Self-Efficacy, Problem Solving, and Social-Environmental Support Are Associated With Diabetes Self-Management Behaviors

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OBJECTIVE — To evaluate associations between psychosocial and social-environmental variables and diabetes self-management, and diabetes control.

RESEARCH DESIGN AND METHODS — Baseline data from a type 2 diabetes self-management randomized trial with 463 adults having elevated BMI (M = 34.8 kg/m²) were used to investigate relations among demographic, psychosocial, and social-environmental variables; dietary, exercise, and medication-taking behaviors; and biologic outcomes.

RESULTS — Self-efficacy, problem solving, and social-environmental support were independently associated with diet and exercise, increasing the variance accounted for by 23 and 19%, respectively. Only diet contributed to explained variance in BMI (β = −0.17, P = 0.0003) and self-rated health status (β = 0.25, P < 0.0001); and only medication-taking behaviors contributed to lipid ratio (total-to-HDL) (β = −0.20, P = 0.0001) and A1C (β = −0.21, P < 0.0001).

CONCLUSIONS — Interventions should focus on enhancing self-efficacy, problem solving, and social-environmental support to improve self-management of diabetes.

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Diabetes management requires coordination between the patient and the primary care team. Given the lifestyle changes required for self-management success, patient, social, and environmental factors, including health care (1) and community support (2), are increasingly recognized as important. Understanding relations among demographic, psychosocial, and social-environmental variables, and multiple health risk behaviors is critical to developing interventions that will sustain health behavior changes.

RESEARCH DESIGN AND METHODS — Baseline data were collected as part of a patient randomized trial to evaluate the impact of an interactive, multimedia diabetes self-management program relative to “enhanced” usual care (Glasgow RE, Christiansen S, Kurz D, King D, Woolley T, Faber A, Estabrooks P, Strycker L, Toobert D, Dickinson J, unpublished data). Recruitment details are also described elsewhere (3). Briefly, participants between 25 and 75 years old were recruited from five Kaiser Permanente Colorado primary care clinics in the Denver metropolitan area. Eligibility criteria included: diagnosis of type 2 diabetes for at least 1 year, BMI of 25 kg/m² or greater, at least one other risk factor for heart disease (i.e., hypertension, LDL >100 mg/dl or on a lipid-lowering agent, A1C >7%, or cigarette smoking), and willingness to participate in a computer-assisted diabetes self-management study.

Data were collected during a recruitment call and baseline study visit. Self-management behaviors were measured using self-report surveys. Fat intake was measured by the National Cancer Institute’s Percent Energy from Fat (PFAT) screener (4). Eating behaviors, such as consumption of sugary beverages and fast food, were assessed with the Starting the Conversation scale (5). Physical activity was assessed by the Community Healthy Activities Model Program for Seniors (CHAMPS) questionnaire (6), calculated as total weekly caloric expenditure.

Adherence to diabetes, blood pressure, and cholesterol medication regimens was assessed by the medication-taking items of the Hill-Bone Compliance Scale (7). Biologic outcomes included the UK Prospective Diabetes Study (UKPDS) 10-year heart disease risk score (8). BMI was calculated from electronic medical records and measurement during the baseline visit. Hemoglobin A1C and lipids were collected at Kaiser Permanente Colorado clinics. General health status was measured using the visual analog scale from the EuroQol instrument (9).

Self-efficacy was assessed with Long’s 8-item Diabetes Self-Efficacy Scale (10). Six additional, similarly constructed self-efficacy items recommended by Bandura (11) were added to measure confidence regarding taking diabetes medications, exercising, and limiting high-fat foods. Self-efficacy subscales were calculated for healthy eating, physical activity, and medication-taking behaviors. Problem-solving skill was assessed with the Positive Transfer of Past Experience from the Diabetes Problem-Solving Scale of Hill-Briggs (12).

The social and environmental context in which patient self-management takes place was assessed at the health care and community resource levels. Support from the health care team was measured using 11 items from the Patient Assessment of Chronic Illness Care (PACIC) (13) survey; support from the broader community was assessed with nine items on the use of healthy eating and physical activity...
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resources from the Chronic Illness Resources Survey (CIRS) (14).

Analyses

Hierarchical multiple regression analyses examined the extent to which psychosocial factors accounted for variance in self-management variables. Demographic variables that were significantly correlated with self-management variables were entered in step 1 (sex, ethnicity, age) and psychosocial factors were entered in step 2. Additional hierarchical multiple regression analyses were conducted to determine the extent to which self-management variables accounted for variances in clinical indicators.

RESULTS — Participants averaged 60 years of age, had elevated BMI ($M = 34.8$ kg/m²), and had a mean A1C of 8.1%.

