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Postoperative outcomes based on patient participation in a presurgery education and weight management program

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Abstract

Background: The benefits of presurgery weight management programs (WMPs) for bariatric patients are mixed; some show a positive impact on percent excess weight loss (%EWL) at 12 months postsurgery, while others show no effect.

Objectives: The purpose of this study was to compare pre- and postoperative 6- and 12-month outcomes between patients who attended a 12-week presurgery WMP and patients who did not participate.

Setting: Ohio State Wexner Medical Center, University Hospital, United States.

Methods: A retrospective medical record analysis was conducted to compare preoperative and 6- and 12-month postoperative outcomes for patients who attend the presurgery WMP (n = 56) and patients who did not (n = 441) within a 2-year time period (N = 497). Descriptive statistics and independent *t* tests were conducted to determine mean differences between groups, while controlling for surgery type, for weight status outcomes (%EWL, change in body mass index) preoperatively and 6 and 12 months postsurgery, and length of stay and readmission rate.

Results: Patients who attended the preoperative WMP had significantly higher %EWL at 12 months postsurgery compared with patients who did not attend the WMP. Additional findings indicated a positive, but nonsignificant effect, from the WMP on presurgery body mass index, and postsurgery %EWL at 6 months and body mass index change at 6 and 12 months postsurgery.

Conclusions: Patients attending the WMP had better 12-month %EWL and outcomes compared with those who did not attend the WMP, though this was not true for 6-month outcomes and differed based on surgery type. (Surg Obes Relat Dis 2018;14:1714–1724.) Published by Elsevier Inc. on behalf of American Society for Bariatric Surgery.

Keywords

Bariatric surgery; Educational programs; Weight management programs; Behavioral programs; %EWL postsurgery

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The prevalence of obesity in the United States has steadily increased over the past 5 decades, with approximately 35% of adults classified as obese (body mass index [BMI] >30 kg/m^2) and 6.3% with Class III or severe obesity (BMI ≥40 kg/m^2) [1,2]. One of the most successful treatment options for severe obesity is bariatric surgery, wherein the majority of patients experience a 50% to 75% reduction in excess weight within 6 months of surgery [3]. However, weight recidivism may occur approximately 2 years postsurgery [4] and is often attributed to reduced motivation [5], reemergence of unhealthy behaviors [6], stress [7], and limited social support [8]. As bariatric surgery remains an effective treatment for severe obesity [2,9], it is imperative to understand how presurgical medical weight management and educational programming can be designed to provide a foundation for positive and sustainable behavior change, and weight loss both pre- and postsurgery.

The goal of preoperative medical weight management programs (WMPs) is to establish positive presurgical behavioral changes, reinforced with concomitant weight loss that is sustainable postoperatively. In fact, both private and government-run insurance providers require bariatric surgery candidates to have tried medically supervised diets (ranging from 3–18 mo) consisting of consecutive weight management visits or programming, with some providers actually mandating presurgical weight loss (5%–15%) before surgery approval [10]. Behavioral lifestyle interventions for patients with severe obesity are more effective at producing weight loss compared with dietary interventions alone, with approximately 5% to 10% weight loss over 6 to 12 months [10–12]. One randomized controlled trial randomized patients into a 24-week program, comprising inperson and phone contact targeting dietary education, physical activity, and behavioral strategies compared with usual care [13]. Patients randomized to the program (n = 71) had greater preoperative weight loss compared with those in the usual care arm (5.7% versus 2.6% mean excess weight loss [%EWL]). However, there were no differences in postoperative outcomes between patients who received the program and completed at least 80% of required contact and those in usual care, including co-morbidities or EWL at 6 or 12 months postsurgery. Parikh et al. [12] found similar results with patients randomized into a 6-month mandatory medically supervised weight management program or usual care.

Furthermore, 3 independent systematic reviews concluded that preoperative weight loss did not lead to improved postsurgery weight loss or health outcomes [11,14,15]. One study did note that patients who achieved greater preoperative weight loss (i.e., 5%–10%, >10%) had shorter operative times and lengths of stay compared with those with lower percentages of preoperative weight loss (i.e., 5%); however, there were no significant differences between the groups for weight loss at 6 months and 2 years postsurgery [15].

More recently, Brown et al. [16] assessed the impact of a prehospital patient education program on bariatric surgery outcomes at 12 months. The program involved both inperson and online components. At 12 months postsurgery, patients who participated in the program (n = 82) had a greater mean EWL of 41.1 ± 20.3%, though this was not statistically significant, compared with 32 ± 18.0% for patients treated with usual care (n = 61). Finally, Tewksbury et al. [17] reviewed the relationship between preoperative weight loss via participation in weight management programs and bariatric surgery outcomes. They

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determined that preoperative programs and interventions have not been evaluated in the detail required to determine if postoperative outcomes can be attributed to the weight loss from these presurgery programs and interventions.

