self-efficacy through personalized goal setting, it may be that the quantitative attainment of goals, as measured by steps walked, pounds lost, or calories consumed, matters less than patients' perceptions of success and progress.

Diabetes affects the poor and members of ethnic and racial minority groups at a higher rate than other groups.[17,18] These populations are more likely to have poor glycemic control, poor adherence to self-care guidelines, and ultimately higher rates of serious diabetes-related complications.[19] Our program demonstrated that these most marginalized at-risk patients, when provided with a program tailored to meet their needs, can participate actively by attending education sessions and setting real goals. The majority had at least some success at achieving such goals, and those who did were more likely to improve their glycemic control. Health disparities in diabetes outcomes can be reduced when programs such as this are combined with effective, evidence-based medical care with long-term follow-up.

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