Published in final edited form as:

Diabetes Educ. 2008 ; 34(6): 1053–1061. doi:10.1177/0145721708325886.

Healthy Changes™ for Living with Diabetes: An Evidence-Based Community Diabetes Self-Management Program

Cindy Klug, MST, CHES,

Patient and Professional Education, Providence Health System

Deborah J. Toobert, PhD, and

Senior Research Scientist, Oregon Research Institute

Michaela Fogerty

Abstract

Purpose—This article addresses the gap between research and practice by describing the feasibility and outcomes of an evidence-based diabetes self-management health education program. The Healthy Changes™ program used a peer-led group format to promote physical activity and healthful eating practices, employing culturally relevant materials and measures.

Methods—Older adults (mean age = 69.2 years; SD = 10.7) with type 2 diabetes (N = 243) were recruited from nine communities to participate in the Healthy Changes™ program. Components included goal setting, problem solving, group support, and interactive lectures from experts. Measures of eating patterns, physical activity, body weight, community resources, self-rated health, and self-efficacy were administered at baseline, and at 4, 8, and 12 months.

Results—Participants attended on average 13 weekly sessions, and showed improvements in health behaviors, supportive resources, and self-efficacy at 4, 8, and 12 months.

Conclusion—The Healthy Changes™ program can be successfully translated into community settings and led by trained peer leaders, yielding health improvements similar to those reported in efficacy trials. Trained peer leaders are key to effective program implementation. Peer-led groups enhance goal attainment by giving participants a venue to discuss obstacles and strategize solutions.

Keywords

diabetes; self-management; translation; diet; physical activity; social support; intervention planning

Introduction

Diabetes affects more than 171 million people worldwide,¹ potentially increasing to 366 million in 2030.² Diabetes is an independent risk factor for coronary heart disease³ and a major cause of functional limitations, comorbidities,⁴ and mortality.⁵ Diabetes self-

management programs⁶ and specific lifestyle behaviors, including healthful eating, regular physical activity, and adequate social resources, have been shown to affect body weight, blood glucose, hemoglobin A1c,⁷ and morbidity and mortality. Given the prevalence of unhealthful lifestyles, our obesogenic culture,⁸ and the difficulty of changing health practices, it is essential to investigate evidence-based behavioral interventions with the potential for wide dissemination. Most diabetes self-management research has not addressed real-world community dissemination and application issues.⁹

The translation of evidence-based programs requires identification of interventions which have succeeded in controlled research trials and appropriate adoption of these programs for community settings. Noting that many studies do not report sufficient contextual information to determine the applicability of programs to particular settings, Glasgow et al.¹⁰ recommend that researchers report descriptions of program implementation as well as discussions of generalizability and feasibility.

A number of evidence-based lifestyle change programs have been successfully translated into community projects.^{11,12} Investigators of such programs have reported variously on implementation procedures, participant recruitment, procedures related to improved outcomes, health disparities, and process evaluation procedures. This report expands on previous research by presenting information about the creation of community partnerships; resources needed to implement this community program; agency recruitment and oversight; peer leader recruitment, training, supervision, and support; barriers to program participation; and program maintenance.

The investigators considered evidence-based programs for community delivery, and chose to adapt elements from the Diabetes Prevention Program (DPP)¹³ and the Chronic Disease Self-Management Program (CDSMP).¹⁴ This paper describes the process for translating elements of the DPP and CDSMP to a community-based lifestyle change intervention called Healthy Changes™. Like the DPP, the Healthy Changes™ program targeted dietary practices, physical activity, goal setting, and problem-solving skills. Unlike the DPP, which targeted people with pre-diabetes and used intensive individual meetings with nurse health coaches, Healthy Changes™ targeted older adults over age 55 with type 2 diabetes and employed a group approach delivered by peer leaders similar to the CDSMP. Outcomes from N = 179 participants are presented here, along with process evaluation data from site coordinators, interventionists, and participants.

Methods

Pilot study

A 6-month pilot study was conducted to assess the feasibility, desirability, and adoption of Healthy Changes™. A total of N = 144 subjects participated in the pilot study (N = 76 provided baseline survey data). Quantitative and qualitative data were gathered to evaluate peer-leader training techniques, recruitment procedures, and intervention elements, and to evaluate feedback from agencies, site coordinators, peer leaders, and participants. Attendance was collected, and demographic, physiologic, behavioral, and psychosocial measures were assessed at baseline and immediately post-intervention.