In summary, there is not clear evidence to indicate the following: (1) whether preoperative patient weight loss or lifestyle behavioral change improves weight loss or health outcomes postsurgery, and (2) whether presurgical weight management/education programs improve patient compliance, behavior change, and weight loss postsurgery. Further research is needed to determine how preoperative weight management and educational programming affect pre- and postsurgical patient outcomes, including presurgery BMI, postsurgery length of stay (LOS) and readmission rates, %EWL, and BMI change at 6 and 12 months. Thus, the purpose of this study was to determine the effects of a presurgery weight management and education program (WMP) on weight loss preoperatively and postsurgery outcomes, including weight loss at 6 and 12 months, hospital LOS, and readmission rates. We hypothesize that patients who participate in the presurgery WMP will have lower presurgery weight status compared with those who did not participate in the presurgery program. Additionally, patients who participate in the presurgery WMP will have greater %EWL and BMI change at 6 and 12 months postsurgery compared with those who did not participate in the program. Finally, patients who participated in the presurgery WMP will have shorter hospital LOS and lower readmission rates compared with patients who did not participate in the program, likely due to the education they received in the presurgery WMP.

Methods

Patient selection

After institutional review board approval at The Ohio State University (OSU) Wexner Medical Center, a retrospective review was performed on patients who underwent primary bariatric surgery at a single academic institution from July 2014 to June 2016. Patients between 21 and 65 years of age were eligible if they had a documented preoperative clinical office visit in the electronic medical record, underwent primary laparoscopic Roux-en-Y gastric bypass (RYGB) or sleeve gastrectomy (SG), and had at least 1 documented 6- or 12-month postoperative visit. Patients were identified as either participating in the preoperative WMP (experimental group) nested within OSU's bariatric program, or not participating in the WMP (control group). Participants self-selected to attend the WMP, called the Living Well Program.

Measures

Data extracted by using the electronic medical record included participation in the WMP (yes or no), surgery type (RYGB, SG), patient age (date of birth), patient sex (male, female), patient race/ethnicity (White, Black, Hispanic, Multiracial), and date of surgery (day, month, year), top co-morbidities related to obesity (obstructive sleep apnea, hypertension, hyperlipidemia, and type 2 diabetes), LOS, and readmission rate within 30 days postoperatively. Weight status variables measured at the date of the intake evaluation and at the 6- and 12-month postoperative visits included BMI, ideal weight, and %EWL. All assessments of weight and height were completed at office visits using standard assessment

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procedures and were reported in kilograms and inches [18]. BMI was automatically included in the medical record. Ideal weight for women was calculated using 45.5 ± 2.3 kg (for every inch >5 feet) and 50.0 ± 2.3 kg × (every inch >5 feet) for men. %EWL was calculated at 6 and 12 months postoperatively by %EWL = ([preoperative weight – follow-up weight] / preoperative weight – ideal weight]) × 100. Change in BMI was calculated by 6 and 12 month BMI from preoperative BMI.

Surgical procedures

All surgeries were performed by 1 of 3 surgeons using the same surgical approach. Laparoscopic RYGB entailed the formation of a jejunojejenostomy by anastomosing a 60- to 80-cm biliopancreatic limb to a point 150-cm distal along the roux limb, creation of a 5-cm gastric pouch, and formation of an anticolic, antigastric gastrojejunostomy using a 25-mm EEA™ circular stapler, for an internal stoma diameter of 15 mm. Laparoscopic SG entailed formation of a gastric sleeve using a stapling device with a bioabsorbable reinforcement (GORE, SEAMGUARD; Gore WL & Associates, Inc., Flagstaff, AZ, USA) over a 36-Fr or 40-Fr bougie. Finally, standardized postoperative order sets for pain and nausea control, diverticulitis prophylaxis, Foley catheter management, and diet were used for all patients.

Preoperative weight management program

The WMP was established in 1991 to fulfill a gap in comprehensive weight management, which was dominated by surgery or commercial weight management programs. Since 2002, when program data were formally collected, the program has enrolled an average of 240 patients per year for a total of approximately 2700 patients to date. Eligibility for the WMP includes both presurgery patients and those who are interested in pursuing a nonsurgical approach to weight loss. The staff includes dieticians, exercise physiologists, nurses, nurse practitioners, behavioral health providers, and health coaches who work together to assist patients with their weight loss goals. Based on data collected since 2002, patients have an average weight loss of 11%EWL over a 6-month period in the WMP.

