Is a Telehealth Preoperative Weight Loss Program Effective in Helping Patients Attain BMI Criteria for Total Joint Arthroplasty?

Macllain Riley Edington, Benjamin M Stronach[1], C Lowry Barnes[2], Simon Mears, Eric Siegel[3], Jeffrey Benjamin Stambough[1]

[1]University of Arkansas For Medical Sciences, [2]University of Arkansas for Medical Sciences, [3]Univ. Arkansas Medical Sciences

INTRODUCTION: Nearly three-quarters of adults in the United States are overweight or obese, posing challenges for surgical clearances. This study evaluates the 20Lighter® pre-operative patient-optimization program (POPOP), an 8-week medical weight loss program addressing obesity through tailored meal plans, natural supplements, and telehealth. It aims to improve total joint arthroplasty (TJA) surgical eligibility, health indicators, and post-operative outcomes compared to standard-of-care (SOC) patient-derived lifestyle changes.

METHODS: This prospective, randomized study enrolled patients seeking TJA with a body mass index (BMI) of 41-48 kg/m² over one year at our tertiary referral orthopedic clinic. Patients were randomized into SOC or POPOP groups, with POPOP including meal plans, nutritional supplementation, and daily engagement via a smartphone app with a 20Lighter health care provider for eight weeks. Data on body composition, health indicators, and Patient-Reported Outcome Measures (PROMs) were collected and compared between groups with ANCOVA to adjust for baseline assessments.

RESULTS:
Of the 46 patients enrolled, 23 completed the study, 10 in POPOP and 13 in SOC. Conversion rates to TJA eligibility were 70% with POPOP vs. 0% with SOC ($P<0.001$). After 90 days, POPOP participants had 4.69-kg/m^2 lower BMI ($P<0.001$) and 2.56% lower visceral fat ($P=0.004$). POPOP participants also had 2.17% lower body fat percentage ($P=0.330$) and 1.17% lower body water percentage ($P=0.449$) after 90 days, though these changes were not statistically significant (see Table 1). Over the same period, the changes in various other health metrics among POPOP participants were generally not significant. Hemoglobin A1c decreased by 0.22% ($P=0.242$), albumin levels dropped by 0.14 g/dL ($P=0.216$), and creatinine levels were 0.08 mg/dL lower ($P=0.245$). BUN levels saw a marginally non-significant decrease of 3.27 mg/dL ($P=0.054$), while C-reactive protein levels fell by 0.96 mg/L ($P=0.470$).

ALT levels increased by 9.77 U/L ($P=0.074$) and AST levels by 5.48 U/L ($P=0.095$), both non-significant changes. Hematocrit levels rose by 1.09% ($P=0.394$) and hemoglobin levels increased by 0.16 g/dL ($P=0.668$), neither of which were significant. WBC counts showed a decrease of 0.91 K/μL ($P=0.035$), and platelet counts decreased by 21.83 K/μL, which was marginally non-significant ($P=0.065$) (see Table 2). Six weeks post-TJA, POPOP participants showed a 31.19-point average improvement in KOOS/HOOS JR ($P=0.013$) and an 11.33-point average decrease in PROMIS® Pain Interference scores ($P=0.043$) compared to pre-operative scores. Changes in PROMIS® Physical Function scores were not significant, with a 4.27-point average improvement ($P=0.134$) (see Table 3).

DISCUSSION AND CONCLUSION: The POPOP group achieved more TJA eligibility and greater reductions in BMI and visceral fat compared to SOC. 70% decreased BMI below 40. POPOP had minimal effects on various pre-operative health, nutritional, and inflammatory laboratory values, but improved KOOS/HOOS JR and PROMIS Pain Interference scores six weeks post-TJA for participants. These findings demonstrate that a preoperative weight loss program can be a highly effective method in enhancing eligibility for TJA and optimizing body composition. The comprehensive benefits observed suggest that integrating such programs into orthopedic practices could significantly improve surgical outcomes and overall healthcare efficiency.

Table 1. Comparison of Changes in Body Composition Metrics Between POPOP[1] and SOC[2] Groups

Traits Measurements	POPOP (n=10) Mean	(SD)	SOC (n=13) Mean	(SD)	Adjusted difference	ANCOVA (P)
Body Mass Index						
Initial Evaluation	44.52	2.32	45.08	1.94	--	---
90 Day Follow-up	39.15	2.23	44.35	2.51	-4.69	<0.001
Change from Baseline	-5.37	1.57	-0.73	1.31	-4.69	<0.001
Body Fat Percentage						
Initial Evaluation	48.63	6.38	50.22	5.29	--	---
90 Day Follow-up	45.35	7.54	49.05	7.47	-2.17	0.330
Change from Baseline	-3.28	4.46	-1.16	5.37	-2.17	0.330
Visceral Fat Rating						
Initial Evaluation	18.55	4.03	19.57	3.76	--	---
90 Day Follow-up	15.48	2.96	18.95	4.52	-2.56	0.004
Change from Baseline	-3.07	2.02	-0.62	1.68	-2.56	0.004
Body Water Percentage						
Initial Evaluation	37.49	4.53	36.70	4.25	--	---
90 Day Follow-up	39.40	5.25	37.46	5.69	1.17	0.449
Change from Baseline	1.91	3.09	0.76	3.79	1.17	0.449

