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## Sustained Weight Loss One Year After Group Telephone Intervention: 3- Year Results from the SHINE Study

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### Abstract

A telephone delivered translation of the DPP weight loss program, delivered by trained primary care staff over 2 years, resulted in significant weight loss for patients with metabolic syndrome. Participants in groups (conference calls) continued to lose weight a full year after the program ended, while those called individually regained.

### Keywords

obesity; Diabetes Prevention Program; metabolic syndrome; telephone intervention; weight loss

### 1. Introduction

Thirty-four per cent of adults in the U.S. are diagnosed with metabolic syndrome [IDF criteria [1] and BMI  $\geq 30$  kg/m<sup>2</sup>]. In the Diabetes Prevention Program (DPP) patients at risk for diabetes who lost weight, including those with metabolic syndrome, reduced their risk of developing diabetes [2–5]. Many have tested DPP translations that have greater reach and lesser cost, and overall, these translations do achieve weight loss [6]. However, few report on the maintenance of weight loss.

We have previously reported results of the SHINE (Support, Health Information, Nutrition and Exercise) study. Primary care (PCP) staff delivered the DPP intervention on the

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**Conflict of Interest Disclosures:** None

Trial Registration: [clinicaltrials.gov](http://clinicaltrials.gov) Identifier: NCT 00749606

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telephone, in groups (CC: conference calls) or individually (IC: individual calls) [7]. The phone can increase access for those with disabilities, transportation or time barriers. After the two year intervention ended, we followed participants for one year. Here we report the 3 year results. Primary outcomes were change in weight/BMI/waist circumference at end of year-3.

## 2. Participants and methods

A detailed description of SHINE has been published [7]. Inclusion criteria: >18 years, with metabolic syndrome [IDF criteria [8], and BMI  $\geq 30$  kg/m<sup>2</sup>], recruited 6/09–11/10, provided informed consent. Exclusion criteria: diagnosed diabetes, presence of severe medical problems that could affect participation. Five diverse (rural, small city, medium-sized city/poor, medium-sized city/moderate income) upstate NY PCP sites participated. SHINE was approved by the Institutional Review Board at SUNY Upstate Medical University. Participants were randomized to treatment arms using a balanced block randomization schedule stratified by site and gender. The CONSORT diagram has been previously published [7].

DPP materials were adapted for phone delivery. Interventionists participated in a 2-day training course, and were supervised to competence with random tape review. In year-1, educators followed DPP 16-session curriculum scripts (weekly-5 weeks, monthly-1 year), either individually (IC) or in groups (CC). Dietitian “coaches” provided individualized support monthly. In year-2 educators addressed DPP “additional topics” monthly, coaches were available. Participants logged diet/activity/weight, sent to educators monthly. The interventions were identical except for CC, scripts included prompts to engage all group members. In year-3 there was no intervention.

A blinded research nurse performed standardized assessments at PCP sites: height, weight, waist circumference, blood pressure, and obtained blood for fasting lipid levels, questionnaires for demographic data. Mixed linear model regression procedures were used in intent-to-treat analysis to partition variation in repeated outcome measures over time. Predictors included assessment period, treatment group and their interaction. Mixed model procedures adjusted coefficient estimates to account for missing outcome measures. However, baseline observation carried forward (BOCF) and last observation carried forward (LOCF) analyses yielded consistent results (data not shown).

## 3. Results

See Table 1 for demographic and baseline measures. See Table 2 and Figure 1 for outcome data for both arms at each assessment point. Absolute weight loss, change in BMI and waist circumference was comparable for CC and IC groups at year-1. At year-2 and year-3 (one year after completion of all intervention contact) IC participants regressed somewhat, while CC participants continued to improve or maintained. At year-3, CC adjusted mean weight decreased 6.44 kg ( $\pm 15.61$ ,  $p < .001$ ), whereas IC decreased by 2.35 kg ( $\pm 16.32$ ,  $p = .018$ ), still significantly better than baseline but showing regain. Mean percent reduction in weight was 6.16% for CC vs. 1.98% for IC ( $p = .002$ ). And 50.7% (CC) vs. 28.6% (IC) lost at least 5% weight, their goal. Our prior finding that completers (i.e., attended 9 of 16 core

sessions; CC:51.4%; IC: 50.0%) had greater weight loss was supported at year-3 but only for the IC arm. There was no difference in 5% weight loss at year-3 for CC completers (51.0%) vs. CC non-completers (50.0%,  $p=.943$ ), but there was a significant difference between IC completers (37.8%) vs. IC non-completers (5.6%,  $p=.011$ ).