The participating community-based pilot sites (N = 4) attracted a reasonable number of non-Caucasian participation (24%), which is higher than the local area of 20.5%. Respondents' ages ranged from 27 to 96 years with a mean of 65.7 (SD = 13.4) and most were female (81%). Out of 26 possible meetings, attendance averaged 8.7 (SD = 6.5) and ranged from 1–26. The most common reason for non-attendance was illness. There was a statistically nonsignificant tendency for better attendance to relate to greater improvement in outcomes.

Among participants with pre- and post-intervention survey data (N = 48; 63%), improvements were made in dietary self-management and use of community resources, and participants generally recommended the program.

The pilot study demonstrated that benefits were derived from assisting participants in locating community resources, identifying problems, exploring solutions, and communicating with health-care providers. Therefore, in the main study, communicating with one's physician was included as a group session topic. Trained Personal Advocates also were available as a resource for people who needed assistance with problems beyond the group's capacity. Their services, however, were underutilized.

The pilot study revealed the necessity for site-specific support of the program, in providing a consistent and adequate location for classes, supervising peer leaders, and recruiting participants. Thus, for the main study, a coordinating agency was designated to assist in recruitment of peer leaders and participants.

Main study

Program overview—The main Healthy Changes™ study was funded under the Administration on Aging's (AoA) Evidence-Based Disease Prevention Initiative. Oversight of the study was provided by a partnership of four organizations: a community-based advocacy organization for older adults (Elders in Action), a large health-care system (Providence Health System), a research organization (Oregon Research Institute), and the local Area Agency on Aging (AAA).

Intervention description—The Healthy Changes™ program was offered at no cost to study participants, and addressed dietary and physical activity-related educational, support, and advocacy needs of older adults with type 2 diabetes in weekly 1½-hour group sessions. At each meeting, participants reported on their success in achieving weekly action plans, identifying actions needed to achieve their health goals, barriers to completing actions, resources to overcome barriers, and whether they believed they could achieve their actions. Other participants offered encouragement, made helpful suggestions, and discussed relevant community resources. Trained peer leaders or an expert lecturer gave interactive presentations about healthful eating or physical activity from 26 prepared topics. Presentations included such topics as cooking demonstrations, blood glucose meter demonstrations, and food taste testing. Meetings concluded with participants developing new action plans for the next week.

Site recruitment—Existing networks were used to recruit potential sites with final selection based on willingness to maintain fidelity to key intervention components and

quality controls. Healthy Changes™ was delivered to eight public and nonprofit community sites located in urban and suburban settings, including senior and community centers, an American Indian health clinic, a faith-based organization, and a housing authority agency.

Peer leader recruitment—Healthy Changes™ was designed to be delivered by volunteer, nonprofessional, trained peer leaders. Leaders were selected based on their similarity to group members (e.g., speaking primary language of group), being respected in their communities, previous experience facilitating a group, ability to motivate, good listening and problem-solving skills, and experience living with diabetes.

Participant recruitment—Eligibility criteria included being an older adult (age 55+) with diabetes, residing in the community, and not having physical and/or mental impairments. To recruit participants, site coordinators made announcements and presentations to internal and external community groups, posted fliers, placed bulletins in newsletters, contacted eligible older adults directly, depended on “word of mouth,” worked with local media, and partnered with other agencies. Announcements at other programs offered by the agency and bulletins in agency newsletters were rated as the most successful strategies.

Program materials—The program guide, available in English, Spanish, and Russian, provided detailed information for sites about selecting peer leaders, recruiting participants, and finding community partners, and gave session-by-session instructions for delivering the program.

Peer leaders were required to attend a 2-day experiential workshop taught by three of the study investigators. The training included information about facilitating groups, behavior change, diabetes self-management, and collecting study outcome measures. Once trained, all leaders were observed leading their sessions, and given feedback at least once by an investigator. Bi-monthly meetings were held to provide ongoing assistance, address problems, and maintain program fidelity.

Measures

Data for the project came primarily from paper-and-pencil participant surveys, program records, focus groups, and exit interviews. The measures were selected based on strong psychometric properties, feasibility in non-research settings, and use in comparable evidence-based trials. Baseline assessments were conducted at the second meeting; post-test measures were obtained at 4, 8, and 12 months. All measures were translated and back-translated into Spanish and Russian. Peer leaders assisted participants with reading or comprehension issues.

