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Diabetes Peer Coaching

Do "Better Patients" Make Better Coaches?

Elizabeth A. Rogers, MD, MAS

Danielle M. Hessler, PhD

Thomas S. Bodenheimer, MD, MPH

Amireh Ghorob, MPH

Eric Vittinghoff, PhD, MPH

David H. Thom, MD, PhD

From Division of General Internal Medicine, University of California San Francisco, San Francisco, California (Dr Rogers), Division of General Pediatrics, University of California San Francisco, San Francisco, California (Dr Rogers), Division of General Internal Medicine, University of Minnesota, Minneapolis, Minnesota (Dr Rogers), Division of General Pediatrics and Adolescent Health, Minneapolis, Minnesota (Dr Rogers), Department of Family and Community Medicine, University of California San Francisco, San Francisco, California (Dr Hessler, Dr Bodenheimer, Ms Ghorob, Dr Thom), Department of Epidemiology and Biostatistics, University of California San Francisco, San Francisco, California (Dr Vittinghoff).

Correspondence to Elizabeth A. Rogers, MD, MAS, Divisions of General Internal Medicine and General Pediatrics, Applied Clinical Research Program, University of Minnesota, Room 166, 717 Delaware St. SE, Minneapolis, MN 55414, USA (earogers@umn.edu).

Purpose

The purpose of this study was to identify characteristics of peer coaches associated with improvement in diabetes control among low-income patients with type 2 diabetes.

Methods

Low-income patients with type 2 diabetes who spoke English or Spanish from 6 urban clinics in San Francisco, California, were invited to participate in the study. Twenty participants received training and provided peer coaching to 109 patients over a 6-month peer coaching intervention. Primary outcome was average change in patient glycosylated hemoglobin (A1C). Characteristics of peer coaches included age, gender, years with diabetes, A1C, body mass index (BMI), levels of diabetes-related distress, self-efficacy in diabetes self-management, and depression.

Results

Patient improvement in A1C was associated with having a coach with a lower sense of self-efficacy in diabetes management ($P < .001$), higher level of diabetes-related distress ($P = .01$), and lower depression score ($P = .03$).

Conclusions

Coach characteristics are associated with patient success in improving A1C. "Better" levels of coach diabetes self-efficacy and distress were not helpful and, in fact, were associated with less improvement in patient A1C, suggesting that some coach uncertainty about his or her own

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diabetes might foster improved patient self-management. These coach characteristics should be considered when recruiting peer coaches.

In the United States, diabetes affects 8.3% of the population and is the seventh leading cause of death.[1] Chronic diseases such as diabetes require extensive self-management, and providing self-management support is the fundamental task assigned to the health care team within the chronic care model.[2] In settings strained for time and resources, new models are being tested to provide this support. One model involves using peers—patients who also have diabetes—to provide support to other patients. Several randomized controlled trials have found peer support to provide improvement in diabetes control as measured by reduction in glycosylated hemoglobin (A1C) levels,[3-7] including one-on-one peer coaching.[8-10] However, in these studies, not everyone benefits equally. It is unclear from the current literature which diabetes peer support intervention elements may be most important for patient success.[11] Who benefits may depend on coach characteristics as well as on patient-coach similarities. No studies could be located that examined coach characteristics or patient-coach demographic concordance as predictors of success within a peer coaching intervention. To maximize diabetes peer coaching efficacy in future interventions, understanding the integral pieces of the health coach intervention is crucial. If one can identify influential coach characteristics that predict better glycemic control for the patients they coach, coach selection and patient-coach pairings can be improved, promoting intervention efficacy and patient success. The goal of this study was to investigate the association of coach characteristics on reduction in patient A1C within a diabetes peer coaching intervention.