Fifty percent of participants were female and 21% were Latino. About 20% of participants had less than a high-school education, and 44% reported an annual family income of less than $50,000. Self-efficacy scores revealed moderate confidence and large variability. Participants reported high levels of medication adherence, moderate amounts and high variability of physical activity, high-fat intake, and low fruit and vegetable intake. Demographic factors were not associated with either psychosocial variables or self-management behaviors in bivariate analyses.

Regression results revealed that self-efficacy, problem-solving, and social-environmental factors increased the variance accounted for in all self-management variables (Table 1), and self-efficacy and problem-solving factors were independently associated with three self-management outcomes. Healthy eating patterns and physical activity were especially related to behavioral outcomes. Self-efficacy for diet and physical activity were independently associated with three self-management outcomes.

Mean arterial pressure

The mean arterial pressure was associated with both medication adherence and self-management variables, but not medication adherence. Support from the health care team was not associated with behavioral or clinical outcomes.

Table 1—Associations between psychosocial and social-environmental factors and diabetes self-management and diabetes control

| I. Diabetes self-management outcomes | II. Diabetes control outcomes |
|-------------------------------------|------------------------------|
| Change in $R^2$ | $\beta$ | $P$ | Change in $R^2$ | $\beta$ | $P$ |

Continued on facing page
The importance of social and community en-
the health care team is not underscore the
self-management while support from
fully explore other known correlates of
related to lipid ratio and A1C.

general health, and medication adherence
healthy eating related to self-reported
physical activity measures related to BMI,
healthy eating and calories expended in
self-efficacy was strongly related to
associated with self-management behav-
iors. Self-efficacy was strongly related to

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**Table 1—Continued**

|                          | Change in R² | β   | P       |
|-------------------------|--------------|-----|---------|
| Lipid ratio: total–to–HDL |              |     |         |
| Step 1: demographic variables | 0.05         | 0.0002 |         |
| Step 2: self-management variables | 0.04         | 0.0019 |         |
| Medication adherence | −0.20         | 0.001 |         |
| Starting the conversation (diet) | 0.05         | 0.37 |         |
| % fat (NCI fat screener) | 0.03         | 0.50 |         |
| PA calories/week (CHAMPS) | −0.02         | 0.66 |         |
| Hemoglobin A1C |              |     |         |
| Step 1: demographic variables | 0.16         | <0.0001 |         |
| Step 2: self-management variables | 0.05         | 0.0001 |         |
| Medication adherence | −0.21         | <0.0001 |         |
| Starting the conversation (diet) | −0.06         | 0.22 |         |
| % fat (NCI fat screener) | −0.02         | 0.56 |         |
| PA calories/week (CHAMPS) | 0.01         | 0.78 |         |
| General health state |              |     |         |
| Step 1: demographic variables | 0.05         | 0.0001 |         |
| Step 2: self-management variables | 0.06         | <0.0001 |         |
| Medication adherence | 0.05         | 0.33 |         |
| Starting the conversation (diet) | 0.25         | <0.0001 |         |
| % fat (NCI fat screener) | 0.03         | 0.55 |         |
| PA calories/week (CHAMPS) | 0.03         | 0.59 |         |
| UKPDS (10-year risk) |              |     |         |
| Step 1: demographic variables | 0.0002        | 0.79 |         |
| Step 2: self-management variables | 0.015        | 0.21 |         |
| Medication adherence | 0.09         | 0.09 |         |
| Starting the conversation (diet) | 0.01         | 0.80 |         |
| % Fat (NCI fat screener) | 0.05         | 0.36 |         |
| PA calories/week (CHAMPS) | 0.08         | 0.11 |         |

NCI, National Cancer Institute; PA, physical activity.

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Conclusions — Problem solving and behavior-specific self-efficacy were associated with self-management behaviors. Self-efficacy was strongly related to healthy eating and calories expended in physical activity, as was behavior-specific support from family, friends, and community resources. Healthy eating and physical activity measures related to BMI, healthy eating related to self-reported general health, and medication adherence related to lipid ratio and A1C.

We acknowledge this study’s inability to fully explore other known correlates of self-care, such as the quality of the physician/patient relationship, yet the findings that self-efficacy, problem solving, and social-environmental support are related to self-management while support from the health care team is not undermine the importance of social and community environments in promoting healthy eating, physical activity, and even medication-taking behaviors.

Analyses were limited to baseline data and the use of self-report measures of self-management behaviors, and the study was limited to a fairly educated sample in one health care organization. Nevertheless, the results demonstrated these relationships after controlling for a variety of potential confounders with a large, multi-ethnic sample and using validated measures that were driven by theory. These findings suggest the need to design diabetes self-care interventions that enhance problem-solving skills (e.g., activity logs to identify problems), increase self-efficacy (e.g., skill-building programs), and connect patients to community resources to support healthy eating and exercise.

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