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Outcomes of a Health Coaching Intervention for Older Adults With Uncontrolled Type 2 Diabetes

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Abstract

Objectives—To develop a pilot health coaching curriculum, investigate its effects on geriatric patient outcomes, and examine qualitative feedback by older patients and medical students to the curriculum.

Methods—A mixed methods study involving 29 first-year medical students randomly paired with 29 older adults with uncontrolled Type 2 diabetes was completed. Health-related quality of life (HRQoL), stage of change movement, diabetes knowledge, locus of control, body mass index (BMI), and glycosylated hemoglobin (HbA1c) were assessed. Focus groups were used to evaluate patients' and medical students' experiences.

Results—Patients' HRQoL and stage of change for exercise improved significantly over time. There were no significant changes in stage of change for healthy diet and medication, diabetes

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knowledge, BMI, and HbA1c from baseline to end-of-study. Focus group data indicated positive responses by older patients and the medical students.

Discussion—A health coaching curriculum may improve patient outcomes and can provide medical students the skills needed to provide compassionate care for geriatric patients.

Keywords

geriatric education; medical students; diabetes mellitus; quality of life; stages of change

Introduction

More than 25% of the U.S. population aged ≥ 65 years has diabetes (Centers for Disease Control and Prevention, 2014). The demands of providing healthcare for an aging population are enormous, and constantly growing in number and complexity (Shay & Burns, 2008). Due to the significant effects of diabetes on morbidity, mortality, and healthcare costs, a need exists for innovative strategies that help older patients with diabetes to effectively manage their disease and improve their quality of life (Norris, Engelgau, & Narayan, 2001).By developing medical students' skills in health promotion and disease management early in their coursework, medical schools may increase students' interest in and attention to health promotion in their practice (Wylie & Holt, 2010).

One strategy to test and practice these patient-centered skills is through the development of health coaching curriculums for medical students. Palmer et al. defines health coaching as "the practice of health education and health promotion within a coaching context, to enhance the well-being of individuals and to facilitate the achievement of their health-related goals". Due to the need in medical education for geriatric education and patient-centered care (Eleazer, Doshi, Wieland, Boland, & Hirth, 2005), medical educators at The Ohio State University. This geriatric curriculum, titled "Senior Partners," was implemented during the 1995–96 academic year. Preclinical students were paired with older, relatively healthy adults who lived in the community, met with them six times over two years, and completed a series of assignments (Kantor & Myers, 2006). The program promoted a health-oriented, rather than disease-focused model of aging, and was designed to modify student beliefs and attitudes that aging is synonymous with infirmity.

The Ohio State University developed training in patient-centered care among a geriatric patient population by developing a pilot health coaching component. This curriculum was modeled after the 6-step approach for curriculum development for medical education (Kern, 1998). Advantages associated with this option involved working with clinic patients and the development of competency in patient-centered communication and behavior change skills.

Health coaching is a program that also emphasizes a wellness-oriented model of aging (Warshaw, Bragg, Brewer, Meganathan, & Ho, 2007). A large body of literature has demonstrated that health coaching is effective in the adoption of healthy behaviors, improves measures of health, and reduces health care utilization (Frates, Moore, Lopez, & McMahon, 2011; Hayes, McCahon, Panahi, Hamre, & Pohlman, 2008; Holland et al., 2005; Howard & Hagen, 2012; Palmer, Tubs, & Whybrow, 2003; Wolever et al., 2010).

Most studies have investigated the use of professionals in the coaching role, although a few have examined the use of students (Leung et al., 2012; Sacco, Malone, Morrison, Friedman, & Wells, 2009; Sheehan-Smith & Brinthaupt, 2010; Wagner, Jester, & Moseley, 2002; Veroff, Marr, & Wennberg, 2013). Findings have been limited by brief intervention duration (Leung et al., 2012; Sacco, Malone, Morrison, Friedman, & Wells, 2009; Sheehan-Smith & Brinthaupt, 2010; Wagner, Jester, & Moseley, 2002), minimal training (Sheehan-Smith & Brinthaupt, 2010), and high attrition rates (Leung et al., 2012; Sheehan-Smith & Brinthaupt, 2010). One study (Wagner, Jester, & Moseley, 2002) reported the use of medical students as health coaches, but information on the details or effectiveness of this curriculum could not be found. To the authors' knowledge, no published studies to date have reported on health coaching as a component of a geriatrics curriculum in medical school.

