

Factors Related to Perceived Diabetes Control Are Not Related to Actual Glucose Control for Minority Patients With Diabetes

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OBJECTIVE — To examine variables associated with perceived diabetes control compared with an objective measure of glucose control (A1C).

RESEARCH DESIGN AND METHODS — Beliefs about diabetes were assessed among 334 individuals with diabetes living in a primarily low-income, minority, urban neighborhood. Regression analyses tested associations between disease beliefs and both participants' perceptions of control and actual control (A1C).

RESULTS — Poorer perceived diabetes control was associated with perceiving a greater impact of diabetes, greater depressive symptoms, not following a diabetic diet, A1C, and a trend toward less exercise. Variables associated with better actual control (A1C) included higher BMI, older age, and not using insulin.

CONCLUSIONS — Patients' perceptions of their diabetes control are informed by subjective diabetes cues (e.g., perceived impact of diabetes and adherence to a diabetic diet), which are not related to A1C. Clinicians should take into account what cues patients are using to assess their diabetes control.

Diabetes Care 33:736–738, 2010

The common-sense model suggests that patients' adherence to recommendations for managing their diabetes are shaped by health perceptions (1,2). Perceptions of overall health status have been shown to predict overall mortality, morbidity, and diabetes health outcomes (i.e., vascular events and diabetes complications) (3–5). Perceptions of diabetes-specific health status predict quality of life (6). Despite the importance of health perceptions, there are few examinations of factors related to perceptions of diabetes control (7), and to our knowledge, no study has compared the factors related to perceived versus actual glucose control. We hypothesized that perceived

control would be associated with subjective cues (i.e., mood and perceived impact of diabetes) and actual control would be associated with objective cues (i.e., age and insulin use).

RESEARCH DESIGN AND METHODS

This study was part of a larger program to understand and improve diabetes care in East Harlem, a low-income, urban, minority community (8). We identified 670 adults who had at least two visits for diabetes (ICD-9 250.xx). Potential participants were contacted by letter (in English and Spanish), and a bilingual surveyor called individuals who did not refuse further contact. Of these,

334 individuals consented both to complete the survey and to have their A1C extracted from their medical record. The phone survey included questions from validated measures (9) and was informed by our ongoing work with this population (8,10). The two dependent variables were the most recent A1C value in the patients' medical records and the participants' perceptions of diabetes control, assessed by the question, "How well has your diabetes been controlled?"—a question essentially the same as that used in other studies (6).

Analysis

We estimated correlation coefficients (Pearson [r], Spearman [r_s], and point-biserial [r_{pb}] as appropriate) to determine bivariate relationships. Separate multivariate regression analyses were conducted using actual glucose control (A1C) and perceived diabetes control as dependent variables. Two models were run predicting perceived control: one with and one without A1C as a predictor variable. Number of hypoglycemic episodes, perception that following a diabetic diet is stressful, and self-monitoring of blood glucose did not predict either dependent variable and were not entered into the final model. Finally, variables that predict A1C may indirectly affect perceptions of control through their influence on A1C. To examine this, we tested A1C as a mediator of the relationship between perceived control and any independent variable that predicted A1C, using a bootstrapping technique (11).

RESULTS — The sample was 42% African American, 58% Latino, 14% Caucasian, and 78% female, with an average age of 60.2 years. The majority of participants had a high school education or less (78%); 28% had less than a junior high school education. Most were overweight (BMI ≥ 25 kg/m² = 91%) or obese (BMI ≥ 30 kg/m² = 66%), and 33% used insulin. Although fewer than half (24%) had well-controlled diabetes (A1C $\leq 6.5\%$), more than half (51%) perceived their di-

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Received 6 July 2009 and accepted 31 December 2009. Published ahead of print at <http://care.diabetesjournals.org> on 12 January 2010. DOI: 10.2337/dc09-1229.