Methods

Design

To identify whether coach characteristics and patient-coach concordance by age, gender, race/ethnicity, or education might influence patient success in lowering A1C, the authors used previously collected data from a diabetes peer coaching trial to isolate, using linear regression, coach characteristics that were statistically associated with change in patient A1C levels. They used a cohort of low-income patients diagnosed with diabetes who participated as coaches (hereafter referred to as coaches) and as patients receiving coaching (hereafter referred to as patients), in the intervention arm of a randomized controlled trial (RCT) comparing diabetes peer coaching to usual care.[12] In this trial, the intervention arm of coached patients had a larger decrease in A1C over the 6-month coaching intervention, with an average decrease of 1.1% versus 0.3% in the control arm (P = .01).[10] The authors hypothesized that low-income patients who are coached by peers who have more years with diabetes, lower BMI, lower level of diabetes distress, higher level of self-efficacy, or lower depressive symptoms will experience greater diabetes control as measured by A1C. The authors further hypothesized, based on previous studies linking patient-provider concordance to improved outcomes in diabetes management,[13-15] patients of coaches with whom they were concordant on age, race/ethnicity, gender, and/or education would have a greater improvement in their A1C. These coach characteristics and patient-coach concordance variables were the candidate predictors in assessing influence on patient change in A1C.

Setting and Participants

Details of the study design of the randomized controlled trial have been published previously.[12] Briefly, all participants were eligible to be a patient in the trial if they received care from 1 of 6 San Francisco Department of Public Health primary care health centers serving low-income populations, spoke English or Spanish, had poorly controlled diabetes defined as an A1C level of >8.0%, and were not currently enrolled in a management program or study. Patients were identified through an electronic registry, diabetes classes, or posted fliers.

Coaches were individuals with controlled diabetes, defined as an A1C level <8.5%, and spoke either English or Spanish who were recruited based on clinician and staff recommendation after reviewing a registry of eligible patients with whom they were familiar. Potential coaches underwent 36 hours of training that included instruction on the basics of diabetes, using active listening and nonjudgmental communication, helping with diabetes self-management skills, providing social and emotional support, assisting with lifestyle change, facilitating medication understanding and adherence, navigating the clinic, and accessing community resources. After passing both a written and oral exam, they became peer coaches.

Patients were paired with a coach based on their preference after looking at a booklet with a photo and brief coach self-description, language (all were language concordant), and coach availability. Generally coaches and patients were from the same clinic. Coaches interacted with patients assigned to them either in person, by telephone, or during a clinic visit, at the discretion of the coach and patient, with these interactions serving as the setting for coaches to support patients with identifying care management obstacles and to design concrete action plans to achieve goals chosen by the patient. Over the course of the trial, each coach was assigned to on average 5 patients (range, 1-9).

The study was approved by the institutional review (human subjects) board of the University of California, San Francisco. All participants provided signed informed consent at the time of their enrollment.

Measures

Both patient and coach participants completed detailed surveys at the time of enrollment answering questions about demographic characteristics, years with diabetes, use of insulin, and diagnoses of hypertension or hyperlipidemia. Surveys also included 3 validated Likert-scale surveys—the Diabetes Distress Scale (DDS),[16-18] which assesses level of distress attributable to diabetes (patient concerns about disease management, support, emotional burden, and access to care); the Perceived Diabetes Self-Management Scale (PDSMS),[19] which assesses how efficacious one feels in his or her diabetes self-management; and the 8-item Patient Health Questionnaire (PHQ-8),[20] which assesses depression symptoms (depressed mood, anhedonia, fatigue, difficulty concentrating, psychomotor agitation, feeling bad about self, and changes in sleep and appetite). Participant height and weight was assessed by the research assistant who administered the survey. A1C was measured at a central laboratory at San Francisco General Hospital. The baseline level was obtained between 6 months prior and 4 weeks after enrollment (median = 34 days prior to enrollment; intraquartile range = 6 to 74 days prior to enrollment). The 6-month level was obtained between 5 and 9 months after enrollment (median = at 6 months; intraquartile range = 6 prior to 24 days after the 6-month mark). The primary outcome was reduction in patient A1C.