The WMP includes an initial wellness orientation, supervised reduced-calorie meal plans, and weekly 1-hour educational and support classes in the areas of nutrition, exercise, and behavior change, which are taught by registered dieticians, health coaches, licensed marriage and family therapists, and exercise physiologists. Classes are designed to allow patients to start at any point in the curriculum, and the class size is limited to 15 participants. Initial wellness orientation includes testing patients' resting metabolic rate test and formulating individualized meal plans with a dietician, a fitness evaluation and creation of personalized exercise plans with an exercise physiologist, and a meeting with a health coach to discuss behavior modification. Weight, food, and exercise journals are reviewed weekly, and fitness evaluations are done pre- and postprogram. Individual appointments are provided as needed with any of the providers. All education materials in the WMP were created using evidence-based guidelines from the American Dietetic Association, American College of Sports Medicine, American Psychological Association, and American Association for Marriage and Family Therapy. All staff are licensed and/or certified in their respective disciplines and have sought out extra training (e.g., continuing education credit) to work in adult weight management. Each patient receives a program booklet that contains all the education

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material designed for the 6-month WMP and weekly goal monitoring sheets. These books are used by patients to journal their caloric intake, physical activity, and weight, and brought to their weekly WMP session where weight is checked, goals are set, and progress is reviewed and noted. A brief outline of the program session descriptions and educational and interactive WMP components are provided in Table 1.

Statistical analyses

Descriptive analyses were completed for all demographic, weight status, and clinical outcome variables. Analyses were conducted with patients who had a 6- and/or 12-month visit. Independent *t* tests were used to compare demographic characteristics, weight status, and clinical outcome variables between patients who participated in the WMP and those who did not. Finally, a multiple linear regression model was created controlling for patient demographic characteristics and program participation for 12-month %EWL. Due to prior evidence noting significant differences in long-term postoperative outcomes based on surgery procedure type [19], analyses were also conducted separately for RYGB and SG. Significance was evaluated at $P < .05$.

Results

Demographic characteristics

Four hundred ninety-seven patients who underwent primary bariatric surgery and had documented 6- and/or 12-month postoperative follow-ups were included in the analysis. Fifty-six patients participated in the WMP, and 441 patients did not participate in the WMP. Of the WMP patients, 54 (96.4%) had a 6-month postoperative visit and 35 (62.5%) had a 12-month visit. Of the patients who did not participate in the WMP, 417 patients (94.6%) had a 6-month visit and 258 patients (58.5%) had a 12-month visit. Patients in the WMP had an average initial weight of 304.51 ± 65.46 and BMI of 49.12 ± 8.67. Their average weight and BMI post-WMP were 291.37 ± 63.16 and 47.03 ± 8.67, respectively; on average, this was a 2.09 ± 3.27 reduction in BMI and 16.44 ± 27.34 %EWL from pre- to post-WMP.

The majority of patients were female (80%), White/Caucasian (81%), and had private insurance (82%). The average age at the time of surgery for the entire sample was approximately 45 ± 10.11-years old. On average, patients stayed in the hospital approximately 2.5 days after surgery (2.64 ± 2.33). The majority of participants did not readmit to the hospital within 30 days after surgery. There was close to an even split between surgical procedures, with 46% having the RYGP procedure and 55% having the SG procedure. Demographic characteristics for the entire sample and split by WMP participation are provided in Table 2. For the entire group, the most prevalent co-morbidities were obstructive sleep apnea (n = 280, 56.3%), hypertension (n = 269, 54.1%), hyperlipidemia (n = 167, 33.6%), and type 2 diabetes (n = 146, 29.4%). There were no significant differences in the prevalence of these top 4 co-morbidities preoperatively between patients who participated in the WMP and patients who did not participate. The only significant clinical demographic difference between WMP participants and non-WMP participants was patient age. WMP participants (47.23 ± 10.45) were slightly older than non-WMP participants (44.11 ± 10.02; $t_{495} = -2.25$, $P = .025$).