Participant demographic variables included age, gender, race/ethnicity, education, income, employment, smoking status, living situation, and marital status. Information was also collected on medical condition (self-rated health, self-reported height and weight, age at diabetes diagnosis, years since diabetes diagnosis, number of comorbidities) and insurance status.

The primary behavioral endpoints were derived from the nine-item Summary of Diabetes Self-Care Activities (SDSCA),¹⁵ which assesses self-care over the preceding week for diet and physical activity. Six physical activity items from the Stanford Education Research Center Exercise Behavior Scale (EBS)¹⁶ were incorporated to compare with results from earlier randomized clinical trials.

Psychosocial outcomes included self-efficacy and use of supportive community resources, assessed via the Chronic Illness Resources Survey (CIRS),¹⁷ which profiles the respondent's use of proximal (e.g., family and friends) and more-distal (e.g., neighborhood) health-promoting resources.

Project staff interviewed site coordinators and peer leaders regarding their role, satisfaction with the program, and suggestions for improvement. Peer leaders were asked to delineate the characteristics of successful leaders and to describe differences between study participants and dropouts. Focus groups were conducted with study participants to determine reasons for joining and attending, to learn about their behavior changes, and to assess their program experiences.

Research design

Like the CDSMP, Healthy Changes™ was designed to test the magnitude of effects in community settings. Compatible with real-world delivery settings, a pre-post design was used rather than a control-treatment group design.

Analyses

Prior to analysis, data were checked and descriptive statistics were computed to provide an understanding of the nature of the data. One-way analyses of variance for continuous variables and chi-square analyses for categorical variables were used to evaluate the equivalence of completers and dropouts on demographic and medical history variables. The effectiveness of the program was defined as pre-to-post program change in total time per week participants spent on specific types of exercise; number of days in the past week participants engaged in at least 30 minutes of physical activity; number of days participants followed their eating plans, consumed high-fat foods, and ate packaged or bakery sweets; and body mass index. To determine intervention effects on diet and physical activity from baseline to 4, 8, and 12 months, repeated measures analyses of covariance were conducted, controlling for differences in site, race, gender, age, body mass index, health rating, and education (high school or fewer years vs. some college or college graduate).

As in Lorig et al.,¹⁸ the extent to which initial levels and 4-month changes in self-efficacy predicted subsequent diet and physical activity behavior change was explored. Multiple regression analyses were conducted to determine other predictors of behavior change and program satisfaction, such as demographic variables, goal-setting, attendance, and use of supportive resources.

Qualitative data from meeting observations, focus groups, and exit interviews were reviewed and common themes identified.

Results

Participant characteristics

Baseline characteristics of Healthy Changes™ participants are presented in Table 1. This was a high-risk group: average body mass index was in the obese category, most participants had multiple chronic illnesses (most commonly high blood pressure and arthritis), only six respondents reported being in excellent health, and average yearly income was about \$16,000. Since it was not possible to collect demographic information from eligible people who failed to enroll in the program, representativeness of the sample¹⁹ was determined by comparing demographic data from the 2005 Oregon Behavioral Risk Factor Surveillance System (BRFSS) survey. The BRFSS survey sampled 2,236 people aged 55 years and older with type 2 diabetes (Table 1). The current sample was compared on: age, gender, education attainment, marital status, employment status, body mass index, and self-rated health. The two samples compared favorably for body mass index and self-rated health, but Healthy Changes™ attracted more females, and adults with lower incomes and less formal education.

Attendance

Total enrollment was 243 individuals, with baseline data available for 179 participants. Partial data were collected from 147 (82%) participants at 4 months. After exclusion of those with incomplete follow-up data, 97 (54%) individuals were available for 4-month analyses, 50 (28%) at 8 months, and 43 (24%) at 12 months. The sharp decrease in the sample from baseline to 12 months can be attributed to difficulties in completing the assessments (refusal, lack of follow-through from peer leaders), rather than attrition. Results are not formally presented for the 8- and 12-month assessments due to the limited data. Analysis of characteristics of those who provided 4-month follow-up data vs. those who did not revealed that those who were married ($p < .02$) and those with less education ($p < .02$) completed the 4-month assessment.

