Translating the Diabetes Prevention Program

A Comprehensive Model for Prevention Training and Program Delivery

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Background: The Diabetes Prevention Program (DPP) demonstrated that lifestyle intervention reduces risk for type 2 diabetes and the metabolic syndrome. A universal framework for translation of multiple aspects of the DPP intervention, including training, support, and evaluation is needed to enhance treatment fidelity in a variety of settings.

Purpose: This study aims to develop a comprehensive model for diabetes prevention translation using a modified DPP lifestyle intervention.

Methods: The DPP lifestyle intervention was adapted to a 12-session group-based program called Group Lifestyle Balance for implementation in the community setting. A model for training and support mirroring that of the DPP was developed for prevention professionals administering the program. The process of training/support and program implementation was evaluated for feasibility and effectiveness using a nonrandomized prospective design in two phases (N=51, Phase 1: 2005–2006; N=42, Phase 2: 2007–2009; data analysis completed 2008–2009). A total of 93 nondiabetic individuals with BMI ≥25 kg/m^2 and the metabolic syndrome or prediabetes participated. Measures were collected at baseline and post-intervention for all and 6 and 12 months post-intervention for Phase 2.

Results: Significant decreases in weight, waist circumference, and BMI were noted in both phases from baseline. Participants in Phase 2 also demonstrated decreases in total cholesterol, non-HDL cholesterol, and systolic and diastolic blood pressure that were maintained at 12 months. Average combined weight loss for both groups over the course of the 3-month intervention was 7.4 pounds (3.5% relative loss, $p<0.001$); 23.8% and 52.2% of those who completed the program reached 7% and 5% weight loss, respectively. More than 80% of those achieving 7% weight loss in the Phase-2 group maintained their weight loss at 6 months.

Conclusions: A comprehensive diabetes prevention model for training, intervention delivery, and support was shown to be successful and was effective in reducing diabetes and cardiovascular disease risk factors in this group of high-risk individuals.

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Introduction

It is estimated that more than 57 million adults in the U.S. have prediabetes and are therefore at increased risk for developing type 2 diabetes and cardiovascular disease (CVD).[1] The metabolic syndrome, a clustering of risk factors including insulin resistance, dyslipidemia, obesity, and hypertension, has also been associated with elevated risk for both conditions.[2–6]

Lifestyle intervention clearly reduces the risk for type 2 diabetes.[7–10] The Diabetes Prevention Program (DPP) demonstrated that lifestyle intervention was highly successful in reducing risk for type 2 diabetes in all groups regardless of ethnicity, age, or gender.[11] In addition, the DPP lifestyle intervention was effective in reducing risk factors for CVD[12] and components of the metabolic syndrome.[13] Recent research has focused on translating the DPP intervention to a variety of settings, including YMCAs,[14] churches,[15] primary care practice settings,[16] and healthcare locales.[17–19] Currently, there are few models developed for training and support for delivery of adapted DPP interventions. One training model has

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been described for implementation in the YMCA; however, this has not been applied in other settings.[20] A universal framework for translation of multiple aspects of the DPP intervention, including training, support, and evaluation, as well as updated program materials, is needed in order to enhance treatment fidelity in a variety of settings.

The objective of this project was to develop a comprehensive model for real-world diabetes prevention intervention for application in multiple settings that includes (1) updated diabetes prevention curriculum and behavioral lifestyle materials; (2) a standardized training for healthcare professionals with support in the delivery of the intervention; and (3) ongoing evaluation of the implementation of the intervention. This manuscript describes the first two components of this model and provides an evaluation of the process demonstrated in one type of community venue, the healthcare setting.

Methods

Intervention

The original individually administered DPP Lifestyle Intervention was developed at the University of Pittsburgh by the DPP Lifestyle Resource Core and has been described elsewhere.[21] Based on cost estimates from the DPP,[22] several members of the DPP Lifestyle Resource Core modified the DPP lifestyle intervention to the Group Lifestyle Balance program for group rather than individual delivery. While maintaining the goals and key learning objectives of the DPP curriculum, the number of sessions was reduced from 16 to 12. Other modifications (see Table 1) included concentrating on healthy-food choices rather than the food pyramid specifically, a focus on energy as well as fat intake from the beginning of the intervention and an enhanced emphasis on pedometer use. The manual was also updated from the 1996 DPP version to reflect current standards.