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The average preoperative weight for the entire sample was 139.62 ± 30.71 kg, and the average weight for WMP patients (138.76 ± 30.29 kg) was slightly lower than non-WMP patients (139.73 ± 30.80 kg). The same trend was seen for remaining preoperative weight status measures including excess weight, ideal weight, and total BMI (see Table 2). On average, the entire sample had a 44.37 ± 13.12 %EWL at 6 months, with WMP participants having a slightly higher %EWL (45.72 ± 14.36) and BMI change (12.13 ± 7.01 kg/m^2) from baseline compared with non-WMP patients (44.20 ± 13.00 and 11.87 ± 7.12 kg/m^2, respectively). For patients with a 12-month visit, the average of the entire sample was 52.85 ± 17.88%EWL, again with WMP patients having slightly higher %EWL (56.73 ± 16.85) and BMI change (16.48 ± 7.66 kg/m^2) from baseline compared with non-WMP patients (52.32 ± 17.99 and 14.53 ± 8.28 kg/m^2, respectively).

The following 3 hypotheses were tested comparing WMP participants with non-WMP participants, and controlled for program participation based on surgical procedures type, RYGB or SG (see Table 3).

Comparison of preoperative weight status outcomes based on participation in the WMP

Hypothesis 1: patients who participate in the presurgery program will have lower presurgery weight status compared with those who did not participate in the presurgery program. There was not a significant difference in preoperative weight status outcomes between patients who participated in the WMP and those who did not participate in the program, though patients who did participate in the WMP on average had lower total weight, excess weight, and BMI compared with their peers who did not participate in the program (see Table 3).

For patients who underwent the RYGB procedure, those in the WMP had lower preoperative total weight, excess weight, and BMI compared with non-WMP patients, though these differences were not significantly different. For patients who underwent SG procedures, the opposite was true, where those in the WMP had higher preoperative total weight, excess weight, and BMI compared with non-WMP patients, which was also not statistically significant.

Comparison of weight status outcomes at 6 and 12 months postoperatively based on participation in the WMP

Hypothesis 2: patients who participate in the WMP will have greater %EWL and BMI change at 6 and 12 months postsurgery compared with those who did not participate in the program. There were no significant differences in %EWL and BMI change for patients that participated in the WMP compared with patients who did not participate; however, on average patients who participated in the WMP had higher %EWL and BMI change from baseline compared with their peers who did not participate in the program (see Table 3).

For patients who underwent the RYGB procedure, there was a positive, not nonsignificant, difference in %EWL between WMP patients (51.43 ± 16.19) and non-WMP patients (46.54 ± 12.36) at 6 months, where patients in the WMP had greater weight loss ($t_{212} = -1.70$, $P = .091$); there was not a significant difference for change in BMI. There was a statistically significant difference between patients in the WMP and their peers not in the WMP who received the RYGB procedure at 12 months postoperatively. WMP patients (66.49 ± 14.76)

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demonstrated a statistically significant increase in %EWL compared with non-WMP patients (56.09 ± 16.49; t_{130} = –2.33, P =.022). Change in BMI was not significantly different between WMP and non-WMP patients.

For patients who underwent the SG procedure, patients in the WMP had less %EWL compared with non-WMP patients at 6 months but had greater BMI change, though neither was significant. However, at 12 months, patients who had the SG procedure and participated in the WMP had greater %EWL from 6 to 12 months compared with non-WMP patients, making their 12-month %EWL outcomes nearly equal (49.42 ± 14.69 versus 49.20 ± 18.63, respectively; t_{159} = –.05, P =.961); WMP patients continued to have greater changes in BMI at 12 months compared with non-WMP patients (13.45 ± 6.43 kg/m^2, 12.21 ± 8.41 kg/m^2, respectively; t_{159} = –0.63, P =.53).

Comparison of LOS and readmission rates based on WMP participation

Hypothesis 3: patients who participated in the WMP will have better postsurgery clinical outcomes compared with patients who did not participate in the WMP, including less LOS and readmittance rates postsurgery. Patients who participated in the WMP (n = 56) had shorter LOS and lower readmission rates at 30 days postsurgery compared with non-WMP patients (n = 441). Specifically, though not statistically significant, patients in the WMP (2.27 ± .73) had a shorter length of stay compared with patients who did not participate in the program (2.69 ± 2.46; t_{495} = 1.28, P =.203). Additionally, patients in the WMP (7.1%) had slightly lower early 30-day readmission rates compared with patients who did not participate in the program (7.3%).

There were no significant differences based on surgical procedure when comparing postoperative outcomes between WMP and non-WMP patients. On average, for patients who underwent RYGB (N = 226), the patients in the WMP (n = 23) had lower readmission rates and LOS (4.3%; 2.65 ±.71, respectively) compared with non-WMP patients (n = 203; 8.8%; 2.99 ± 1.38; $t_{22}4$ = 1.157, P =.249; respectively). For patients who underwent SG (N = 271), patients in the WMP (n = 33) trended toward slightly higher readmission rates and shorter LOS (9.1%, 2.00 ± .61, respectively) compared with non-WMP patients (n = 238; 5.8%; 2.43 ± 3.08; t_{269} =.805, P =.422, respectively], although this was not statistically significant.

