# *Behavioral Factors Associated with Successful Weight Loss after Gastric Bypass*

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**Patients undergoing bariatric surgery lose substantial weight (≥50% excess weight loss [EWL]), but an estimated 20 per cent fail to achieve this goal. Our objective was to identify behavioral predictors of weight loss after laparoscopic Roux-en-Y gastric bypass. We retrospectively surveyed 148 patients using validated instruments for factors predictive of weight loss. Success was defined as ≥50 per cent EWL and failure as <50 per cent EWL. Mean follow-up after laparoscopic Roux-en-Y gastric bypass was 40.1 ± 15.3 months, with 52.7 per cent of patients achieving successful weight loss. After controlling for age, gender, and preoperative body mass index, predictors of successful weight loss included surgeon follow-up (odds ratio [OR] 8.2, $P < 0.01$), attendance of postoperative support groups (OR 3.7, $P = 0.02$), physical activity (OR 3.5, $P < 0.01$), single or divorced marital status (OR 3.2, $P = 0.03$), self-esteem (OR 0.3, $P = 0.02$), and binge eating (OR 0.9, $P < 0.01$). These factors should be addressed in prospective studies of weight loss after bariatric surgery, as they may identify patients at risk for weight loss failure who may benefit from early tailored interventions.**

THE MAJORITY OF patients undergoing bariatric surgery lose significant weight, however 15 to 20 per cent fail to achieve adequate excess weight loss (EWL).[1, 2] EWL is weight loss relative to initial excess weight (ideal weight subtracted from initial weight). Patients who lose ≥50 per cent EWL are defined as having successful weight loss, whereas <50 per cent EWL is considered weight loss failure.[3] Emphasis is being placed on identifying patient behaviors that correlate with successful weight loss after surgery. This retrospective study analyzes the association between patient behaviors (eating habits, self-esteem, social support, and exercise) and weight loss after laparoscopic Roux-en-Y gastric bypass (LRYGB). The main outcome is long-term weight loss success *versus* failure.

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## Materials and Methods

Patients who had LRYGB (January 2003 to December 2008) at a single program were consecutively identified from an existing database.[4] One hundred and ninety-seven patients with at least 1 year follow-up who had agreed to be contacted for research were invited by e-mail to participate in a retrospective survey. One hundred and forty-eight (75%) patients completed surveys. This study was approved by the Institutional Review Board. Preoperative demographic information was extracted from the patients' medical records. Data on preoperative behavioral factors included preoperative weight loss, psychiatric issues, and depression. The survey used validated instruments to assess postoperative behaviors: 1) Medical Outcomes Study Social Support Survey;[5] 2) The Eating Inventory[6] (clinically abnormal scores are >13 for the restraint subscale, >11 for disinhibition, and >10 for hunger); 3) The Binge Eating Scale[7] (score of >26 is identified as severe binge eating disorder, whereas <18 is mild or no binge eating); 4) The Rosenberg Self-Esteem Scale;[8] and 5) The International Physical Activity Questionnaire—Short.[9] Questions regarding support networks and postoperative support groups were included.

Patients presenting for bariatric surgery at this program are recommended to lose 10 per cent of their excess weight before surgery. Preoperative EWL was calculated as (weight loss/baseline excess weight) × 100, where weight loss = preoperative weight – initial weight and baseline excess weight = initial weight – ideal weight. Current weight was self-reported on the survey. Current per cent of EWL was calculated as (weight loss/baseline excess weight) × 100. Weight loss success was defined as ≥50 per cent EWL and failure as <50 per cent EWL at the completion of the survey. Univariate analysis was performed with *t* test for continuous variables and $\chi^2$ test for nominal variables. Multivariate logistic regression was performed to identify predictors of weight loss success.

## Results

One hundred and forty-eight patients were included in the analysis. Average age was 45.9 years and 84 per cent were female. Average baseline body mass index was 46.2 kg/m$^2$ with 26.4 per cent classified as superobese (body mass index ≥50 kg/m$^2$). Twenty per cent were Hispanic, and 72.3 per cent white, 12.8 per cent black, 0.7 per cent Asian, and 3.4 per cent American Indian or Alaskan Native. Twenty-three per cent were diabetic, and 34.5 per cent had a preoperative psychiatric issue. Mean preoperative EWL was 8.7 per cent. Mean follow-up at the time the survey was filled out was 40.1 ± 15.3 months (range 15.4–72.1 months), with average EWL of 52.6 per cent ± 22.4 per cent.