Year-3 results for waist circumference and BMI paralleled those for weight, i.e., CC maintained improvements, IC regressed (Table 2 and Figure 1). For CC participants at year-3 compared to baseline, BMI decreased  $2.08 \text{ kg/m}^2$  ( $\pm 11.04$ ,  $p<.001$ ); for IC the decrease was not significant ( $0.77 \text{ kg/m}^2 \pm 11.36$ ,  $p=.055$ ). Similarly, waist circumference decreased 4.73 in. ( $\pm 29.92$ ,  $p<.001$ ) in CC, but the change was not significant for IC (1.62 in  $\pm 30.81$ ,  $p=.136$ ). Mean decrease in waist circumference differed significantly between the two arms ( $p=.015$ ). We note that compliance with logging was similar, i.e., mean (SD) no. of weeks logged was IC: 13.02 (16.45); CC: 15.11 (18.07). Between baseline and year-3, both arms showed improvements in HDL, and IC showed increases in systolic and diastolic blood pressure, while CC did not.

## DISCUSSION

In SHINE, a real-world, DPP telephone adaptation intervention delivered by PCP staff to patients with metabolic syndrome, group participants were more likely than individual participants to maintain weight loss after a full year with no intervention. Studies show that weight loss maintenance is challenging, the majority regain [9, 10]. However, comparisons are difficult since most do not report long-term data after program completion [6]. The DPP group assessed weight at  $>3$  years, but the intervention continued during those years. Other trials of comparable interventions also intervened until the final assessment [11, 12]. Others who have specifically studied weight loss maintenance performed assessments after continued intervention [13, 14]. A few DPP translation trials have assessed participants after no intervention, but lack of randomization and very small Ns limit comparisons [15, 16]. SHINE is the first randomized trial of a DPP translation we are aware of in which participants were assessed a full year after intervention, and 3 years from baseline, key in evaluating long-term program effectiveness.

Results are limited to PCP patients with metabolic syndrome and may not generalize to groups of different race/ethnicities or SES. Although common in community samples, we also had a high attrition rate.

In conclusion, the group phone delivery of the SHINE translation of the DPP lifestyle intervention for obese people with metabolic syndrome was more effective than individual intervention and this success was maintained after the intervention ended, suggesting that group intervention is a better approach for effective and sustained weight loss.

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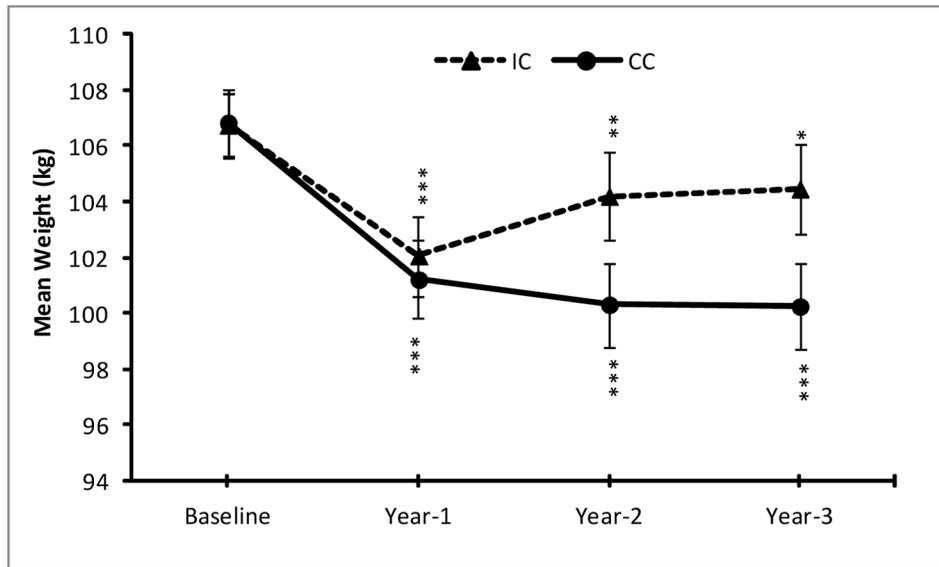
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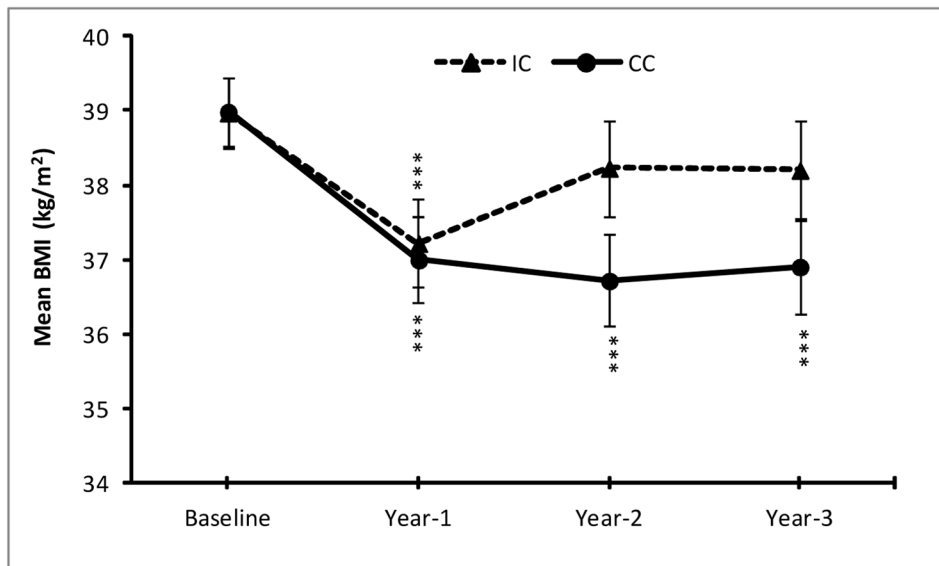
**HIGHLIGHTS**