Attendance was recorded for 235 participants. Of these, 213 attended at least two sessions. Participants attended an average of 12.9 (28%) sessions ($SD = 11.8$), ranging from 0–46. Most common reasons for non-attendance were illness, and social and work conflicts. Participants tended to complete a higher percentage (81%) of sessions (5.7 out of 7 sessions) in the Lorig, Ritter et al.¹⁴ CDSMP program.

Analyses of the characteristics of low attenders (0–9 sessions) vs. high attenders (10 or more sessions) indicated that non-Caucasian individuals, those who lacked a regular health-care provider, and those with more comorbidities were more likely to attend regularly.

Barriers to participation

Focus groups with group leaders indicated that a lack of transportation was the major barrier to Healthy Changes™ participation. Inconvenient time and location of the meetings were also cited, but less frequently.

Effectiveness

Primary analyses—Examination of the baseline and 4-month mean ranks (MRs) from the Wilcoxon matched-pairs signed-ranks test indicated significant improvement on two of the four outcomes: the SDSCA Diet (baseline MR = 34.61, 4-month MR = 45.17, $p < 0.0092$) and SDSCA Physical Activity (baseline MR = 35.76, 4-month MR = 45.56, $p < .0248$) scales. The reported average number of days eating a healthful diet increased from 3.9 at baseline to 4.1 at 4 months, and the reported number of days of engaging in physical activity increased from 2.9 days at baseline to 3.5 at 4 months. Outcomes from the EBS were mixed. There was a pattern of increased total time spent performing all physical activities combined as well as stretching or strengthening exercises, walking for exercise, and using aerobic exercise equipment. For the 4-month comparisons, none of the individual EBS items, nor the average of all items reached the $p < .05$ level of significance. There were no significant improvements on self-rated health or body mass index.

Secondary analyses—Wilcoxon matched-pairs signed-ranks test indicated that there were significantly greater improvements in the MRs for two of the three psychosocial outcomes: self-efficacy (baseline MR = 29.09, 4-month MR = 47.26, $p < 0.001$) and use of supportive resources (baseline MR = 33.34, 4-month MR = 46.46, $p < .002$).

Participants made significant improvements from baseline to 4 months on measures of dietary self-efficacy, exercise self-efficacy, and confidence in overcoming challenges to illness management. The average confidence rating for the seven items combined was 6.6 (SD = 2.5) at baseline and 7.7 (SD = 2.5) at 4 months.

Respondents varied widely in their use of supportive resources. At 4 months, participants reported a substantial and significant increase in use of community resources (e.g., attending free or low-cost meetings that supported them in managing their diabetes), but they did not report an increase in support from their health-care providers (e.g., doctors involving them as a partner in making decisions).

Predictors of change

Hierarchical regression analyses were used to evaluate hypothesized relationships between predictor variables (i.e., attendance, gender, volunteer work, income, education, years diagnosed with diabetes, self-efficacy, and use of community resources) and changes in diet and physical activity outcomes. Engaging in volunteer work and years diagnosed with diabetes were significantly positively associated with dietary changes at 4 months ($p < .05$ and $p < .01$, respectively). Increased self-efficacy was modestly, though significantly, related to changes in the SDSCA physical activity measure ($p < .01$ at 4 months). Increased use of supportive resources was significantly related to change in the EBS at 4 months ($p < .05$).

Comparison of outcomes with similar programs

Healthy Changes™ participants closely matched their counterparts in the CDSMP [18] in making significant improvements in self-efficacy (see Table 2). However, for self-rated health, Healthy Changes™ participants approached, but did not match, the improvements reported in the CDSMP study.

Process measures

Program evaluation information was obtained at the 4-month assessment. Most participants reported that the program helped them achieve program goals (76%), communicate better with health-care providers (73%), use community resources (68%), and manage their diabetes (75%).

Qualitative data from peer leaders indicated that the most important qualities for their success were their ability to relate to seniors and to engender a sense of ownership. They also felt, but less so, that a successful peer leader should be knowledgeable about diabetes, outgoing, and able to maintain group control.

Six site coordinators responded to a survey about their experience with Healthy Changes™. The site coordinators indicated that the greatest benefits to their agencies were the strengthening of their relationship with the community, bringing new people to their center, educating staff about diabetes and community resources, and cultivating new trained leaders. Coordinators varied widely in their reporting of obstacles to program implementation. The most frequently mentioned challenges were difficulties with peer leaders, an inadequate number of interested participants, and an already full schedule.