Predicting RYGB patient %EWL at 12 months

Given the significant difference in %EWL at 12 months for the RYGB patients who participated in the WMP compared with those patients who did not participate, we conducted a multiple linear regression model to determine if participation in the WMP was an independent predictor for improved %EWL at 12 months using clinical factors from the literature used to control for weight loss outcomes, such as age, sex, race, insurance status, WMP participation, and 6-month %EWL.

Twelve-month %EWL (N = 117) with 6 predictors produced a model fit of R^2 =.66 (adjusted R^2 =.65; $F_{6,110}$ = 36.24, P =.000); 65% of the variance in patients %EWL at 12 months was explained by the model. Patient 6-month %EWL had a significant positive regression weight, indicating patients with higher %EWL at 6 months were expected to have higher

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%EWL at 12 months, after controlling for the other variables in the model. Patient age, also had a significant positive regression weight, where patients who were younger were expected to have higher %EWL at 12 months, after controlling for the other variables in the model. WMP participation, sex, race/ethnicity, and insurance status did not significantly contribute to the 12-month %EWL regression model. Table 4 summarizes the descriptive statistics, correlations, and regression analysis results.

Discussion

The relationship between preoperative patient education and weight management programs on patient weight loss and postoperative outcomes after bariatric surgery is unclear. While some researchers have reported the positive impacts of these programs on postsurgery patient weight loss, others, more often, have found undetectable differences for postsurgery weight loss. The purpose of this study was to further assess the impact of an established presurgery education and weight management program on patients' presurgery weight status (total weight, BMI, excess weight), postsurgery weight loss (%EWL, change in BMI), and postoperative readmission rates and LOS. We anticipated that patients who participated in the WMP would have lower presurgery weight status, greater postsurgery %EWL and change in BMI at 6 and 12 months, and lower postsurgery readmission rates and LOS compared with nonWMP patients, independent of surgical procedure. Overall, WMP patients exhibited greater weight loss, as well as lower readmission rates and shorter LOS during their index hospitalization. However, these results were only significant for %EWL at 12 months for patients who underwent RYGB, though our regression analysis indicated that significance was attributed to %EWL at 6 months, and not to WMP participation. Specific findings and implications for future research and educational and weight management preoperative program considerations and discussed below.

Overall, based on Hypothesis 1, patients in the WMP reported a lower preoperative weight status (total weight, BMI, excess weight) than patients who did not attend the WMP. Although this was not statistically significant, patient participation in presurgery educational and weight management programs may equip them to make long-term behavior changes needed to both prepare for surgery and ensure weight loss maintenance after surgery. Prior researchers [12,13] have also noted the positive effect of preoperative WMPs on preoperative weight loss compared with nonprogram participants; however, these studies also mentioned the muted effect of these programs on postoperative 6- and 12-month weight loss.

Based on Hypothesis 2, overall patients who participated in the WMP had greater %EWL and change in BMI at 6 months and 12 months postsurgery compared with non-WMP participants; however, this was only significant for %EWL at 12 months for patients in the WMP who had the RYGB procedure. We did observe a trend toward significance at 6 months postsurgery for the WMP patients, which may be explained by the fact that at that early time point, patients were all losing weight regardless of their participation in preoperative programming. However, at 1-year postsurgery, compliance with diet and activity learnings becomes more important, which are often learned in preoperative educational and weight management programs. It may be important to consider other

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measures of effective compliance with postoperative guidelines beyond %EWL and change in BMI (i.e., specific behavior change), given the high volume of weight loss all participants experience at 6 months. Additionally, given that patients self-selected to attend the preoperative WMP, these patients may have greater motivation to achieve weight loss and behavior change. Future research should attempt to assess factors that may differ between WMP and non-WMP patient groups, including readiness to change, motivation, and resources. Assessment of these factors may discern if patients who attend WMPs have inherently different attitudes, motivation, and resources for weight loss compared with patients who do not attend WMPs and have surgery.

Given that one of the big concerns with bariatric surgery is longevity of weight loss and co-morbidity recidivism, the %EWL at 12 months for WMP participants may speak to the importance of these classes in helping patients maintain their weight loss and compliance with healthy behaviors. Percentage differences are often small when comparing between groups even though they are statistically significant, but the difference between WMP and non-WMP participants at 1 year is nearly 10%, signifying both clinical and statistical significance. Given the significant differences at 1 year postsurgery, the effects of preoperative educational programming may be even more pronounced over longer follow-up periods (e.g., 2 yr postsurgery). Other researchers with comparable samples of WMP and non-WMP participants, found similar but non-significant results, where preoperative WMP participants had greater %EWL at 12 months compared with non-WMP participants [16].