The aims of our pilot study were to: 1) develop a health coaching curriculum; 2) assess the effects of the curriculum on patient outcomes; and 3) examine patients' and students' qualitative experiences with the curriculum.

Design and Methods

Recruitment

All first-year medical students were emailed information about an alternative to the required Senior Partners curriculum. The health coaching program was later described at an information session for all interested first-year students. If students agreed to participate, an informed consent process followed. Our initial recruitment goal was 30 students, and this was achieved. However, one student discontinued the program due to academic reasons, resulting in a total of 29 student participants.

The Ohio State University's Primary Care Network were recruited to participate through an email message. If they agreed to participate, an informed consent process followed. Physicians were requested to refer potential patients into the program and periodically meet with students to discuss patient progress.

Patients were eligible for participation if they were: 1) age ≥ 65 years old; 2) diagnosed with uncontrolled Type 2 diabetes (HbA1c > 7%); 3) independent in all activities of daily living (ADL); and 4) received care with a primary care provider (PCP). Patients referred by their primary physician were contacted by a member of the study team through a phone call. If patients agreed to participate, an informed consent process followed. Patients were randomly assigned to work one-on-one with the students. Approval to conduct this study was obtained from The Ohio State University's Institutional Review Board (IRB).

Health Coaching Curriculum

Training—Students received training in health coaching prior to and during the time they were coaching patients. They attended six (four in first year, two in second year) two-hour training sessions that covered a variety of topics, including chronic disease management, fundamentals of diabetes care, behavior change, patient education resources, and health coaching skills. The two health coaching sessions in the second year were taught by professional health coaches employed by the university health plan. In addition, students

were required to attend three (two in first year, one in second year) check-in sessions. These involved group discussion of students' successes and challenges with health coaching, and included suggestions from faculty (a physician and a behavior scientist) on problem-solving strategies students could utilize.

Students were required to meet three times (once in first year and twice in second year) with a designated fourth-year medical student and received individual consultation on health coaching. Two fourth-year students, one for each year of the study, received one-month of elective credit in Family Medicine by performing a variety of study-related roles, including consultations with students, recruiting patients and physicians, conducting baseline and end-of-study interviews, and participating in study meetings.

Health Coaching Program

Students met with patients in the seniors' homes and/or agreed-upon locations (e.g., clinic or community library) to perform the following tasks over time: 1) Meet with the patient and perform a needs assessment; 2) Based on results, collaborate with the patient to develop an action plan; 3) Set up a tracking system to monitor patient progress towards achieving goals; 4) Collaborate with patients on strategies that could be used to reduce barriers and achieve goals; and 5) Communicate progress of patients by writing a consultant letter to the patient's primary care physician.

Students were required to meet with their patient at least four times (twice in the first and twice in the second year) and to contact their patient via phone or email four times (twice per year) to complete these study tasks. In addition, students were initially required to accompany their senior to one medical office visit and use a program titled "PACE" to teach the patient prior to the medical visit how to communicate effectively with their physician (Cegala, Coleman, & Turner, 1998). Students experienced multiple difficulties with this component of the program, and completion of this module was changed from required to strongly encouraged. Upon completion of the program, patients received a $50 gift card for their time.

Measures

Patients were asked to complete the following surveys at baseline and end-of-study: SF-36, Diabetes Knowledge Test, Multidimensional Health Locus of Control, and stage of change for exercise, diet, and adherence to diabetes medications. HbA1c and BMI data were collected from patients' electronic medical record at baseline and end-of-study. Baseline was considered the date of the clinic visit closest to and before the start date of the intervention, and end-of study as the date closest to and after the final date of the intervention. Demographic information was obtained in the baseline survey.