Group Lifestyle Balance program participants attended 1-hour weekly sessions and received handouts for each session, a commercially available fat- and calorie-counting book, self-monitoring books for tracking food intake and physical activity, a pedometer with instructions, and a chart for self-monitoring weight over the course of the program. All participants were asked to self-monitor their weight two times per week, as well as food intake and physical activity levels daily; participants received feedback concerning their progress each week.

Training and Support System

In an effort to replicate the successful support structure that the DPP lifestyle coaches received in the form of annual trainings and monthly support from the DPP Lifestyle Resource Core,[21] the Diabetes Prevention Support Center (of the University of Pittsburgh Diabetes Institute; https://diabetesprevention.upmc.com) was established. As part of this comprehensive prevention model, a 2-day training workshop for healthcare professionals was developed by the Diabetes Prevention Support Center to provide a complete overview of the Group Lifestyle Balance program and its implementation. Eleven training workshops have been held to date, with more than 375 healthcare professionals completing training, including those providing the intervention for the present evaluation.

The Group Lifestyle Balance workshops were designed to provide an overview of the background and results of the DPP, the rationale for the nutrition and physical activity goals of the program, and a session-by-session teaching synopsis. Other aspects of the training included promotion of behavioral skills for leading effective group sessions and discussion centered on helping attendees plan for program implementation in their respective setting. Training closely followed a standardized Group Lifestyle Balance manual of operations, which included a leader's guide for teaching each session and a complete set of participant handouts.

To date, workshop attendees have been healthcare professionals representing all disciplines, primarily registered dieticians, registered nurses, and diabetes educators, but also including social workers, exercise specialists, pharmacists, physicians, psychologists, and emergency services technicians. A network of trained group leaders or prevention professionals who are available to deliver the Group Lifestyle Balance program in a variety of settings has been established, with more than 300 members.

Table 1. Comparison of DPP lifestyle intervention to GLB intervention program

Fundamental aspects of DPP and GLB interventions	
■ **Goal:** 7% weight loss and increase physical activity to 150 minutes/week	
■ Safe and appropriate intervention that incorporates nutrition, physical activity, and behavior change	
■ Intervention delivered by appropriately trained group leader	
■ Strong focus on use of self-monitoring tools with feedback	
■ Use of problem-solving techniques to address barriers to healthy eating and physical activity	
Specific adaptations to DPP intervention	
DPP intervention	**Modified GLB**
■ 16 sessions delivered over 24 weeks with monthly follow-up	■ 12 weekly 1-hour sessions delivered over 12–15 weeks
■ Individual counseling	■ Group classes
■ Focus on food pyramid	■ Primary focus on healthy food choices
■ Initial emphasis on fat intake	■ Initial emphasis on fat intake and calories
■ Pedometer introduced during maintenance phase	■ Pedometer introduced during core sessions
■ Use of lifestyle toolbox	■ Use of inexpensive food samples and incentives
■ Lifestyle coach training conducted by DPP LRC	■ Prevention training conducted by DPSC faculty via 2-day workshop
■ Ongoing support for implementation provided by LRC	■ Ongoing support for implementation provided by DPSC

DPP, Diabetes Prevention Program; DPSC, Diabetes Prevention Support Center; GLB, Group Lifestyle Balance; LRC, Lifestyle Resource Core

As in the DPP, Diabetes Prevention Support Center support is available to prevention professionals who have completed the Group Lifestyle Balance training workshop. Support in the current project was provided via telephone and e-mail, with contact between the Diabetes Prevention Support Center and the prevention professionals occurring approximately twice per month on topics that included participant adherence, self-monitoring difficulties, goal barriers and solutions, and participant incentives.