Finally, in Hypothesis 3, we anticipated that patients who attended the WMP would have better postoperative outcomes based on LOS and readmission rates due to the education received in the WMP. Specifically, longer LOS and higher readmission rates postoperatively are commonly due to nausea/vomiting and subsequent dehydration [20,21]. Given that the WMP provides patient education about the volume and pace of oral intake, we hypothesized that the WMP group would have better postoperative outcomes. Our results, though not significant, pointed to a trend where patients in the WMP had both shorter LOS and lower readmission rates compared with non-WMP patients who had the RYGB procedure. Interestingly, patients in the WMP who had the GS procedure actually had slightly higher readmission rates compared with non-WMP participants. Similar results were found by other researchers, where greater postoperative weight loss resulted in shorter LOS after surgery [15]. With respect to readmission rates, the difference between WMP patients and non-WMP patients, based on surgical procedure (RYGB or SG) appears to be random. Future research should assess if patients in WMPs self-select to receive a certain surgical procedure (RYGB or SG) based on their education received and expectations for complying with postsurgical care. Additionally, research is needed to discern the effects of WMP participation and surgical procedure type on postsurgery LOS and readmission rates and to explore additional confounders that may inform these outcomes.

Regardless of the trend of greater %EWL at 6 and 12 months for WMP participants, age and 6-month %EWL, but not participation in the WMP, independently predicted %EWL at 12 months for RYGB patients. Given the variability in preoperative education and weight management programs, program components need to be described, measured, and evaluated

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in the detail required to compare between WMPs and to determine if postoperative outcomes can be attributed to aspects from these preoperative WMPs [17].

Limitations

Given the number of WMP participants in our sample, we were limited in our ability to detect differences between WMP and non-WMP participants for weight loss and clinical outcomes, especially after splitting our groups by surgery type (RYGB and SG). Prior researchers have also reported small sample sizes for WMP participants [16,17], making our sample not unusually small. Future research could obtain a case-matched control group comparable to the group of WMP participants, thus making the groups of WMP and non-WMP participants equal. Furthermore, obtaining 12-month outcomes continues to be a challenge postsurgery, regardless of WMP participation preoperatively. The strengths of our study included comparing WMP patients with non-WMP patients and further splitting these groups by surgical type, which prior researchers have not controlled for [12–14,16]. Consistent with prior research with bariatric surgery patients, our sample was fairly homogenous with respect to race/ethnicity, limiting our ability to generalize results to more diverse groups of patients. Finally, it is important to consider the amount of weight loss and behavior change that patients attending preoperative WMPs have and how weight loss from these programs before surgery is associated with or influences postoperative weight loss.

Conclusions

Patients who attend the preoperative WMP and had RYGB had significantly higher %EWL at 12 months postsurgery compared with patients who did not attend the WMP. Although not statistically significant, patients who attended the presurgery program had better weight status outcomes preoperatively and at 6 and 12 months postsurgery. There appears to be a positive, but nonsignificant, effect from the WMP on patient presurgery BMI and postsurgery %EWL and BMI change at 6 and 12 months postsurgery. Future research should be adequately powered, including more patients in the WMP group, to determine the statistical significance of presurgery programming on postsurgery patient outcomes.

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Table 1

Living Well Program, WMP, session descriptions and educational and interactive components.

Session description	Educational component	Interactive component
Orientation	Meal planning	Resting metabolic rate test
	Exercise planning	Fitness evaluation (6-min walk test, 6-site girth
	Action plan for behavior change	measurements, sit and reach flexibility, wall sit, push-ups for strength) Vision, goal setting, barrier identification, and readiness to change evaluation
Meal planning and food journaling	Meal planning strategies and options	Enter weight
	Skill of food journaling	Review and update goals Sample food journal created and evaluated with partners
Exercise prescription	Exercise principles	Enter weight
	Activity graph	Review and update goals
	Safe stretching handout	30- to 60-min supervised group physical activity
Balancing your life	Key life areas: physical, emotional, spiritual, intellectual, social	Enter weight
		“How do you spend your time?” activity
	Prioritizing life roles	“What are your roles?” activity Review and update goals
Exercise benefits and barriers	50 reasons to exercise strategies for overcoming barriers	Enter weight
		Group brainstorming benefits of exercise Group brainstorming barriers and solutions to barriers Review and update goals 30- to 60-min supervised group physical activity
Knowing nutrients	What is good nutrition?	Enter weight
	Six major nutrients	Review and update goals
	What is a calorie? Dietary fiber and foods Using herbs and supplements	Group discussion
Taming your triggers	Types of eating triggers	“Finding your eating triggers” activity
	Five Ds when dealing with triggers	Tackling your triggers
	50 Things to do besides eat when you are not hungry	Enter weight Review and update goals
Metabolism: making the most of yours	Energy cost of activities	Enter weight
	Energy balance equation	Review and update goals
	What is weight training?	Demonstrate and practice theraband strength exercises 30-min supervised group physical activity