HRQoL: SF-36—The SF-36 (Ware & Sherbourne, 1992) was used to assess patient perception of HRQoL during the past four weeks. The instrument contains 36 items and 8 individual sub-scales: physical functioning, role limitations due to physical health problems, bodily pain, general health, vitality, social functioning, role limitations due to emotional problems, and mental health. Each individual sub-scale is scored separately, and scores

range from 0–100, with 100 being the more favorable score. The Cronbach's alphas for the SF-36 subscales have ranged from 0.82 to 0.93 (Ware, Kosinki, & Keller, 1994; Ware & Sherbourne, 1992). Reliability analysis for the current study found Cronbach's alpha for the SF-36 is 0.76.

Diabetes Knowledge Test—The Diabetes Knowledge Test (DKT) (Fitzgerald et al., 1998) was used to assess diabetes-specific knowledge. All 23 items can be used for patients who take insulin, while the first 14 questions are also applicable to patients who do not take insulin. The test emphasizes patients' understanding of their disease process/management, co-morbidities related to diabetes, as well as new knowledge acquired. We erroneously included only 13 of the 14 non-insulin items and converted raw test scores to percentage of questions answered correctly. Cronbach's alpha for the DKT = 0.71 (Fitzgerald et al., 1998). For the current study, the Cronbach's alpha for the DKT is 0.69.

Multidimensional Health Locus of Control—Multidimensional Health Locus of Control (MHLC) (Wallston, Wallston, & DeVellis, 1978) is an 18-item scale that measures the degree of external versus internal control the patient believes he/she maintains over the disease. The MHLC contains 4 subscales: Internal, Chance, Doctors, and Other People. Responses to each item are on a 6-point Likert scale (1 = "Strongly Disagree" to 6 = "Strongly Agree"), with higher scores indicating higher control. Cronbach's alpha was 0.82 for the internal control subscale, 0.82 for other people, and 0.72 for the Chance subscale (Wallston, Wallston, & DeVellis, 1978). For the current study, the Cronbach's alpha for the internal control subscale is 0.74, 0.73 for other people, and 0.70 for the Chance subscale.

Stage of Change—Patients also completed an 8-item measure to assess their willingness to change/attempt to change their health behaviors (Norcross, Krebs, & Prochaska, 2011; Prochaska & DiClemente, 1992). They were asked to complete two items for each health behavior in order to assess stage of change for exercise, diet, and adherence to diabetes medication. Participants in the precontemplation stage had no intention of taking action (exercising, dieting, taking medication) in the next 6 months. Participants in the contemplation stage intended to take action in the next 6 months, but not within the next month. Participants in the preparation stage planned take action in the next month, while those in the action stage reported having changed their health behavior (exercising, dieting, taking medication) within the past 6 months. Finally, participants in the maintenance stage had changed their health behavior over 6 months ago and planned to continue their health behavior change.

Demographic Characteristics—Participants provided information about age, gender, race, marital status, education, employment, and household income at the time of consent.

Disease-Specific Measures—We assessed HbA1c and BMI to measure potential changes in patients' medical outcomes. Quality metrics for this study were aligned with goals recommended by the American Diabetes Association (ADA) 2011 guidelines (American Diabetes Association, 2011).

Responses to the Study: Patients and Student Health Coaches—Qualitative data was obtained from patients, students, and referring physicians regarding the quality of the curriculum. Five focus groups (2 with medical students, 3 with patients) were conducted. Focus group questions focused on successes and challenges experienced by each group, program satisfaction, and suggestions regarding improvement. All focus groups were audio recorded and transcribed verbatim. Transcripts were reviewed for accuracy. Names of participants and other identifiers were removed.

Referring physicians were asked to complete a 9-item post-program survey. Questions included rating of patient outcomes, evaluating the value of student health coaching, and recommending the program to future patients. A five-point Likert response scale, ranging from a score of 1 (strongly disagree) to 5 (strongly agree), was used.