Patient-coach dyads were defined as "concordant" by age if they were no more than 10 years apart, by gender if either male or female by self-report, by race if they self-identified as the same race or ethnic group (Asian or Pacific Islander, black or African American, Latino or Hispanic, Native American, or white or Caucasian non-Hispanic), and by education if they were no more than one level apart (levels were defined as no school, between first and fifth grade, between sixth and eighth grade, some high school, high school graduate or GED, some college, and college graduate).

Statistical Analysis

The authors used linear regression to evaluate the relationships of coach characteristics and patient-coach concordance (predictor variables) with change in patient A1C (outcome variable). They also evaluated an a priori set of patient variables to identify significant predictors to include as adjusting variables in the final model. Model selection proceeded in 2 stages. In the first, the authors excluded predictor variables with the weakest association to change in patient A1C using 2-predictor models (after adjustment of patient baseline A1C), retaining variables with $P < .20$ for further consideration as potentially significant predictors for the final model. In the second stage, starting with this reduced set of candidate predictors, the authors selected the final multivariate model by sequentially deleting the remaining predictor variables with P-values ≥ 0.20, leaving the model that retained all variables with an association to change in patient A1C. The authors used the liberal inclusion criterion of $P < .20$ to ensure that negatively confounded variables were retained in the first stage and to minimize residual confounding in the second. Generalized estimating equations were used to account for clustering of the outcome among patients with the same coach.

To further examine the pattern of the association between continuous predictors and change in patient A1C, the authors used a technique known as restricted cubic spline modeling to test for nonlinearity. Those variables that were found to have statistically significant ($P < .05$) nonlinearity were modeled using linear splines to more accurately describe the association with the outcome variable. They designated points of change in the direction of the association based on the shape of the cubic spline. The authors checked the models for omitted interactions, collinearity between predictors, normality and constant variance of the residuals, and influential points. Observations with missing values on any included variable were dropped from the analysis. All reported P-values are 2-sided. All analyses were carried out in STATA Version 12 (Stata Corp, College Station, Texas).

Table 1

Baseline Characteristics of Diabetes Peer Coaches and Coached Patients

Baseline Characteristic	Coaches (n = 20)	Patients (n = 109)
Age, mean ± SD, years	59 ± 9	57 ± 10
Female gender (%)	12 (60)	60 (55)
Race		
Latino (%)	7 (35)	48 (44)
Black (%)	8 (40)	41 (38)
White (%)	2 (10)	9 (8)
Other (%)	3 (15)	11 (10)
Language		
Spanish (%)	5 (25)	42 (39)
English (%)	15 (75)	63 (58)
Native of U.S. (%)	13 (65)	61 (56)
At least high school graduate or GED (%)	19 (95)	68 (64)
Part- or full-time employed (%)	5 (25)	21 (20)
Annual household income >$10 000 (%)	13 (65)	43 (39)
In long-term relationship (%)	6 (32)	31 (28)
Years with diabetes, mean ± SD	12 ± 13	12 ± 10
Diagnosis of hypertension (%)	15 (75)	99 (91)
Diagnosis of hypercholesterolemia (%)	11 (55)	79 (72)
Use insulin (%)	5 (25)	65 (60)
Body mass index, mean ± SD, kg/m^2	35.4 ± 12.2	35.1 ± 8.4
A1C[a], mean ± SD, %	6.8 ± 0.7	9.9 ± 1.9
Diabetes Distress Scale Score (1-6), mean ± SD	1.6 ± 0.6	2.5 ± 1.0
PHQ-8[b] Depression Scale Score (0-24), mean ± SD	2.1 ± 2.8	7.9 ± 5.6
Perceived Diabetes Self-Management Score (8-40), mean ± SD	27 ± 4	21 ± 4

[a]A1C = glycosylated hemoglobin.
[b]PHQ-8 = 8-question Patient Health Questionnaire depression scale.