- We compared group to individual telephonic translation of the DPP intervention
- At 3 years both interventions led to significant weight loss compared to baseline.
- At 3 years, group participants maintained weight loss, individual participants regained.
- Group intervention was more effective than individual for maintaining weight loss.

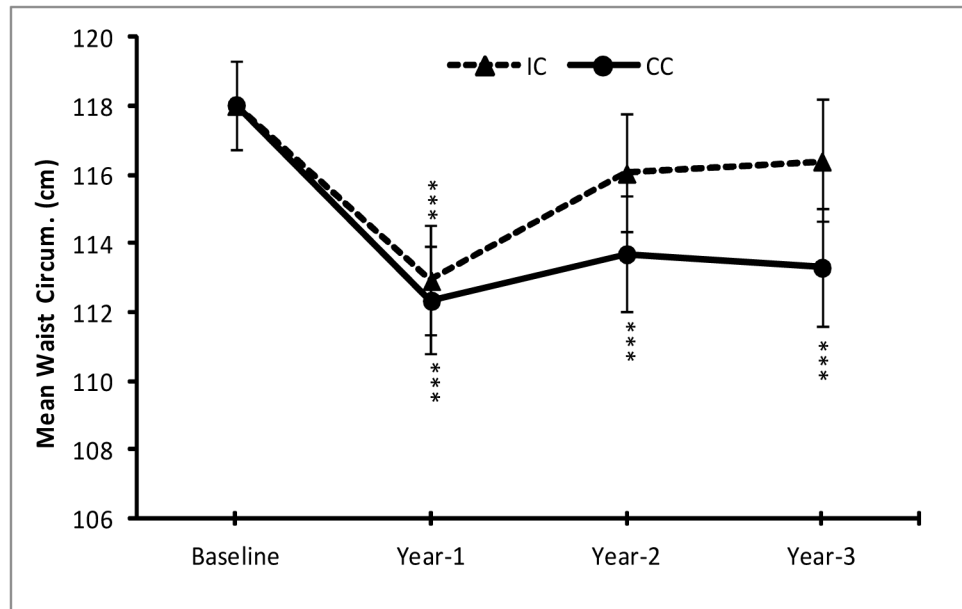
A



B



C



**Figure 1.** Mean weight (A), body mass index (B), and waist circumference (C) at baseline, 1, 2 and 3 years. Error bars indicate 95% confidence intervals. P-values are for within-arm planned comparisons to baseline means: \*p .05; \*\* p .01; \*\*\*p .001

**Table 1**

Baseline Measures and Characteristics of Participants (n=257) in SHINE

	Individual (N=129)	Group (N=128)	P
Gender			
Female (N, %)	101 (78.3)	92 (71.9)	0.23
Age (mean (SD))	50.7 (13.1)	52.7 (12.8)	0.22
Race (N, %)			
White	109 (84.5)	110 (85.9)	0.80
African American/Other	18 (13.9)	16 (12.5)	
Hispanic	1 (0.8)	2 (1.6)	
Missing	1 (0.8)	0 (0.0)	
Marital Status (N,%)			
Married	68 (52.7)	67 (52.3)	0.80
Single	38 (29.5)	33 (25.8)	
Divorced/Separated	16 (12.4)	18 (14.1)	
Widowed	7 (5.4)	10 (7.8)	
Employment			
Employed-Yes (N,%)	63 (48.8)	56 (43.8)	0.41
Education			
No High School Diploma	15 (11.6)	11 (8.6)	0.36
High School/Technical Diploma	70 (54.3)	64 (50.0)	
Associates Degree	18 (14.0)	22 (17.2)	
Bachelor's Degree	13 (10.1)	22 (17.2)	
Post-Bachelor's Degree	13 (10.1)	9 (7.0)	
Household Income (N,%)			
\$20,000	28 (21.7)	21 (16.4)	0.71
\$20,001 – 40,000	37 (28.7)	38 (29.7)	
\$40,001	51 (39.5)	53 (41.4)	
Missing	13 (10.1)	16 (12.5)	
Weight (kg)	105.8 (23.6)	109.4 (26.1)	0.25
Height (cm)	164.7 (9.3)	165.9 (9.2)	0.32
Body Mass Index (kg/m <sup>2</sup> )	38.9 (7.6)	39.7 (8.3)	0.44
Waist Circumference (cm)	118.3 (15.9)	118.8 (17.6)	0.81
Systolic BP (mm Hg)	127.7 (15.4)	130.4 (19.8)	0.22
Diastolic BP (mm Hg)	75.1 (9.3)	76.4 (11.3)	0.30
Fasting Glucose (mg/dl)	100.3 (11.8)	98.9 (12.2)	0.36
Total Cholesterol (mg/dl)	178.2 (38.3)	182.4 (36.6)	0.37
HDL Cholesterol (mg/dl)	43.7 (14.2)	41.1 (12.5)	0.12
LDL Cholesterol (mg/dl)	106.7 (29.3)	109.8 (27.2)	0.39
Triglycerides (mg/dl)	141.0 (72.1)	150.4 (91.7)	0.37