Analysis

Descriptive statistics assessed demographic information and pre-post outcome measures, as available, for all participating patients. Descriptive statistics were also used to summarize responses to the physician survey. Change in patient outcome measures was assessed using two-tailed dependent t-tests (Rosner, Glynn, & Lee, 2006). Change in stage of change for health behaviors (medication adherence, diet, and exercise) was assessed using the Wilcoxon test. Bonferroni corrections were used for calculating p-values. Specifically, $p = 0.05/8$ for SF-36 and $p = 0.05/4$ for Multidimensional Health Locus of Control were indicated. All analyses were performed using SPSS version 22.0 (IBM, 2013).

A research group outside of The Ohio State University with expertise in focus group methods directed the qualitative component of the study. The PI of the study (DP) created an initial set of questions for the patient and student focus groups. These questions were discussed at a study meeting and an agreed-upon final version was sent to the outside organization that conducted the focus groups. Questions included items regarding success of the program, challenges faced by the student or patient, their satisfaction with the program, and any suggestions they had regarding improvement. Two professionals from the research group outside The Ohio State University conducted the focus groups, read through transcripts, and generated a list of thoughts and outcomes shared by participants. A “member check” process was not used to validate the qualitative data (Lincoln & Guba, 1985). The final report included focus group themes, key findings, and implications of results (Creswell & Clark, 2007).

Results

Patient Characteristics

Patient characteristics are summarized in Table 1. The average patient age was 72.2 years, and 58.6% were female. Almost two-thirds (62%) of the sample was white, more than half (58.6%) were married, almost half (48.3%) completed college or had a graduate degree, almost three-fourths (72.4%) were retired, and more than half (54.5%) had incomes of less than $40,000 per year.

Physician Characteristics

Thirteen primary care physicians agreed to participate in the study. Six (46.2%) were family physicians, 6 (46.2%) were general internists, and 1 (7.6%) was a med/peds physician.

Process Characteristics

Several students were delayed in starting their health coaching role with patients. Contributing factors included patients not following study protocol ($n = 3$) for various reasons, patient withdrawal due to lack of interest ($n = 2$), patient withdrawal due to relocation outside of the region ($n = 1$), and transfer of care to a non-university primary care physician ($n = 1$). This resulted in 22 (76%) patient participants completing the baseline surveys within 2 months of each other. The remaining 7 participants (24%) completed baseline surveys over the next 6 months. All patients completed the program within 1 month and 1 day of each other. The average duration of the program was approximately 14 months, as originally intended (range: 8.6 – 17). This time frame included the summer months between the first and second year of medical school when students were not expected to coach patients.

HRQoL

Changes in HRQoL were examined from pre-to-post intervention. Two subscales of the SF-36 showed significant improvements in functioning (Table 2). Role limitations due to physical health decreased over the course of the intervention ($p = 0.04$) and social functioning improved ($p = 0.02$).

Multidimensional Health Locus of Control and Diabetes Knowledge

As shown in Table 2, patients had a stronger tendency to attribute health outcomes to their own actions, as compared to doctors, chance, or other people. Interestingly, all subscales decreased over time, although none of these decreases were statistically significant. In addition, no significant pre-post differences were found in patients' diabetes knowledge ($p = 0.22$).

Stage of Change

Stage of change movement for exercise, diet, and adherence to diabetes medication from baseline to end-of-study is reported in Table 3. Among the 28 patients prescribed diabetes medication, 25 (89.3%) remained in the same stage, 3 (10.7%) had forward stage movement, and none moved backward in their stage over time. Twenty-one out of 29 (72.4%) patients reported receiving a diet recommendation from their doctor. Ten (47.7%) of these patients stayed in the same stage, 7 (33.3%) had forward stage movement, and 4 (19%) had backward stage movement from baseline to end-of-study. Twenty-two out of 29 (75.9%) patients reported receiving an exercise recommendation from their doctor. Of these, 12 (54.6%) stayed in the same stage, 9 (40.9%) had forward stage movement, and 1 (4.5%) had backward stage movement from baseline to end-of-study. At end-of-study, there was significant forward stage movement of patients towards the action/maintenance stage for exercise ($Z = 2.13$, $p = 0.04$).