Results

Six-month A1C levels were available for 123 of the 148 patients enrolled in the coaching arm. Two patients were excluded from our analyses because their primary coach dropped out at the time of patient enrollment and there were no documented coach interaction forms. Twelve more patients were excluded from our analyses because of missing data regarding their coach's BMI and the patient's number of years with diabetes, leaving 109 patients. Of 24 study peer coaches, 4 did not have any patients among the 109 used in the current analysis, leaving 20 coaches for inclusion. Characteristics of the 20 coaches and 109 patients receiving coaching analyzed in this study are shown in Table 1.

Coaches and patients were similar with respect to age, gender, and race. Coaches were slightly more likely to speak English as their primary language and to have been born in the United States, and were on average more educated. Coaches and patients reported having had diabetes for a mean of 12 years, but coaches were less likely than patients to use insulin (25% vs 60%). Both groups on average were obese, with mean BMIs around 35 kg/m^2. The average coach baseline A1C level was well controlled at 6.8% (range, 5.3%-8.2%), compared to 9.9% for patients receiving coaching. Coaches had low levels of distress attributed to diabetes (DDS score = 1.6, scale range, 1-6) and low depression scores (PHQ-8 score = 2.1 [scale range 0-24, ≥10 consistent with current depression[21]]); mean patient scores were higher for distress and depression. Coaches' sense of self-efficacy with their diabetes management was good, reflected in an average PDSMS score of 27 (scale range, 8-40 with higher indicating greater self-efficacy); the mean patient score was lower at 21.

Table 2

Baseline Coach and Patient Characteristics Associated With 6-Month Change in Average Patient A1C in Bivariate Models[a]

Baseline Characteristics	Coefficient (95% Confidence Interval)[b]	*P*-Value[c]
Coach characteristics		
Years with diabetes (per 5 years)	–0.08 (–0.16, –0.01)	.02
Baseline A1C when <7% (per 1%)	0.12 (–0.42, 0.67)	.67
Baseline A1C when >7% (per 1%)	0.61 (–0.16, 1.37)	.12
BMI when <35kg/m^2 (per 5 kg/m^2)	0.16 (–0.13, 0.45)	.29
BMI when >35kg/m^2 (per 5 kg/m^2)	–0.23 (–0.41, –0.05)	.01
Diabetes Distress (DDS, per 1 point)	–0.48 (–0.80, –0.15)	.004
Self-efficacy (PDSMS, per 5 points)	0.40 (0.09, 0.71)	.01
Depression (PHQ, per 5 points)	–0.41 (–0.87, 0.06)	.09
Patient-coach concordance characteristics		
Age concordant	–0.46 (–1.11, 0.18)	.16
Education concordant	0.44 (–0.13, 1.01)	.13
Patient characteristics		
Baseline A1C (per 1%)	–0.70 (–0.91, –0.50)	<.001
Years with diabetes when <15years (per 5 years)	0.42 (0.03, 0.81)	.03
Years with diabetes when >15 years (per 5 years)	–0.30 (–0.53, 0.06)	.01
Diagnosis of hypertension	1.07 (–0.28, 2.42)	.12

[a]Only those predictors meeting criteria for potential inclusion in the final multivariate model (*P*-value < .20) are shown. All models except for patient A1C were adjusted for baseline patient A1C level.
[b]Coefficients represent change in patient A1C level over the 6-month intervention. A negative number indicates a decrease, or improvement, in patient A1C for each interval increase in the predictor.
[c]Test for overall importance of the predictors as linear splines in the model were $P = .14$ for coach baseline A1C, $P = .03$ for coach BMI, and $P = .04$ for patient years with diabetes.

Regarding patient-coach demographic concordance, 65% were concordant by gender, 58% concordant by age, 62% concordant by race/ethnicity, and 58% concordant by education (all pairs were language concordant by trial design). The average patient change in A1C by coach over the 6-month intervention ranged from an increase in A1C of 0.7% to a decrease of 2.7% with an overall average decrease, or improvement, of 0.9% (standard deviation ± 2.3%).