Intervention Evaluation

A nonrandomized prospective one-group design was chosen for the initial effectiveness evaluation. The evaluation was conducted in two phases: Phase 1 assessed the Group Lifestyle Balance program in four primary care practices between 2005 and 2006, while Phase 2 further evaluated the program in two additional primary care practices and in subjects referred directly to the Diabetes Prevention Support Center in 2007–2008. The primary care practice setting was initially chosen as it provides a venue for institutional delivery and reinforcement of prevention intervention and the provision of ongoing follow-up care as well as the fact that it has a large number of already identified patients at risk for type 2 diabetes. Some practitioners with limited resources prefered to refer patients to an outside intervention program rather than provide it internally; thus, the university-based Diabetes Prevention Support Center was also used as a delivery site. This project was approved by the University of Pittsburgh IRB, and all participants provided informed consent.

Phase 1: Primary Care Practices

In Phase 1, two of the participating practices were urban while two were rural and located approximately 50 miles away from Pittsburgh PA. Three practices were similar in size (patient range 2150–2659) with the fourth (urban) being somewhat larger (~4000 patients). The practices were asked to identify prevention professionals (one full-time equivalent [FTE] per practice) to conduct recruitment, screening assessments, and delivery of the intervention; two were identified from within and two were hired for the project. The prevention professionals in Phase 1 included nurses, a health educator, and an exercise specialist. Prevention screening assessments included collection of medical and family history, fasting lipid and glucose levels, blood pressure, height, weight, and waist circumference.

Practices sent a total of 2167 screening invitations to all patients aged 25–74 years with birthdays in a specific quarter of the year; 388 (18%) attended screening from which 106 (27%) met eligibility criteria for the intervention. Patients without diabetes, a BMI $\geq$25 kg/m^2, and the metabolic syndrome (National Cholesterol Education Program, Adult Treatment Panel III, definition)[23] were eligible for enrollment in the Group Lifestyle Balance program with their physician's approval. Of 106 eligible individuals, 55 declined participation, yielding a study population of 51 across the four practices. Reasons for nonparticipation are unavailable as the screening component was not part of this consented research evaluation. Exclusionary criteria, kept to a minimum by design in order to follow a true translation model, included previously reported diabetes, pregnancy, or lack of physician approval.

Phase 2: Diabetes Prevention Support Center and Additional Practices

In 2006, one of the trained prevention professionals from the Phase 1 project was hired to provide the Group Lifestyle Balance program to patients referred by physicians in the surrounding communities. Two groups were enrolled at the Diabetes Prevention Support Center with plans to follow their progress over the course of 1 year. In addition, five University of Pittsburgh Medical Center primary care practices also offered the intervention. The Diabetes Prevention Support Center identified prevention professionals for these sites from the Group Lifestyle Balance training network, which consisted of a registered dietician, an exercise specialist, and a registered nurse (one prevention professional delivered the intervention at three practices). It was estimated that approximately 8% FTE was required to deliver one 12-session Group Lifestyle Balance series. Because of funding limitations, only two of the practices were formally evaluated in Phase 2. The two research practices were located in suburban areas of Pittsburgh; one practice had a patient base of approximately 5000 and the other approximately 10,000.

In Phase 2, the inclusion criteria were expanded to include subjects aged $\geq$18 years and those with prediabetes (fasting glucose 100–125 milligrams pre deciliter [mg/dL]).[24] Potential participants learned about the Group Lifestyle Balance program through newspaper announcements and posted flyers, or were referred by their physician. Physician referral with permission for physical activity was required for all participants. A total of 74 referrals were received; 56 (76%) met the eligibility criteria, of which 42 (75%) enrolled.

Procedures and Outcome Measures

Participants in both phases completed assessments at baseline and at the conclusion of the intervention, with blood pressure, height, weight, and waist circumference measured following a standard protocol. Total cholesterol, high-density lipoprotein (HDL) cholesterol, non-HDL cholesterol, and glucose were measured after at least a 2-hour fast using the Cholestech LDX System by a certified research assistant. Global CVD risk assessment[25] was also estimated, and medication use was assessed via participant interview. Weight was recorded at each Group Lifestyle Balance session. Participants in Phase 2 were offered the opportunity to attend monthly support meetings for 9 months after completion of the intervention and received the same clinical assessment described above at 6 and 12 months post-intervention. Topics from the Group Lifestyle Balance sessions were reviewed and weight was assessed at each monthly meeting.

