Implementing a State-Based Cardiovascular Disease and Diabetes Prevention Program

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OBJECTIVE — To evaluate weight loss and cardiometabolic risk reduction achieved through an adapted Diabetes Prevention Program intervention among adults at high risk for cardiovascular disease (CVD) and diabetes.

RESEARCH DESIGN AND METHODS — Eight health care facilities implemented a group-based lifestyle intervention beginning in 2008. Participants attended 16 weekly core sessions followed by 6 monthly after core sessions.

RESULTS — A total of 1,003 participants were enrolled, 816 (81%) completed the core and 578 (58%) completed the after core. Of participants completing the core and after core, 45 and 49% achieved the 7% weight loss goal, respectively. There were significant improvements in blood pressure, fasting glucose, and LDL cholesterol among participants completing the intervention.

CONCLUSIONS — Our findings indicate it is feasible for state-coordinated CVD and diabetes prevention programs to achieve significant weight loss and improve cardiometabolic risk.

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The Diabetes Prevention Program (DPP) and other studies demonstrated that lifestyle intervention can prevent the development of type 2 diabetes and reduce cardiometabolic risk among participants, prompting many countries to begin implementing efforts to translate these studies into practice (1–5). In 2008, the Montana Department of Public Health and Human Services (DPHHS) implemented an adapted DPP, and preliminary results demonstrated feasibility and effectiveness (6). This report describes weight loss and cardiometabolic risk improvement among participants completing the intervention.

RESEARCH DESIGN AND METHODS

— A description of the early phase of this intervention has been published previously, and the initial cohort of participants is included in this report (6). In brief, the DPHHS funded eight health care facilities with recognized diabetes self-management education (DSME) programs beginning in 2008. Sites used trained health professionals as lifestyle coaches to provide the 16-session core followed by 6 monthly after core sessions (7). DPHHS staff provided technical assistance, data collection and analyses, and evaluation.

Overweight (BMI ≥25 kg/m^2) adults, with medical clearance from their referring provider and one or more of the following cardiovascular disease (CVD) and diabetes risk factors were eligible: a previous diagnosis of pre-diabetes; impaired glucose tolerance or impaired fasting glucose; high blood pressure (≥130/85 mmHg or treatment) or dyslipidemia (triglycerides >150 mg/dl, LDL cholesterol >130 mg/dl or treatment, or HDL cholesterol <40 mg/dl men and <50 mg/dl women); or a history of gestational diabetes mellitus or gave birth to a baby >9 pounds.

Height, weight, blood pressure, fasting blood glucose, and lipid values were collected at enrollment and at completion of the core and after core. Participants were weighed at the beginning of each session and submitted self-monitoring records. Participants were considered core completers if they did not drop out or miss three or more consecutive sessions and after core completers if they had completed follow-up laboratory measurements at 10 months.

Institutional review board approval was not required by the DPHHS because previous research established the safety and efficacy of the lifestyle intervention and only de-identified data were used for analyses.

Participant data were analyzed using SAS 9.1 (SAS Institute, Cary, NC). Baseline characteristics were compared among all enrolled participants and core and after core completers; *t* tests were used to compare continuous variables, and χ^2 tests were used to compare dichotomous variables. We calculated the proportion of completers who met the physical activity goal of >150 min/week in the core and 5 and 7% weight loss in the core and after core. In the core and after core, the last observed weight of completers was used to calculate mean weight loss for those not attending the final session. Paired *t* tests were used to assess mean weight loss, and the mean systolic and diastolic blood pressure, HDL cholesterol, LDL cholesterol, and fasting blood glucose from baseline to the end of the core (4-month follow-up) and after core (10-month follow-up). Bonferroni correction was applied to the level of

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Table 1—*Weight loss and cardiometabolic risk factor outcomes among all participants completing the core and after core lifestyle intervention at 4 and 10 months, Montana, 2008–2010*