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Table 1—Regression analyses predicting perceived diabetes control and actual control (A1C)

	Perceived diabetes control ($R^2 = 0.28$)			A1C ($R^2 = 0.11$)		
	β	<i>t</i>	Significance	β	<i>t</i>	Significance
Age	0.08	1.31	0.19	−0.13	−2.00	0.05
Insulin use	0.02	0.43	0.67	0.25	4.29	<0.01
Education	0.07	1.23	0.22	0.01	0.17	0.86
BMI	−0.02	−0.36	0.72	−0.15	−2.54	0.01
A1C	−0.30	−5.43	<0.01	NA	NA	NA
Sex	−0.02	−0.30	0.76	−0.05	−0.76	0.45
Depressive symptoms	−0.19	−3.38	<0.01	0.02	0.28	0.78
Perceived impact of diabetes	−0.19	−3.36	<0.01	−0.04	−0.68	0.50
Self-report exercise	0.10	1.84	0.07	0.02	0.24	0.81
Self-report diabetic diet	0.22	4.05	<0.01	0.34	0.58	0.56

abetes as well controlled or very well controlled.

Better actual diabetes control, or lower A1C, was associated with older age ($r = -0.15$, $P < 0.01$), higher BMI ($r = -0.13$, $P < 0.05$), and not using insulin ($r_{pb} = 0.26$, $P < 0.01$). Perceiving better diabetes control was associated with older age ($r_s = 0.17$, $P < 0.01$), not using insulin ($r_{pb} = -0.13$, $P < 0.05$), reporting fewer depressive symptoms ($r_s = -0.27$, $P < 0.01$), less impact of diabetes ($r_s = -0.26$, $P < 0.01$), and reporting better adherence to diet ($r_s = 0.24$, $P < 0.01$) and exercise ($r_s = 0.11$, $P < 0.05$). The association between better perceived control and lower A1C was moderate ($r_s = -0.36$, $P < 0.01$).

Multivariate analyses demonstrated better actual control (lower A1C) among patients who were older, heavier, and did not use insulin (Table 1). Patients perceiving glucose control as better perceived less impact of diabetes, had fewer depressive symptoms, followed a diabetic diet, and had lower A1C. Self-reported exercise was positively related to perceived control, but the effect was not significant. The pattern of significant results was unchanged when A1C was excluded from the model. Finally, A1C mediated the effect of insulin use on perceived glucose control (point estimate of -0.16 ; 99% CI -0.32 to -0.06). A1C did not mediate the effect of age or BMI on perceived control.

CONCLUSIONS— Consistent with hypotheses generated by our theoretical model (2,12), patients relied on subjective cues (e.g., depressive symptoms, perceived impact of diabetes, and perceived adherence to diet) in assessing diabetes

control. However, actual glucose control (A1C) was only related to objective factors, including insulin use, BMI, and age. As with other studies, only a small amount of the variance in A1C was explained (13).

Clinicians should determine what their patients are using to estimate glucose control. Although fluctuations in glucose do not correspond well to subjective cues, subjective cues are salient and compelling to patients as indicators of health (14). Estimates of glucose control based on subjective cues will likely lead to overly optimistic estimates of control that are unlikely to motivate changes in self-management. Clinicians should teach patients to use objective measures (such as pedometers and glucose monitors) not only to evaluate behavior and glucose control, but to test assumptions about the impact of subjective cues on glucose control. Without challenging these assumptions, patients will likely continue to overuse subjective cues.

Limitations include a moderate response rate and not assessing patients' awareness of their A1C or their understanding of what well-controlled diabetes means. Awareness of A1C levels probably accounts for the moderate correlation between A1C and perceived control. Unexpectedly, higher BMI was associated with better A1C. This finding, while not predicted, has been found in other cross-sectional studies and is likely a result of limitations in cross-sectional designs and self-report data (13).

The main contribution of the study is that subjective cues affect perceptions of control but not actual glucose control. Patients' perceptions of control were predicted by depressive symptoms and

perceptions of health behaviors, whereas more objective and stable factors affected their actual A1C. Studies are needed to test new ways to teach patients how their behaviors affect blood glucose levels. With accurate perceptions of how subjective cues and specific actions affect blood glucose, patients can modify their daily behaviors and improve actual diabetes control.

Acknowledgments— This study was funded by the New York State Department of Health Diabetes Prevention and Control Program and the National Center on Minority Health and Health Disparities (R24 MD 001691). Aspects of this material are the result of work supported with resources and the use of facilities at the War-Related Illness and Injury Study Center (WRIISC), Department of Veterans Affairs, New Jersey Health Care System.

No potential conflicts of interest relevant to this article were reported.

Aspects of this research were previously presented at the Society of Behavioral Medicine Conference, Washington, D.C., 22–24 March 2007.

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