Implementation and robustness

While trained peer leaders having different backgrounds, experience with diabetes, and education levels were equally able to implement the program, not all of the trained peer leaders accepted the importance of consistently reviewing participant action plans using the problem-solving framework—a key part of the CDSMP—and most diabetes self-management programs.^{14,20} Participant outcomes were unrelated to a number of demographic variables and patient characteristics; the only exception was that diet improved more for those with heart disease and back problems than for those without (both *p* values = .001). Given the general lack of significant correlations in more than 120 comparisons, the program appears equally effective across subpopulations.

Discussion

Healthy Changes™ represents a systematic effort to implement a community, evidence-based intervention to improve the self-management of physical activity and dietary intake in older adults with type 2 diabetes. The program sought to be engaging, yet flexible enough to adapt to diverse ethnic, age, and socioeconomic classes. Qualitative data from site coordinators, peer leaders, and study participants indicated that the intervention was relevant in terms of culture and content, and allowed the groups to bond and become adept at solving problems related to lifestyle goals. Participants were highly satisfied with the program.

Despite the availability of effective, evidence-based programs to improve lifestyle habits in older adults with type 2 diabetes,¹³ few have been translated into community settings, and there is a well-documented tendency for practice to lag behind knowledge.^{21–23} An important strength of Healthy Changes™ was an attempt to fill this gap.

Several limitations should be considered. First, the study lacks a direct experimental comparison sample, and therefore it is impossible to know whether the study outcomes can be attributed to Healthy Changes™. But in other studies using the same measures, those in the control conditions generally did not tend to improve over time.²⁴ Also, to reduce costs and participant burden, we relied exclusively on the use of self-report measures. For instance, there were logistical difficulties in providing each site with an accurate, portable scale to reliably measure height and weight, especially since the classes were held at a variety of locations. We were also concerned that the program not have the feel of a medical intervention. Social desirability is the major concern related to self-report data, yet the self-reported increase in body weight suggests results were not due to demand characteristics. Results from other studies using identical measures suggest these measures are not susceptible to social desirability.²⁵ Another limitation concerns missing data. The number of participants who returned post-test surveys sharply decreased from baseline to 4 months, despite attendance of up to 235 participants. This diminished our ability to detect longer-term (8- and 12-month) outcomes. The high level of missing follow-up data reflects the lack of skill and low importance attributed to data collection process among participating agencies. Our experience illustrates one of the constraints of conducting programs in community rather than research settings. Future dissemination efforts should budget for professionals to conduct assessments.

Implications/relevance for diabetes educators

This was a program for adults who had already received diabetes education and, after struggling with the complexities of a diabetes self-care regimen, were ready to receive ongoing help and support to manage their diabetes. In initial fee-for-service diabetes education programs, newly diagnosed diabetes patients receive a large amount of information in a very short time. They can't begin to comprehend it all and typically feel overwhelmed. Long-term maintenance of changes made in diabetes education programs is a major challenge, and it may be that continued intervention is necessary to produce lasting changes in lifestyle behaviors within the "obesogenic" environment in which we live.

Community-based programs should give participants a chance to identify and discuss impediments to goal attainment at support meetings facilitated by peer leaders. Training and supervision of peer leaders should be considered, along with an interactive computer program for action planning.^{20, 26} Further research should identify optimal program length, program aspects that can be altered or dropped, and whether the program can be generalized to other chronic conditions.

Acknowledgments

This study was supported by Grant #1-R18-HL076151-01A1 from the U.S. Administration on Aging (AoA). The contents of this publication are solely the responsibility of the authors and do not necessarily represent the official views of the AoA. The authors acknowledge the invaluable contributions of Vicki Hersen, Marj Cannon, Shannon McCarthy, Russell Glasgow, and Lisa Strycker. We are deeply indebted to the six site coordinators, the eight trained peer leaders, and the 243 dedicated men and women who participated in the Healthy Changes™ program. We also acknowledge the technical assistance provided especially by Nancy Whitelaw, Ph.D., of the National Council on the Aging, during both the program development and evaluation phases of the project.