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Session description	Educational component	Interactive component
Dealing with stress	What is stress?	Enter weight
	Stress management techniques	Stress assessment
	Ways to improve your sleep	Coping style inventory
	Hygiene and routine	Review and update goals
Eating out	Restaurant tips	Eating out situations activity
	Basic guide to eating out	Enter weight Review and update goals
Exercise motivation	Let's get motivated	Role play motivation activity
	Gadgets used for motivation	Enter weight Review and update goals 30- to 60-min supervised group physical activity
Cooking differently	Top 10 ways to cook smart	Enter weight
	Low-fat cooking tools of the trade	Review and update goals
	Low-fat cooking ingredients ERASE: eliminate, reduce, addition, substitute, explore Food safety guide	Modify a recipe activity
Coping with negative thoughts	Six challenging feelings to cope with	Enter weight
	10 healthy coping strategies	Thought Stopping activity
	Healthy coping discussion	Review and update goals
Final fitness evaluation and wrap up	Program continuation option discussion	Enter weight
	Planning for long-term behavior change success	Fitness evaluation (6-min walk test, 6-site girth measurements, sit and reach flexibility, wall sit, push-ups for strength) Vision, goal setting, barrier identification, and readiness to change review, comparison, and update

WMP = weight management program.

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Table 2

Demographic characteristics: weight management program WMP patients versus Non-WMP patients (N [%]; mean [standard deviation], range).

	All patients (N = 497)	WMP patients (n = 56)	Non-WMP patients (n = 441)
Age at time of surgery	44.47 (10.11), 21–65	47.23 (10.45), 21–65	44.11 (10.02), 21–65
Sex			
Male	100 (20.1%)	44 (78.6%)	88 (20.0%)
Female	397 (79.9%)	12 (21.4%)	353 (80.0%)
Race/Ethnicity			
Black/black	86 (17.3%)	10 (17.9%)	76 (17.2%)
White/Caucasian	402 (80.9%)	45 (80.4%)	357 (81.0%)
Other race/ethnicity	9 (1.8%)	1 (1.8%)	8 (1.8%)
Insurance			
Medicare/aid	37 (7.4%)	1 (1.8%)	36 (8.2%)
Private	405 (81.5%)	47 (83.9%)	358 (81.2%)
Self-pay	11 (2.2%)	2 (3.6%)	9 (2.0%)
Medicaid	43 (8.7%)	6 (10.7%)	37 (8.4%)
Type of surgery			
Roux-en-Y gastric bypass	226 (45.5%)	23 (41.1%)	203 (46.0%)
Sleeve gastrectomy	271 (54.5%)	33 (58.9%)	238 (54.0%)
Preoperative values			
Initial total weight, kg	139.62 (30.71), 82.33–298.88	138.76 (30.29), 92.72–224.58	139.73 (30.80), 82.33–298.88
Initial excess weight, kg	80.28 (27.16), 33.00–229.33	79.45 (26.13), 42.20–146.40	80.38 (27.32), 33.00–299.33
Ideal weight, kg	59.35 (8.91), 27.1–91.40	59.30 (9.48), 43.20–89.68	59.35 (8.84), 27.10–91.40
Initial total BMI	49.57 (9.48), 29.4–98.7	49.31 (8.86), 35.60–71.10	49.60 (9.56), 29.40–98.70
6-mo values	n = 471	n = 54	n = 417
%EWL	44.37 (13.12), –6.92 to 103.07	45.72 (14.36), 17.34–88.04	44.20 (13.00), –6.92 to 103.07
Change in BMI	11.90 (7.10), –19.18 to 47.67	12.13 (7.01), –3.50 to 29.18	11.87 (7.12), –19.18 to 47.67
12-mo values	n = 293	n = 35	n = 258
%EWL	52.85 (17.88), –12.61 to 98.58	56.73 (16.85), 24.89–94.82	52.32 (17.99), –12.61 to 98.58
Change in BMI	14.76 (8.22), –20.35 to 39.24	16.48 (7.66), –2.79 to 39.24	14.53 (8.28), –20.35 to 36.47
Preoperative co-morbidities			