Predictors selected for further consideration in our initial screening of candidate predictors are shown in Table 2. These included coach years with diabetes, baseline A1C and BMI, self-efficacy and depression; patient-coach concordance in age and education; and patient baseline A1C, years with diabetes, and hypertension. Baseline coach gender and age and patient-coach concordance by gender and race/ethnicity did not meet criteria for inclusion. No other baseline patient variables that were tested met criteria for inclusion, including patient demographics, educational level, BMI, insulin use, diagnosis of hyperlipidemia, diabetes distress score, or perceived diabetes self-efficacy. The effects of coach A1C and BMI, as well as patient years with diabetes, were nonlinear, and thus modeled using linear splines.

The final multivariate model is shown in Table 3. The association of coach baseline A1C and BMI with change in patient A1C was nonlinear. For patients with coaches who had baseline A1C levels <7%, lower coach A1C was associated with a greater decrease, or improvement, in patient A1C over 6 months ($P < .001$, Figure 1a), consistent with our hypothesis. However, the opposite was seen for patients of coaches with A1C levels >7%, but this was of borderline statistical significance ($P = .05$). Among coaches with BMI <35kg/m^2, lower BMI was associated with greater decrease (improvement) in patient A1C, again consistent with our hypothesis ($P < .001$, Figure 1b). However, for patients of coaches with BMI >35kg/m^2, as coach BMI increased, there was a greater improvement in patient A1C over 6 months ($P = .03$). Contrary to our hypothesis, coaches with greater distress

Table 3

Baseline Coach and Patient Characteristics Associated With 6-Month Change in Average Patient A1C, Final Multivariate Model[a]

Baseline Characteristics	Coefficient (95% Confidence Interval)[b]	*P*-Value
Coach characteristics		
Baseline A1C when <7% (per 1%)	1.23 (0.80, 1.66)	<.001
Baseline A1C when >7% (per 1%)	–0.71 (–1.41, 0.001)	.05
BMI when <35kg/m^2 (per 5 kg/m^2)	0.44 (0.28, 0.60)	<.001
BMI when >35kg/m^2 (per 5 kg/m^2)	–0.12 (–0.23, –0.01)	.03
Diabetes distress (DDS, per 1 point)	–0.42 (–0.75, –0.09)	.01
Self-efficacy (PDSMS, per 5 points)	0.72 (0.40, 1.03)	<.001
Depression (PHQ, per 5 points)	0.55 (0.05, 1.06)	.03
Patient-coach concordance characteristics		
Age concordant	–0.62 (–1.31, 0.06)	.07
Education concordant	0.55 (–0.12, 1.21)	.11
Patient characteristics		
Baseline A1C (per 1%)	–0.72 (–0.94, –0.51)	<.001
Years with diabetes when <15 (per 5 years)	0.44 (–0.02, 0.90)	.06
Years with diabetes when >15 (per 5 years)	–0.26 (–0.49, –0.03)	.03

[a]Results after backward deletion starting from a single model using all predictor variables meeting inclusion criteria from bivariate analysis listed in Table 2. Patient hypertension diagnosis and coach years with diabetes variables were dropped through backward deletion for the final model.
[b]Coefficients represent change in patient A1C level over the 6-month intervention. A negative number indicates a decrease, or improvement, in patient A1C for each interval increase in the predictor.

related to their diabetes and with a lower sense of self-efficacy with diabetes management had, on average, patients with a greater decrease (improvement) in their A1C levels. Finally, consistent with our hypothesis, coaches with lower depressive symptoms had, on average, patients with a greater decrease (improvement) in A1C over 6 months.