Cost

Although no formal cost evaluation was completed, the cost of Group Lifestyle Balance program delivery was calculated using program material expenses and a rate of $30/hour of prevention professional time (based on their report, each session required about 3 hours, including prep and class time). Cost for provision of healthy foods for taste testing and small incentives was also included. The cost of a 1-year program including 12 sessions and nine monthly follow-up meetings was calculated at approximately $300 per participant, with eight participants per group.

Sample Size Estimation and Statistical Analysis

Based on previous local DPP weight-loss experience and using this variance estimate, it was estimated that for paired analysis 21 subjects were needed to detect a 7% weight loss with α=0.05 and 90% power. Analyses were carried out using the SAS statistical package, version 9.1. The mean change between pre- and post-intervention measures was analyzed using the paired Student's t test when change data were normally distributed (weight, waist circumference, and BMI); however, for most measures the nonparametric Wilcoxon matched-pairs signed rank test was used. Mixed models were used to examine weight change over time (repeated measures per participant) adjusting for weight at study entry and clustering of participants within clinical site; individual participant and clinical sites were random effects in the model. Global CVD risk was assessed at both the pre- and post-intervention assessments using the Framingham risk score. Correlations were calculated using Pearson or Spearman correlation coefficient. Primary analyses were conducted on an intention-to-treat basis; to handle missing data, last observation carried forward methodology was used for participants who did not attend the postassessment visit. Specifically, in Phase 1, a total of 18 of the 51 participants did not attend the postassessment visit and, in Phase 2, two of the 42 participants did not attend the postassessment visit, while 12 did not attend the 12-month assessment visit. Subjects with changes in medication use during the course of the intervention for the condition being evaluated were excluded from appropriate specific analyses; in addition, eight participants whose glucose results were affected by a laboratory error were excluded from glucose analysis. Secondary subgroup (per protocol) analyses were also performed for those who attended at least 50% of the intervention sessions and the follow-up assessment visits.

Results

Baseline characteristics are shown in Table 2. Both groups were comprised of primarily middle-aged white women and had a mean BMI ≥30 kg/m^2. In Phase 1, a total of 31 participants (61%) attended at least half of the 12 intervention sessions (mean number of sessions attended was 6.5). In Phase 2, a total of 40 participants (95.2%) attended at least half (mean number of sessions attended was 10.0). Participants who were over the median age (58 years) had better attendance than younger participants (mean sessions attended 10.7 vs 9.2, respectively; p=0.03) in Phase 2; however, in Phase 1 there was no significant attendance difference by age. In both phases, the number of sessions attended was positively correlated with weight loss (Phase 1: r =0.43, p=0.002; Phase 2: r =0.53, p=0.0003) and with physical activity minutes (Phase 1: r =0.37, p=0.03; Phase 2: r =0.38, p=0.01).

Overall mean weight loss in both phases combined (N=93) was 7.4 pounds (−3.5%, p<0.001). Specific results of the baseline and post-intervention assessments are shown in Table 3. Weight loss for the Phase-1 cohort (N=51) was significant, with an average decrease of 4.6 pounds (−2.2%, p<0.001). Using mixed models, participant weight loss was estimated at 0.5 pound per week (p<0.001) after adjusting for starting weight and clinic (p<0.001). Significant decreases from pre- to post-intervention were also found for waist circumference (−0.69 inches, −1.6%, p=0.003); BMI (−0.82 kg/m^2, 2.3%, p<0.001); and glucose (−4.63 mg/dL, 3.7%, p=0.02). Weight loss per protocol in Phase 1 (n=28) was significant, with an average decrease of 7.2 pounds (3.5%, p<0.001; data not shown).