Disease-Specific Measures

There were no significant differences in participants' HbA1c ($t = -0.11$, $p = 0.92$) and BMI ($t = 0.84$, $p = 0.41$) from baseline to end-of-study. At baseline, the mean BMI score was 33.38 (SD = 7.52) and at follow-up, participants' BMI was 33.07 (SD = 7.46). Average HbA1c was 8.17% at baseline and 8.22% at end-of-study.

Medical Student Focus Groups

Two focus groups (first group = 8 students, second group = 10 students) were held with the medical students at the end of the health coaching program. Students indicated that working with an actual patient, in particular an elderly individual, was the highest-rated aspect of the program. They appreciated the program's emphasis on disease management and health coaching's focus on the "whole person" and the stage of change model. They also enjoyed learning about the patient's specific background and life experiences. Students felt these aspects made health coaching sessions more relaxed and facilitated positive patient progress towards health goals. In terms of gaining knowledge and skills, students felt the patient needs assessment, patient action plan, and accompanying patients on visits to their physician were useful learning opportunities.

There were, however, several needs for improvement identified with the intervention program as it was administered. Students indicated several challenges were associated with the health coaching program. These included: 1) patient matching issues, such as being matched with either extremely knowledgeable patients or unmotivated patients; 2) logistical issues; 3) lack of relevance of some of the training sessions; and 4) lack of knowledge of diabetes, as compared to patients. Overall, most medical students reported positive interactions with and feelings of closeness to their patients. Many students reported their patients made progress towards a healthier lifestyle, although it was unclear whether this progress impacted patients' HRQoL.

Patient Focus Groups

Three focus groups (first group = 3 patients, second group = 4 patients, third group = individual interview with 1 patient) were held with the patients at the end of the health coaching program. Patients indicated that building a relationship between students and patients was their favorite aspect of the program. Similar to students, patients believed coaching provided students an opportunity to work with "real" patients and learn more about their unique situations. Another highly-rated aspect of the program was the opportunity to learn a great deal about the management of their diabetes. Several mentioned the student was so persistent that they eventually altered their exercise and dietary behaviors. In addition, several patients mentioned they often felt uncomfortable asking their regular physician questions due to time constraints. Because of their relationship with student health coaches, patients expressed feeling more comfortable talking to their coach who, in turn, would obtain answers to their health questions. In addition, several patients mentioned that working with students on their health goals improved their motivation to change health behavior.

Initially, patients could not think of a program component needing improvement. When prompted, some patients, similar to students, expressed dissatisfaction with student

knowledge of diabetes. All patients expressed overall satisfaction and would recommend the health coaching program to other patients. Overall, patients' responses towards the program were very positive, while student reactions were mixed. It seemed that the programmatic difficulties associated with the first year of this pilot program were a contributing factor to student responses, and that these issues did not affect patients.

Referring Physicians' Survey Results

Thirteen physicians participated in the study, and 11 (85%) completed the post-program survey. All of the 11 physicians agreed that their participation in the program was easy and did not hinder or interfere with their work. Ten (90.9%) of the 11 physicians reported valuing the educational effectiveness of the program and 8 (72.7%) recommended the health coaching program for future medical students. The lowest agreed-upon statement involved the program improving patient outcomes. Three (27.2%) physicians agreed and six (54.5%) were unsure about the improvement in patient outcomes. The physicians communicated positive feedback about the program, stating it provided students a realistic insight into the challenges patients experienced with chronic disease management. Referring physicians stated their patients received a beneficial education from the medical students.

Discussion

The current project was designed to directly benefit the geriatrics education of students at the The Ohio State University's College of Medicine by providing an early, active patient partnership experience. The major benefit of this program was in the "real life" experience that it provided to students regarding the challenges and rewards of working with patients in promoting health behavior change.

Results of the study were mixed. Scores on all HRQoL sub-scales improved over time, although pre-post change was significant on two of the eight sub-scales. However, general improvement in HRQoL was an unexpected finding for a sample whose mean age was 72 years. For patients with chronic disease, previous research indicates risk factors for adverse outcomes increase and associated HRQoL decreases as individuals grow older (Buckley et al., 2013; Laiteerapong et al., 2011).