Neither patient-coach concordance by age nor by education was statistically significantly associated with change in patient A1C over 6 months. Of the patient variables included in the final model as confounders, only baseline patient A1C was statistically significantly associated with patient change in A1C. This final multivariate model accounts for just under half of the variability of patient change in A1C seen in this data set (R^2 = 45%).

Discussion

In this exploratory analysis of a prospective cohort of patients with diabetes and their peer coaches, neither coach age, gender, or years with diabetes nor any patient-coach concordance characteristics were associated with change in patient A1C. However, other coach characteristics were associated. Contrary to our hypothesis, lower coach diabetes distress and higher coach self-efficacy with diabetes management were not associated with a greater improvement in patient A1C, and in fact, the opposite was true. The most successful coaches had higher distress and a lower sense of self-efficacy around their own diabetes self-management. They also had lower depressive symptoms.

Keeping in mind that overall the coaches in this cohort had relatively high confidence around their self-management and a low level of diabetes distress, the association between both less coach confidence around diabetes self-management and greater coach distress around their own diabetes with improved patient outcomes suggests that some uncertainty with the coach's diabetes management might encourage empathy, approachability, development of coping strategies that might be useful for sharing with patients, or perhaps an openness to coach training. The social learning theory of a "coping model" in which participants formulate their own solutions has proven effective in influencing both children's and parents' self-efficacy as compared to a "mastery model" in which external models demonstrate new skills.[22-24] In a similar way, one can speculate that peer coaches who have had

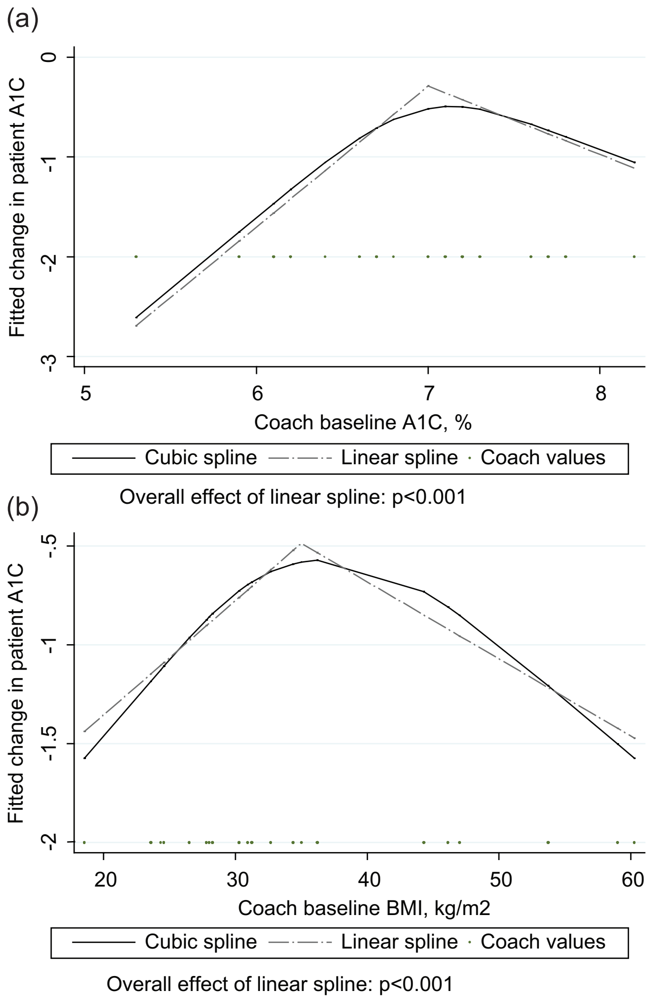

Figure 1. Association between mean change in patient A1C and both (1a) coach A1C and (1b) coach BMI at baseline comparing linear versus cubic spline fit. Coach A1C and BMI are centered.

their own struggles and have been trained in motivational interviewing are good "supports" as patients discover their own solutions as opposed to a perfect, confident "model" who only demonstrates new skills. Perhaps these findings reflect that the coach with good A1C control but who is also somewhat unsure about her own self-efficacy and feels at least some distress about her own disease is more collaborative and willing to participate in a reciprocal relationship that facilitates peer coaching and fosters patient self-management. A recent one-on-one peer coaching RCT by Long included exit interviews of the coaches in which 15 of 24 felt it was important that at one time they did not have good control,[9] giving additional support to this explanation.