Significant decreases in weight (−9.9 pounds, −4.9%, p<0.001); waist circumference (−1.7 inches, −4.2%, p<0.001); and BMI (−1.6 kg/m^2, 4.9%, p<0.001) were also observed from baseline to post-intervention in the Phase-2 cohort (N=42). In addition, significant decreases in total cholesterol (−14.9 mg/dL, −7.6%, p=0.001); non-HDL cholesterol (−14.1 mg/dL, −9.4%, p=0.001); systolic blood pressure (−8.6 mmHg, −6.8%, p<0.001); and diastolic blood pressure (−3.1 mmHg, −3.7%, p=0.04) were noted. Using mixed models analysis, participant weight loss in the Phase-2 cohort was estimated at 1 pound per week (p<0.001) after adjusting for baseline weight and clinic. At 12 months, a significant decrease from baseline continued to be observed for all of the above noted measures, with the exception of total cholesterol (−6.6 mg/dL, −3.6%, p=0.09). In addition, a significant increase in HDL (+2.7 mg/dL, +6.1%, p=0.007) was noted. Weight loss per protocol at 3 (n=39); 6 (n=35); and 12 months (n=30) was significant, with an average decrease of 10.6 pounds (−5.1%, p<0.001); 12.5 pounds (−6.0%, p<0.001); and 11 pounds (−5.3%, p<0.001), respectively (data not shown).

Table 2. Baseline characteristics of study population: Group Lifestyle Balance program, University of Pittsburgh primary care practice and DPSC population

	Phase 1 (n=51)	Phase 2 (n=42)
Women/total group	42/51 (82%)	33/42 (79%)
Nonwhite	14/51 (27%)	0/42 (0%)
Age	52.9 (12.3)	57.2 (9.7)
Age range	27−74 years	24−73 years
Weight (pounds)	216.0 (42.3)	208.4 (37.2)
Waist (inches)	43.2 (5.6)	41.2 (5.1)
BMI[a]	36.6 (7.4)	34.6 (5.4)
Total cholesterol (mg/dL)	191.3 (31.4)	185.8 (30.0)
HDLC (mg/dL)	41.6 (11.4)	44.4 (10.9)
Non-HDLC (mg/dL)	149.7 (31.2)	142.4 (27.6)
Blood glucose (mg/dL)	98.8 (17.9)	108.1 (12.2)
Systolic blood pressure (mmHg)	125.4 (16.4)	122.8 (11.8)
Diastolic blood pressure (mmHg)	79.1 (9.9)	79.0 (7.1)

Note: Data are M (SD), unless noted otherwise.
[a]n=50; height missing for 1 participant
DPSC, Diabetes Prevention Support Center; HDLC, high-density lipoprotein cholesterol

Table 3. Baseline and post-intervention comparisons: Group Lifestyle Balance program, University of Pittsburgh primary care practice and DPSC population