During the course of the intervention, participants reported improvements in their stage of change. The participants' stage of readiness for health behavior change generally moved in healthy directions. The largest change involved exercise, with nine times as many individuals reporting forward versus backward stage movement for exercise. This suggested that student health coaches had a positive impact on factors important to the effective control of diabetes. This result is not surprising given that previous studies have found that increases in patient activation are related to increased self-management behaviors (Hibbard, Mahoney, Stock, & Tusler, 2007; Wolever et al., 2010).

However, the use of medical students as health coaches to increase patient activation is a novel approach. Our qualitative results indicated that health coaching by medical students can improve healthcare communication and disease awareness among patients regarding their disease and overall health. Improvement in communication between patients and their

health care providers can allow for higher utilization of health care, better adherence to treatment recommendations, and improved management of chronic disease, such as diabetes (Post, Myers, & Miser, 2002; Street, Makoul, Arora, & Epstein, 2009).

This study found improvements in aspects of participants' HRQoL during the intervention period, specifically role limitations due to physical health and social functioning.. The role limitations and social functioning subscales increased by 10 and 15 points, respectively. However, there is no widely accepted notion of what represents clinically meaningful change in HRQoL in diabetes care. An expert panel on HRQoL defined 12.5 as a small clinical change for social functioning and 10 for role limitations (Wyrwich et al., 2003). However, the scores reported here are from a pilot study, not powered to detect HRQoL differences, and scores were not adjusted for demographic, clinical or other variables that might have impacted the patients' HRQoL during the course of the project. Nonetheless, these subscales showed significant improvement in function, particularly social functioning, which was greater than half a standard deviation unit change in score from baseline to follow-up, which is often used as an indicator of moderate clinical significance (Cohen, 1998; Osoba et al., 1998; Sloan & Dueck, 2004). In addition, the SF-36 is a generic HRQoL measure not a disease-specific questionnaire, which can reduce the sensitivity in detecting the impact of disease burden (Hill-Briggs, Gary, Baptiste-Roberts, & Brancati, 2005; Vadstrup, 2011).

Findings indicated non-significant effects of health coaching on health locus of control and diabetes knowledge. The latter finding likely reflects the lack of education students received in the regular curriculum on diabetes until the latter part of the program, as well as the program's focus on behavior change versus knowledge acquisition. Both students and patients reported some degree of dissatisfaction with students' knowledge of diabetes and its treatment. A medical student health coaching program would likely be better received and potentially more effective if progressive integration occurred between student learning about specific chronic diseases and subsequent practice of health coaching with patients.

Our results showed no significant change over time in biological markers (BMI, HbA1c). Previous studies have indicated that educational and behavioral interventions have tended to produce modest improvements in glycemic control (Schutzer & Graves, 2004; Zagarins, Allen, Garb, & Welch, 2012). In our study, student coaches were required to meet with patients four times over an average of fourteen months. Thus, our curriculum was much less intensive than traditional diabetes programs, and this may account for the non-significant effects on medical outcomes. Given the positive associations of health coaching on stage of change movement and certain aspects of HRQoL, perhaps increasing the number of patient visits in our curriculum would have positively impacted the biological indicators associated with diabetic control.

There are several limitations to this study. We recruited a small, non-random sample of students and patients associated with a medical school and medical center located in the Midwest. Thus, our results cannot be assumed to be generalizable to all student or geriatric patient populations. The validity of significant results in our pilot study was also limited by insufficient power and lack of a control or comparison group. In addition, medication adherence and lifestyle behaviors (diet, exercise) were measured by self-report, and

participants' answers may have been affected by social desirability and memory biases. This study's research design makes it difficult to discern whether the impacts found were due to training in health coaching, training in patient-provider communication, or providing motivated patients with an opportunity to hold themselves accountable for their health status. A final study limitation involves variability in the dose and timing of the interventions patients received due to delays in program start times. This limits the conclusions one can draw regarding relationships between the intervention and study outcomes.