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	All patients (N = 497)	WMP patients (n = 56)	Non-WMP patients (n = 441)
OSA	280 (56.3%)	34 (12.1%)	246 (87.9%)
Hypertension	269 (54.1%)	28 (10.4%)	241 (89.6%)
Hyperlipidemia	167 (33.6%)	21 (12.6%)	146 (87.4%)
T2D	146 (29.4%)	17 (11.6%)	129 (88.4%)
Readmission rate	36 (7.2%)	4 (7.1%)	32 (7.3%)
Total hospital length of stay	2.64 (2.33), 0–44	2.27 (.73), 1–4	2.69 (2.46), 0–44

WMP = weight management program; %EWL = percent excess weight loss; BMI = body mass index; OSA = obstructive sleep apnea; T2D = type 2 diabetes.

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Table 3

Preoperative and postsurgery 6 and 12-mo weight loss outcomes.

	Total sample					Roux-en-Y gastric bypass					Sleeve gastrectomy				
	WMP mean (SD)	**No WMP mean (SD)**	***t***	**df**	***P***	**WMP**	**No WMP**	***t***	**df**	***P***	**WMP**	**No WMP**	***t***	**Df**	***P***
Preoperative	n=56	n=441				n=23	n=203				n=33	n=238			
Total weight	138.76 (30.29)	139.73 (30.80)	.22	495	.823	136.43 (31.81)	143.01 (31.28)	.96	224	.341	140.38 (29.58)	136.93 (30.16)	−.62	269	.538
Excess weight	79.45 (26.13)	80.38 (27.32)	.24	495	.810	77.52 (28.97)	85.00 (28.36)	1.20	224	.233	80.80 (24.33)	76.44 (25.81)	−.92	269	361
Initial BMI	49.31 (8.86)	49.60 (9.56)	.22	495	.828	49.41 (10.41)	51.64 (10.27)	.98	224	.326	49.23 (7.78)	47.86 (8.55)	−.87	269	.383
6 mo	n=54	n=417				n=22	n=192				n=32	n=225			
%EWL	45.72 (14.36)	44.20 (12.96)	−.80	469	.423	51.43 (16.19)	46.54 (12.36)	−1.70	212	.091	41.80 (11.67)	42.20 (13.15)	.17	255	.869
Change in BMI	12.13 (7.01)	11.87 (7.12)	−.26	469	.799	14.29 (7.07)	1421 (6.75)	−.06	212	.956	10.64 (6.68)	9.87 (6.82)	−.60	255	.549
12 mo	n=35	n=258				n=15	n=117				n=20	n=141			
%EWL	56.73 (16.85)	52.32 (17.99)	−137	291	.171	66.49 (14.76)	56.09 (16.49)	−2.33	130	.022*	49.42 (14.69)	49.20 (18.63)	−.05	159	.961
Change in BMI	16.48 (7.66)	14.53 (8.28)	−132	291	.187	20.53 (746)	17.31 (7.21)	−1.62	130	.108	13.45 (6.43)	12.21 (8.41)	−.63	159	.530

WMP = weight management program; SD = standard deviation; df = degrees of freedom; %EWL = percent excess weight loss; BMI = body mass index.

*$P < .05$.

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Table 4

Linear regression models for 12-mo %EWL for RYGB patients.

Variable	RYGB				
	Mean (SD)	**Correlation with 12-mo %EWL**	**B**	***β***	***P***
Age	45.09 (10.24)	−.212*	.189	−.121	.043*
Sex†	.19 (.39)	.018	−3.442	−.085	.138
Race/ethnicity	1.13 (.34)	−.180*	−3.197	−.067	.240
Insurance status	.79 (.41)	.039	1.218	−.031	.592
WMP participation	.11 (.32)	.171*	2.518	.050	.397
6-mo %EWL	46.98 (12.68)	.799‡	.977	.777	.000‡

%EWL = percent excess weight loss; RYGB = Roux-en-Y gastric bypass; SD =standard deviation;

B = unstandardized beta;

B = standardized beta; WMP = weight management program.

*$P < .05$;

†Sex (0 = female, 1 = male); race/ethnicity (1 = White/Caucasian; 2 = Black/black; insurance status (0 = Medicaid/care, 1 = private); WMP participation (No = 0, Yes = 1).

‡$P < .01$.