	Phase 1 (3 months) (n=51)					Phase 2 (3 months) (n=42)					Phase 2 (12 months)				
Variable	n	Pre M (SD)	Post M (SD)	M change (SD)	M % change	p-value	n	Pre M (SD)	Post M (SD)	M change (SD)	M % change	p-value	n	M (SD)	M change	M % change	p-value
Weight (pounds)	51	216.0 (42.3)	211.4 (43.0)	−4.6 (7.2)	−2.2%	<0.001	42	208.4 (37.2)	198.5 (38.9)	−9.9 (8.0)	−4.9%	<0.001	42	199.1 (41.0)	−9.3 (12.5)	−4.5%	<0.001
Waist (inches)	51	43.2 (5.58)	42.5 (5.67)	−0.7 (1.61)	−1.6%	0.003	42	41.2 (5.1)	39.5 (5.4)	−1.7 (1.8)	−4.2%	<0.001	42	38.4 (5.7)	−2.8 (2.4)	−6.8%	<0.001
BMI (kg/m^2)	50	36.6 (7.35)	35.7 (7.45)	−0.9 (1.18)	−2.3%	<0.001	42	34.6 (5.4)	33.0 (5.8)	−1.6 (1.3)	−4.9%	<0.001	42	33.1 (5.9)	−1.6 (2.1)	−4.8%	<0.001
Total cholesterol[a] (mg/dL)	47	190.6 (31.4)	190.7 (32.4)	0.1 (23.9)	0.8%	0.92	41	185.9 (30.4)	171.0 (34.6)	−14.9 (25.2)	−7.6%	0.001	41	179.3 (28.4)	−6.6 (22.4)	−3.6%	0.09
HDLC[a] (mg/dL)	47	42.1 (11.5)	42.8 (11.7)	0.7 (7.1)	2.2%	0.32	41	44.2 (10.9)	44.9 (13.5)	0.7 (5.9)	1.4%	0.50	41	46.9 (11.2)	+2.7 (8.1)	+ 6.1%	0.007
Non-HDLC[a] (mg/dL)	47	148.5 (31.2)	148.0 (32.8)	−0.5 (22.6)	−0.5%	0.84	41	142.8 (27.9)	127.6 (31.0)	−14.1 (22.9)	−9.4%	0.001	41	135.0 (29.8)	−7.8 (21.9)	−5.5%	0.02
Glucose (mg/dL)	43[b]	99.1 (15.7)	94.5 (15.5)	−4.6 (16.7)	−3.7%	0.02	42	108.1 (12.2)	110.0 (12.0)	1.9 (13.9)	2.7%	0.48	42	106.6 (16.7)	−1.5 (14.9)	−1.4%	0.52
SBP[a] (mmHg)	45	122.4 (17.9)	124.2 (19.9)	1.8 (9.31)	1.6%	0.29	38	123.4 (12.3)	114.8 (14.6)	−8.6 (12.3)	−6.8%	<0.001	35	111.0 (17.0)	−13.0 (18.0)	−10.5%	<0.001
DBP[a] (mmHg)	45	77.6 (11.8)	76.6 (10.9)	−1.0 (5.39)	−0.1%	0.22	38	78.6 (7.2)	75.5 (9.3)	−3.1 (8.7)	−3.7%	0.04	35	74.2 (6.9)	−4.3 (8.1)	−5.5%	0.002

[a]Patients with medication changes excluded
[b]n = 43 due to lab error
DBP, diastolic blood pressure; DPSC, Diabetes Prevention Support Center; HDLC, high-density lipoprotein cholesterol; SBP, systolic blood pressure

Figure 1. Weight-loss achievement for Group Lifestyle Balance program intervention—University of Pittsburgh primary care practice and Diabetes Prevention Support Center population

Achievement of weight loss is reflected in Figure 1 for both phases as well as the combined data following a per-protocol analysis (n=67); 16 participants (23.8%) reached 7% weight loss at the 3-month post-intervention assessment, while 35 (52.2%) and 40 (59.7%) achieved 5% and 3.5%, respectively.

No change was found in global CVD risk (mean pre-intervention 10-year risk=5.0% [SD=6.0%] vs 6.0% [SD=7.0%] post-intervention, p=0.70) during Phase 1. In Phase 2, there was a marginal reduction in the 10-year CVD risk after completion of the intervention (mean pre-intervention 10-year risk= 3.0% [SD=3.0%] vs 2.0% [SD=3.0%] post-intervention, p=0.09).

Discussion

The findings of this project provide evidence that a comprehensive diabetes prevention model for training, intervention delivery, and support can be successful. The Group Lifestyle Balance program was administered to prevention professionals via training and support provided by the Diabetes Prevention Support Center, who, in turn, delivered the program to individuals at risk for diabetes and CVD. The program significantly reduced key components of risk for type 2 diabetes and CVD in high-risk participants in both the primary care practice and university-based setting, which were maintained at 12 months. One other nonrandomized study that implemented a modified DPP delivered over 6 weeks reported a significant decrease in the glucose level and systolic and diastolic blood pressure, which were maintained at 12 months.[15] In randomized controlled projects, Whittemore et al.[16] demonstrated a marginal trend for higher HDL levels (p=0.21) at 6

months when compared to controls, and Ackermann and colleagues[14] reported that intervention participants had a greater decrease in total cholesterol than controls, which was sustained after 12 months.