References

1. Thom T, Haase N, Rosamond W, et al. Heart disease and stroke statistics--2006 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. *Circulation*. 2006; 113:e85–151. [PubMed: 16407573]
2. Centers for Disease Control and Prevention. Prevalence of diabetes and impaired fasting glucose in adults: United States, 1999–2000. *MMWR Morb Mortal Wkly Rep*. 2003; 52:833–837. [PubMed: 12966357]
3. Mellen PB, Cefalu WT, Herrington DM. Diabetes, the metabolic syndrome, and angiographic progression of coronary arterial disease in postmenopausal women. *Arterioscler Thromb Vasc Biol*. 2006; 26:189–193. [PubMed: 16239594]
4. Imperatore G, Cadwell BL, Geiss L, et al. Thirty-year trends in cardiovascular risk factor levels among US adults with diabetes. *Am J Epidemiol*. 2004; 160:531–539. [PubMed: 15353413]
5. Saydah SH, Eberhardt MS, Loria CM, Brancati FL. Age and the burden of death attributable to diabetes in the United States. *Am J Epidemiol*. 2002; 156:714–719. [PubMed: 12370159]
6. Warsi A, Wang PS, LaValley MP, Avorn J, Solomon DH. Self-management education programs in chronic disease: a systematic review and methodological critique of the literature. *Arch Intern Med*. 2004; 164:1641–1649. [PubMed: 15302634]
7. Toobert DJ, Glasgow RE, Strycker LA, et al. Biologic and quality of life outcomes from the Mediterranean Lifestyle Program: a randomized clinical trial. *Diabetes Care*. 2003; 26:2288–2293. [PubMed: 12882850]
8. Glass TA, Rasmussen MD, Schwartz BS. Neighborhoods and obesity in older adults: The Baltimore Memory Study. *Am J Prev Med*. 2006; 31:455–463. [PubMed: 17169707]
9. Glasgow, RE.; Bayliss, E.; Estabrooks, EA. Translation research in diabetes: asking broader questions. In: Montori, VM., editor. *Evidence-based endocrinology*. Totowa, NJ: Humana Press; 2005. p. 241–256.
10. Glasgow RE, Green LW, Klesges LM, et al. External validity: we need to do more. *Ann Behav Med*. 2006; 31:105–108. [PubMed: 16542124]
11. Hooker S, Seavey W, Weidmer CE, et al. The California Active Aging Community Grant Program: translating science into practice to promote physical activity in older adults. *Ann Behav Med*. 2005; 29:155–165. [PubMed: 15946109]
12. Belza, B.; Toobert, DJ.; Glasgow, RE. RE-AIM for program planning: overview and applications. NCOA's Center for Healthy Aging; 2007. Available at: www.healthyagingprograms.org [Accessed May 2, 2007]
13. The Diabetes Prevention Program (DPP): description of lifestyle intervention. *Diabetes Care*. 2002; 25:2165–2171. [PubMed: 12453955]
14. Lorig KR, Ritter P, Stewart AL, et al. Chronic disease self-management program. *Med Care*. 2001; 39:1217–1223. [PubMed: 11606875]
15. Toobert DJ, Hampson SE, Glasgow RE. The Summary of Diabetes Self-Care Activities Measure: results from seven studies and revised scale. *Diabetes Care*. 2000; 23:943–950. [PubMed: 10895844]
16. Lorig, K.; Stewart, A.; Ritter, P.; González, V.; Laurent, D.; Lynch, J. Outcome measures for health education and other health care interventions. Thousand Oaks CA: Sage Publications; 1996. p. 25p. 37–38.
17. Glasgow RE, Toobert DJ, Barrera M Jr, Strycker LA. The Chronic Illness Resources Survey: cross-validation and sensitivity to intervention. *Health Education Research*. 2005; 20:402–409. [PubMed: 15572438]
18. Lorig KR, Ritter PL, Jacquez A. Outcomes of border health Spanish/English chronic disease self-management programs. *Diabetes Educ*. 2005; 31:401–409. [PubMed: 15919640]
19. Green LW, Glasgow RE. Evaluating the relevance, generalization, and applicability of research: issues in translation methodology and external validity. *Eval Health Prof*. 2006; 19:11–19.
20. Glasgow RE, Nutting PA, Toobert DJ, King DK, Strycker LA. Effects of a brief computer-assisted diabetes self-management intervention on dietary, biological, and quality-of-life outcomes. *Chronic Illn*. 2006; 2:27–38. [PubMed: 17175680]