Coach diabetes-related distress and depressive symptoms operated independently and in differing directions in this study. Previous studies differentiate diabetes distress from depression such that distress pertains to patient concerns about disease management, support, emotional burden, and access to care; and major depressive disorder is related to but distinct from diabetes distress.[17] One could imagine that the variance unique to depression such as fatigue and anhedonia would not facilitate coaching ability. However, those who have some distress but not these depressive symptoms could have more motivation for change through coach education and could make stronger patient connections. Thus, even though diabetes-related distress and depression are somewhat related, they appear to function independently in regard to peer coaching.

While there was no significant association between coach A1C level and patient success in a simple linear regression model (results not shown), results from this exploratory analysis using spline regression found that lower coach A1C levels <7% were associated with greater patient success. Above 7% the association was reversed, though this was of borderline significance. Similarly, there was no association between baseline coach BMI and patient success in a simple linear regression model, but using a linear spline to better fit coach BMI, the authors found that more successful coaches had either very low or very high BMI measures. When interpreting these, one must keep in mind that our coaches had well-controlled diabetes with A1C levels less than 8.3%, preventing any conclusions about whether patients with A1C levels greater than this might still be successful coaches. Regarding coach BMI, one could speculate that the extremes in coach BMI influence patients differently—coaches with low BMI could serve as a role model, whereas patients might relate more comfortably with coaches with highest BMI. Given the exploratory nature of spline analyses and the unexpected pattern of results for coach A1C and BMI, these results should be considered preliminary and require replication before being applied as criteria for selecting coaches.

As more clinics work to implement peer coaching models into their diabetes management potentials, we need a better understanding of how this heterogeneous intervention works and which elements are most important to replicate so that these interventions are as useful as possible. This study demonstrates that the coaches themselves are an important element of the intervention:

baseline characteristics of coaches, particularly psychosocial characteristics, do influence the glycemic control of the patients they coach. When recruiting diabetes peer coaches, individual characteristics should be considered beyond just A1C level.

Limitations of the study include the small sample size particularly after dropping missing data, though reviewing baseline characteristics of coaches and patients dropped from the analysis did not demonstrate consistent differences from those included. Inadequate heterogeneity in patient-coach concordance in our cohort likely contributes to the lack of association with patient change in A1C, and these results should be replicated in a larger or more heterogeneous cohort before concluding that concordance is not important to the patient-coach relationship. Our results also may not be generalizable to populations or interventions that do not match our study.

With this new knowledge that the coach element is important for patient success, new questions arise that could not be answered with our data. There are likely to be unmeasured aspects of the coach as well as the patient that are important for patient-coach interactions that one cannot capture through this quantitative methodology, a hypothesis supported by the >50% of variability in patient outcome that is not explained by our model, leaving room for future qualitative work. Qualitative work might also better address the question of how coaches influence their patients. There is also a need for longer-term evaluations to assess the durability of patient glycemic control and whether coach associations remain important after an initial coaching exposure.

In conclusion, though the authors hypothesized that "better" patients would make better coaches, our study demonstrates that higher coach distress regarding his or her diabetes and lower coach self-efficacy with diabetes management influence patient success through this diabetes peer coaching intervention. In addition, lower coach depressive symptoms was associated with greater patient success. Overall, a variety of patients diagnosed with diabetes have potential to be successful coaches. Those who are implementing diabetes peer coaching programs in their own clinics should consider coach recruitment based on the individual's more qualitative characteristics that might facilitate a collaborative patient-coach relationship, fostering improved patient diabetes self-management.

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