**Table 2**

Baseline-adjusted means (SD) for clinical variables by study arm and assessment

	Baseline (N=257) <sup>I</sup>	Year-1 (N=154)	Year-2 (N=135)	Year-3 (N=132)
Weight (kg)				
IC	106.75 (14.34)	102.07(19.73)***	104.2 (21.57)**	104.47 (21.51)*
CC	106.85 (14.43)	101.23(18.97)***	100.33(20.49)***	100.27(20.44)***
Weight Change from Baseline (kg)				
IC	---	-5.07 (15.33)***	-2.84 (14.03)**	-2.35 (16.32)*
CC	---	-5.51 (14.85)***	-6.49 (13.42)***	-6.44 (15.61)***
Weight Change from Baseline (%)				
IC	---	-4.61 (13.97)***	-2.40 (15.18)**	-1.98 (15.53)*
CC	---	-5.44 (13.53)***	-6.09 (14.47)***	-6.16 (14.79)***
BMI (kg/m <sup>2</sup> )				
IC	38.97 (6.16)	37.22 (8.35)***	38.23 (9.08)	38.20 (9.00)
CC	38.99 (6.18)	37 (8.05)***	36.72 (8.65)***	36.91 (8.58)***
Waist Circumference (in)				
IC	118.02 (16.30)	112.92(22.29)***	116.05 (24.28)	116.4 (24.28)
CC	118.04 (16.37)	112.35(21.47)***	113.71(23.11)***	113.31(23.12)***
Total Cholesterol (mg/dL)				
IC	179.61 (57.03)	187.56 (76.40)*	189.11 (83.32)**	184.02 (82.44)
CC	180.31 (57.27)	181.66 (74.46)	181.34 (79.52)	182.02 (78.73)
HDL Cholesterol (mg/dL)				
IC	42.7 (18.78)	43.42 (24.75)	42.84 (27.25)	45.54 (26.81)*
CC	42.51 (18.80)	43.97 (24.28)	46.6 (25.96)***	47.98 (25.79)***
LDL Cholesterol (mg/dL)				
IC	107.32 (51.17)	113.21 (68.81)	113.8 (75.97)	109.74 (75.21)
CC	108.01 (49.91)	109.11 (66.94)	107.91 (72.13)	107.02 (72.1)
Triglycerides (mg/dL)				
IC	143.35(128.56)	147.42 (171.47)	165.21(187.28)**	149.82 (185.49)
CC	145.1 (128.08)	140.41 (167.1)	142.74 (177.29)	143.76 (175.73)
Fasting Glucose (mg/dL)				
IC	99.70 (30.05)	100.43 (40.21)	101.12 (43.83)	101.39 (43.42)
CC	99.44 (30.19)	100.72 (39.15)	101.37 (41.84)	100.61 (41.46)
Systolic BP (mmHg)				
IC	128.75 (31.13)	129.94 (41.83)	132.05 (45.59)	134.43 (45.06)**
CC	129.54 (31.24)	129.9 (40.48)	132.6 (43.5)	131.17 (43.04)
Diastolic BP				
IC	75.24 (15.93)	76.23 (21.33)	77.85 (23.24)**	78.16 (23.00)**
CC	75.61 (16.00)	74.83 (20.63)	76.73 (22.18)	75.74 (21.95)

P-values are for within-arm comparisons to baseline means, except for weight change, where P-values are for comparisons to 0 (no change). P-value symbology:

\*  
p .05;

\*\*  
p .01;

\*\*\*  
p .001.

IC=Individual call. CC=Conference call.

<sup>1</sup>For completers analyses, N=231 subjects who began the intervention