	Baseline	Completed core	*P* value*	Completed after core	*P* value†
Weight (kg)					
Completed core, *n*=816	99.2 ± 20.7	92.4 ± 20.0	<0.001	—	—
Completed after core, *n*=578	97.4 ± 20.4	90.3 ± 19.5	<0.001	89.7 ± 19.3	<0.001
Systolic blood pressure (mmHg)					
Completed core, *n*=684	133.6 ± 15.7	126.5 ± 14.9	<0.001	—	—
Completed after core, *n*=453	132.7 ± 15.4	125.9 ± 14.3	<0.001	127.1 ± 14.6	<0.001
Diastolic blood pressure (mmHg)					
Completed core, *n*=683	82.0 ± 11.0	78.6 ± 9.6	<0.001	—	—
Completed after core, *n*=452	81.2 ± 10.9	77.7 ± 9.1	<0.001	77.7 ± 9.2	<0.001
HDL cholesterol (mg/dl)					
Completed core, *n*=692	48.8 ± 12.0	46.3 ± 10.8	<0.001	—	—
Completed after core, *n*=488	49.1 ± 11.6	46.1 ± 10.7	<0.001	51.0 ± 11.8	<0.001
LDL cholesterol (mg/dl)					
Completed core, *n*=663	125.2 ± 34.6	114.9 ± 32.6	<0.001	—	—
Completed after core, *n*=473	123.2 ± 33.2	112.0 ± 32.0	<0.001	118.7 ± 31.2	<0.001
Fasting blood glucose (mg/dl)					
Completed core, *n*=613	101.5 ± 14.7	97.4 ± 12.7	<0.001	—	—
Completed after core, *n*=418	101.6 ± 14.9	96.9 ± 11.7	<0.001	96.9 ± 15.2	<0.001

Data are means ± SD. *Results of the paired-samples *t* test, comparisons of 4-month and baseline values. †Results of the paired-samples *t* test, comparisons of 10-month and baseline values.

significance ($\alpha = 0.003$) to control for the number of paired *t* tests calculated.

RESULTS — Between February 2008 and January 2010, 1,003 participants were enrolled in the intervention; 816 (81%) completed the core and 578 (58%) completed the after core. Mean ± SD attendance was 14.9 ± 1.6 sessions during the core and 3.7 ± 2.1 sessions during after the core. The age of enrolled participants was 52.3 ± 11.6, and 80% (n = 805) were female. Core completers were significantly older than those who did not complete the core and after core completers were significantly older, had a lower BMI at baseline, and were more likely to have diagnosed dyslipidemia at baseline than those completing only the core (supplementary Table, available in an online appendix at http://care.diabetesjournals.org/cgi/content/full/dc10-0862/DC1).

At the conclusion of the core, 45% of completers achieved the 7% weight loss goal, 66% achieved 5% weight loss, and 66% met the physical activity goal. Among the after core completers, 49% met the 7% weight loss goal, 64% achieved 5% weight loss, and 70% achieved the physical activity goal at the end of core.

Core and after core completers achieved significant improvements in weight, systolic and diastolic blood pressure, LDL cholesterol, and fasting blood glucose and a significant reduction in HDL cholesterol at the end of core (Table 1). Significant improvements in HDL cholesterol were seen for those completing the after core. Participants with and without impaired glucose values at baseline achieved significant improvements in weight, blood pressure, LDL cholesterol, and blood glucose values at completion of the core and after core (data not shown).

CONCLUSIONS — Core and after core completers achieved significant reductions in weight and improvements in cardiometabolic risk. However, HDL decreased significantly at the end of the core but was followed by a significant increase for those completing the after core. Other studies have found similar results, indicating reductions in HDL during initial weight loss, followed by increased HDL levels during weight maintenance (8,9).

Our lifestyle intervention has a number of strengths, which support translating this research into practice. We included overweight adults with risk factor(s) for CVD or diabetes, rather than only adults with pre-diabetes, an approach supported by recommendations from the American Diabetes Association and American Heart Association, acknowledging the importance of addressing an individual's global risk for CVD and diabetes (10). We also relied on physician referrals rather than time-consuming screening events. Finally, offering the DPP in groups allowed for greater participant enrollment than a one-on-one intervention. There are several limitations to our study. First, there was a dropout rate of 19 and 42% at the end of the core and after core, respectively. Second, we used a pre- and post-evaluation with no comparison group. Third, we relied on self-reported physical activity and diet measures. Fourth, we were unable to obtain laboratory measures for all participants. Last, our analyses only included participants completing the intervention, which differed from the DPP, in which an intention-to-treat analysis was used.

Coordinated state and national approaches to implement diabetes prevention programs are needed. A recent assessment of Montana DSME programs indicated that these programs have the capacity to provide diabetes prevention services, the primary barrier being lack of reimbursement (11). Other promising models in the U.S. include regional training and implementation centers in Pittsburgh, Pennsylvania, and Indianapolis, Indiana (12,13). Because of the large number of individuals at high risk for diabetes in the U.S., many prevention sites will be needed, including DSME programs and other settings.

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K.K.V. and T.O.H. researched data, contributed to discussion, wrote the manuscript, and reviewed/edited the manuscript. T.S.H. researched data, contributed to discussion, and reviewed/edited the manuscript. M.K.B. and S.D.H. researched data and reviewed/edited the manuscript.

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