21. Zerhouni EA. Translational and clinical science—time for a new vision. *N Engl J Med*. 2005; 353:1621–1623. [PubMed: 16221788]
22. McGlynn EA, Asch SM, Adams J, et al. The quality of health care delivered to adults in the United States. *N Engl J Med*. 2001; 348:2635–2645. [PubMed: 12826639]
23. Kerner J, Rimer B, Emmons K. Introduction to the special section on dissemination: dissemination research and research dissemination: how can we close the gap? *Health Psychol*. 2005; 24:443–446. [PubMed: 16162037]
24. Glasgow RE, Toobert DJ, Hampson SE, Brown JE, Lewinsohn PM, Donnelly J. Improving self-care among older patients with Type II diabetes: The “Sixty Something...” study. *Patient Educ Couns*. 1992; 19:61–74. [PubMed: 1298950]
25. Toobert DJ, Strycker LA, Glasgow RE, Barrera M, Angell K. Effects of the Mediterranean Lifestyle Program on multiple risk behaviors and psychosocial outcomes among women at risk for heart disease. *Ann Behav Med*. 2005; 29:128–137. [PubMed: 15823786]
26. Herman WH, Hoerger TJ, Brandle M, et al. for the Diabetes Prevention Program Research Group. The cost-effectiveness of lifestyle modification or metformin in preventing type 2 diabetes in adults with impaired glucose tolerance. *Ann Intern Med*. 2005; 142:323–332. [PubMed: 15738451]

Table 1

Characteristics of participants in the Healthy Changes™ program compared with the Oregon BRFSS 2005 survey of adults 55 years and older with type 2 diabetes living in three Oregon counties

Characteristic	Healthy Changes™ Program				Oregon BRFSS Comparison Data (N = 2,236)
	Mean	Standard Deviation	Range	%	
Age	69.2	10.7	23–89		N = 298 Mean age 67.6 (SD = 9.17)
Percent female				78.2	48.3%
Weight (pounds)	175.5	43.3	97–305		----
Body mass index (kg/m ²)	30.2	6.4	18–52		
Not at risk (body mass index less than 25.0)				21.5	18.7
Overweight (body mass index between 25.0 and <30.0)				33.5	37.5
Obese (body mass index 30.0 or greater)				44.9	43.8
Years diagnosed with diabetes	7.9	.71	1 – 37		
Current smoker (% yes)				7.4	9.2
Income					
% \$25,000 or less				73	34.0
% \$25,001 to \$49,999				15.8	38.4
% \$50,000 or more				11.2	27.6
Type of glucose-lowering medication					
% None				36.0	
% Oral medication only				47.2	
% Insulin only				5.6	
% Insulin and oral medication				11.2	
Present living arrangement					
% With spouse or partner				28.4	
% With other relatives				6.3	
% With children only				15.3	
% With spouse/partner and children				5.7	
% With unrelated roommates				4.5	
% Live alone				39.8	

Characteristic	Healthy Changes™ Program			Oregon BRFSS Comparison Data (N = 2,236)
	Mean	Standard Deviation	Range	%
Level of education achieved				
% High school graduate or less				60.1
% Some college				32.6
% College/university graduate				7.3
% Caucasian				74.1
American Indian				11
Asian American				8
African American				1
Caucasian				72
More than one race				1
Other				7
Number of comorbidities				
% With no other disease				25
% With 1–2 other diseases				37
% With 3 other diseases				37.5
Most prevalent comorbidities				
% Having CHD				18.9
% Having arthritis				33
% Having high blood pressure				47.4
% Having glaucoma or vision problems				23.5
% Having a stroke				2.3
% Having back problems				19.4
Self-rated general health				
% Rating themselves good to excellent				59.9
% Rating themselves fair to poor				40.1

Comparisons between the Healthy Changes™ and the Lorig Chronic Disease Self-Management Programs

Table 2

	Healthy Changes™ (N = 147)					Chronic Disease Self-Management Program (N = 104)				
	Baseline		4-Month Changes		Probability of change	Baseline		4-Month Changes		Probability of change
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Self-Rated Health ↑	3.25	1.00	-0.043	1.02	0.705	3.27	0.81	-0.33	0.90	0.001
Self-Efficacy ↑	6.57	2.50	1.227	1.97	0.000	6.81	2.29	0.64	2.66	0.017