Overall, our project demonstrated that a health coaching curriculum delivered by medical students to older adults potentially may lead to improvements in factors associated with effective diabetes control. Although the program resulted in minimal disease-specific improvement (e.g., HbA1c), the qualitative data from all participants denote a positive appraisal of the project for providing students with a hands-on, personalized medical experience that may increase their interest in and attention to health promotion of older adults.

The results of this pilot project led to the development of a health coaching project that is currently required of all Ohio State University medical students. The new curriculum implements health coaching interventions for children, adults, and older adults with chronic conditions based on program requirements and student interest. Large-scale studies of this type of curriculum are needed to investigate the impact of health coaching programs delivered by medical students on student, patient, and health system outcomes.

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Table 1

Patient Characteristics[a]

	***N* (%)**
Age, Mean ± SD	72.17 ± 5.9
Gender	
Female	17 (58.6)
Race	
White	18 (62.1)
African American	9 (31.0)
Other	2 (6.9)
Marital status	
Married	17 (58.6)
Single	7 (24.1)
Divorced/Separated/Widowed	5 (17.3)
Education	
High School	5 (17.2)
Some college/assoc	6 (20.7)
College graduate/graduate degree	14 (48.3)
Employment	
Full-time	5 (17.2)
Part-time	2 (6.9)
Retired	21 (72.4)
Unemployed	1 (3.4)
Household income	
$10,000 – $24,999	8 (27.6)
$25,000 – $39,999	4 (13.8)
$40,000 – $54,999	3 (10.3)
$55,000+	7 (24.1)

[a]Some variables do not total *n*=29 because of incomplete data.

Valid percentages are reported.

Table 2

Patient survey results from baseline to follow-up

Variable	Baseline Mean ± SD	Follow-Up Mean ± SD	*p*-value
SF-36			
Physical functioning	63.62 ± 29.09	67.93 ± 27.04	0.42
Role limitations due to physical health	68.53 ± 27.32	78.88 ± 29.90	0.04
Role limitations due to emotional problems	93.68 ± 13.67	94.83 ± 11.66	1.00
Energy/fatigue	57.33 ± 16.96	60.78 ± 17.35	0.40
Emotional well-being	84.66 ± 11.25	85.17 ± 10.81	1.00
Social functioning	81.25 ± 24.88	96.88 ± 14.28	0.02
Pain	71.12 ± 23.83	78.45 ± 21.22	0.06
General health	64.66 ± 22.83	68.79 ± 17.81	0.54
Diabetes Knowledge Test-general	73.22 ± 17.51	69.80 ± 18.95	0.22
Multidimensional Health Locus of Control			
Internal	31.17 ± 3.09	29.76 ± 5.17	0.20
Chance	12.45 ± 6.72	11.10 ± 6.24	0.08
Doctors	17.14 ± 1.46	16.31 ± 2.44	0.08
Other people	9.93 ± 3.94	8.55 ± 5.19	0.10

Table 3

Stage movement for medication, diet, or exercise from baseline to follow-up

Stage changes	**Diabetes Medication (*N*=28) *n* (%)**	**Diet (*N*=21) *n* (%)**	**Exercise (*N*=22) *n* (%)**
Declined 3 stages	0	1 (4.8)	0
Declined 2 stages	0	1 (4.8)	1 (4.5)
Declined one stage	0	2 (9.5)	0
Stayed in the same stage	25 (89.3)	10 (47.7)	12 (54.6)
Improved 1 stage	2 (7.1)	3 (14.3)	4 (18.2)
Improved 2 stages	1 (3.6)	4 (19.0)	4 (18.2)
Improved 3 stages	0	0	1 (4.5)
Total improvement stage movement at 2nd visit	3 (10.7)	7 (33.3)	9 (40.9)*

Note. Some variables do not total 29 because some patients indicated that they did not receive doctor recommendations for medication, diet, or exercise regimens. Valid percentages are reported.

* $p < .05$ based on a Wilcoxon test.