1: Pre-operative patient-optimization program
2: Standard-of-care

Table 2. Comparison of Various Health, Nutritional, and Inflammatory Laboratory Values Between POPOP[1] and SOC[2] Groups

	POPOP (n=10) N[3]	Mean	(SD)	SOC (n=13) N[3]	Mean	(SD)	Adjusted difference	ANCOVA (P)
Hemoglobin A1c								
Initial Evaluation	10	5.73	0.69	12	6.26	0.77	--	---
90 Day Follow-up	10	5.42	0.45	13	6.15	0.97	-0.22	0.242
Change from Baseline	10	-0.31	0.35	12	-0.11	0.41	-0.22	0.242
Albumin								
Initial Evaluation	10	3.70	0.40	13	3.75	0.28	--	---
90 Day Follow-up	10	3.94	0.31	12	3.83	0.30	0.14	0.216
Change from Baseline	10	0.24	0.32	12	0.07	0.28	0.14	0.216
Creatinine								
Initial Evaluation	10	0.90	0.16	13	0.89	0.26	--	---
90 Day Follow-up	10	0.86	0.18	13	0.93	0.21	-0.08	0.245
Change from Baseline	10	-0.04	0.11	13	0.04	0.20	-0.08	0.245
BUN[4]								
Initial Evaluation	10	13.50	4.35	13	12.30	4.73	--	---
90 Day Follow-up	10	10.90	4.72	13	13.32	5.09	-3.27	0.054
Change from Baseline	10	-2.60	4.03	13	1.02	3.82	-3.27	0.054
C-reactive protein								
Initial Evaluation	10	13.17	20.00	13	9.40	5.19	--	---
90 Day Follow-up	10	9.98	10.51	12	8.38	3.69	-0.96	0.470
Change from Baseline	10	-3.19	9.85	12	-0.18	3.84	-0.96	0.470
ALT[5]								
Initial Evaluation	10	27.10	13.74	13	28.08	12.97	--	---
90 Day Follow-up	10	32.90	20.62	12	24.75	8.26	9.77	0.074
Change from Baseline	10	5.80	15.11	12	-4.38	9.32	9.77	0.074
AST[6]								
Initial Evaluation	10	23.20	9.44	13	26.34	10.15	--	---
90 Day Follow-up	10	28.00	10.79	12	24.50	6.56	5.48	0.095
Change from Baseline	10	3.40	8.51	12	-3.25	8.07	5.48	0.095
Hematocrit								
Initial Evaluation	9	41.79	2.84	13	41.72	3.54	--	---
90 Day Follow-up	10	42.44	4.21	13	41.08	4.12	1.09	0.394
Change from Baseline	9	0.44	2.95	13	-0.64	2.69	1.09	0.394
Hemoglobin								
Initial Evaluation	9	13.50	1.03	13	13.24	1.21	--	---
90 Day Follow-up	10	13.74	1.28	13	13.25	1.50	0.16	0.668
Change from Baseline	9	0.18	0.82	13	0.01	0.83	0.16	0.668
WBC[7]								
Initial Evaluation	9	7.03	1.07	13	6.71	2.41	--	---
90 Day Follow-up	10	6.02	1.31	13	6.77	2.48	-0.91	0.035
Change from Baseline	9	-0.81	0.91	13	0.05	0.90	-0.91	0.035
Platelet								
Initial Evaluation	9	248.44	66.59	13	241.54	76.74	--	---
90 Day Follow-up	10	238.60	74.52	13	244.46	86.62	-21.83	0.065
Change from Baseline	9	-18.44	19.98	13	2.92	28.59	-21.83	0.065

1: Number nominating
2: Pre-operative patient-optimization program
3: Standard-of-care
4: Blood urea nitrogen
5: Alanine aminotransferase
6: Aspartate aminotransferase
7: White blood cell

Table 3. Comparison of Pre-operative and 6-Week Post-operative KOOS/HOOS JR and PROMIS Scores

Measures	Initial Score Range	Mean Initial Score (SD)	6 Week Post-Op Score Range	Mean Post-Op Score (SD)	Mean Change (SD)	P-value
KOOS/HOOS JR	28.94 - 52.47	38.97 (12.41)	43.99 - 80.51	70.71 (5.97)	31.19 (16.51)	0.013
PROMIS Pain Interference	58.53 - 79.00	66.66 (7.73)	52.60 - 56.30	54.42 (1.73)	-11.33 (8.48)	0.043
PROMIS Physical Function	23.29 - 42.10	35.87 (6.22)	30.70 - 47.40	42.84 (2.09)	4.27 (5.59)	0.134

1: Knee injury and Osteoarthritis Outcome Score
2: Hip dysfunction and Osteoarthritis Outcome Score