In the current project, 23.8% of those completing the program reached the 7% goal at 3 months postintervention. The Group Lifestyle Balance program was also recently implemented by prevention professionals, trained and supported by the Diabetes Prevention Support Center, in an urban medically underserved community setting in subjects with the metabolic syndrome; 26.1% reached the 7% weight-loss goal at the conclusion of the 3-month intervention and more than one third reduced at least one component of the metabolic syndrome.[26] The Group Lifestyle Balance program was also evaluated in a hospital-based healthcare practice, in which 27% of enrolled participants reached the 7% weight-loss goal at the end of 1 year.[27]

It could be expected that the effectiveness of translation efforts would be reduced relative to that implemented in a controlled research setting like the DPP, for which 49% of lifestyle participants reached the 7% weight-loss goal by the completion of the core intervention at 6 months.[28,29] In the current project, 33.3% and 59.5% achieved weight losses of 3.5% in the Phase-1 and Phase-2 groups respectively at the 3-month assessment; this is somewhat similar to the trend for weight loss seen in the DPP at 3 months. Two other studies have reported 30% and 45% reaching 7% weight loss in a modified group DPP at 16 weeks,[17,19] with another reporting 25% reaching a weight loss of 5% at 6 months.[16]

Current translation efforts have involved training individuals to deliver DPP intervention in specific settings. In the YMCA model, a 2-day DPP intervention training was held for YMCA employees with an "associate or baccalaureate degree in exercise or a related health field or equivalent training and certification."[20] Whittemore et al.[16] described training nurse practitioners for provision of a modified DPP in primary care practice that included motivational interviewing and education regarding the program protocol. In the church setting, a modified DPP was led by "volunteer healthcare professionals," who attended a 60-minute training session conducted by the researchers.[15] More recently, Amundson and colleagues[19] reported providing training workshops that focused on implementing the DPP curriculum in a group setting for dieticians and health professionals with education and training in exercise sciences.

Thus, it is apparent that diverse individuals in a variety of settings can be successfully trained to deliver adaptations of the DPP; however, an all-encompassing training and support framework is lacking. This will be essential in moving forward with prevention translation in order to allow intervention programs to be effectively delivered on a large scale with the capability to address long-term maintenance and ongoing evaluation.

The Diabetes Prevention Support Center has designed a comprehensive model that should traverse a variety of settings and is currently being evaluated as such. The Diabetes Prevention Support Center has mapped out several priorities: (1) continued enhancement of the Group Lifestyle Balance program with particular attention directed toward both long-term healthy lifestyle maintenance and hard-to-reach communities; (2) continued support for those trained to administer the intervention programs, with ongoing evaluation of training and program effectiveness; (3) implementation of web-based training with expansion to include a train-the-trainer program; and (4) development of a recognition program for diabetes prevention intervention similar to the existing national standards for diabetes self-management education.[30] The achievement of these goals will be critical in moving toward the establishment of Medicare and other third-party payment, and will require the collaboration of all of those involved in diabetes translation efforts.

Strengths of this project include the development of a standardized framework for training and support for prevention lifestyle intervention delivery that is readily available for implementation in a variety of settings. In addition, a prospective follow-up design was utilized in the initial evaluation of this modified DPP lifestyle intervention for translation. Measures were made of change in risk parameters for subjects in both urban and rural environments in two phases, with data analyzed according to the intention-to-treat principle as well as per protocol.

Limitations of this study include the unavailability of information regarding participant decision to decline participation as well as the modest sample size and the attrition of participants in Phase 1. In addition, only a small number of men took part, as did only a few nonwhites. As this trend has been noted previously,[31,32] future translational efforts need to determine strategies to engage these groups. Because missing values were handled by carrying forward the last value for analysis, it is possible that weight loss could have been overestimated. Finally, a more comprehensive cost analysis would provide useful information for implementation.

By mirroring the successful intervention training and support scheme utilized in the DPP, a comprehensive translation model has been implemented for diabetes prevention and CVD risk reduction. At the core is the modified DPP lifestyle intervention that has been adapted for implementation in real-world settings, while maintaining the fundamental aspects of the original intervention. The Group Lifestyle Balance program has now been successfully delivered in healthcare locales as well as a medically underserved community setting. By providing a central training center for intervention delivery via workshops as well as provision

of subsequent post-training support, it is hoped that this model will provide a framework for standardized large-scale prevention dissemination in many diverse settings.

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