Patients were classified into weight loss success (n = 78) or failure (n = 70). There were no significant differences in preoperative demographics, but there was a trend that fewer weight loss success patients had diabetes (Table 1). There was no difference in the incidence of preoperative psychiatric issues (33.3% *vs* 35.7%, $P = 0.76$) or depression (59.7% *vs* 60.0%, $P = 0.81$) in the success *versus* failure groups.

Postoperative behavioral factors associated with weight loss success included surgeon follow-up in the past year (Table 1). More patients replied that their friends and family were supportive of their decision to undergo surgery in the successful *versus* failure group (96.2% *vs* 87.1%, $P = 0.045$). There was no significant difference in the number of friends as reported on the social support survey (7.9 *vs* 7.0, $P = 0.47$). Patients in the success versus failure group had lower mean Eating Inventory Disinhibition (5.3 *vs* 7.4, $P < 0.01$) and Binge Eating Scores (8.9 *vs* 15.3, $P = 0.033$), and higher self-esteem scores (16.3 *vs* 15.2, $P < 0.01$).

In multivariate regression, several behavior factors were predictive of successful weight loss: ≥1 surgical appointment in the past year (Odds Ratio (OR) 8.2, Confidence Interval (CI) 2.3–30.1), ≥1 postoperative support group meeting (OR 3.7, CI 1.3–10.9), high physical activity (OR 3.5, CI 1.2–8.3), and being single or divorced (OR 3.2, CI 1.2–8.5) (Table 2). Factors associated with a lower chance of success were preoperative diabetes (OR 0.2, CI 0.06–0.8), low self-esteem (OR = 0.3, CI 0.08–0.8), and Binge Eating Scale score (OR 0.9, CI 0.8–1.0).

TABLE 1. *Factors Associated with Weight Loss Success or Failure*

| | | Weight Loss Success[a] | Weight Loss Failure[b] | *P* |
|---|---|---|---|---|
| | Follow-up (mo) | 36.9 (15.0) | 43.7 (14.8) | <0.01 |
| Pre-Operative | Sex (% Female) | 84.6% | 82.9% | 0.77 |
| | Age (Years) | 46.1 (9.7) | 45.7 (9.3) | 0.78 |
| | Marital Status: Single | 28.2% | 17.1% | 0.042 |
| | Married / domestic partner | 52.6% | 64.3% | |
| | Divorced / separated | 19.2% | 12.9% | |
| | Diabetes | 20.8% | 34.8% | 0.058 |
| | Psychiatric issues | 33.3% | 35.7% | 0.76 |
| | Depression | 59.7% | 60.0% | 0.81 |
| | BMI (kg/m$^2$) | 47.4 (8.3) | 49.2 (8.3) | 0.18 |
| | Preoperative EWL (%) | 8.6 (7.7) | 8.9 (5.3) | 0.75 |
| | Support to undergo surgery | 96.2% | 87.1% | 0.045 |
| Post-Operative | Eating Inventory: Control | 13.6 (3.8) | 11.3 (4.6) | <0.01 |
| | Disinhibition | 5.3 (3.6) | 7.4 (3.8) | <0.01 |
| | Hunger | 3.6 (3.1) | 4.5 (3.3) | 0.092 |
| | Binge Eating Scale Score | 8.9 (7.6) | 15.3 (8.6) | 0.033 |
| | Physical Activity: Low / Medium / High | 15.4%/18.0%/66.7% | 30.0%/31.4%/38.6% | <0.01 |
| | Social Support: Total Score | 6.0 (3.4) | 5.4 (4.1) | 0.33 |
| | Emotional Score | 4.0 (0.9) | 3.7 (1.1) | 0.037 |
| | Number of friends | 7.9 (6.7) | 7.0 (7.7) | 0.47 |
| | Self-Esteem Score | 16.3 (1.7) | 15.2 (1.8) | <0.01 |
| | # Surgical Appointments[c] | 62.3%/19.5%/18.2% | 87.1%/4.3%/8.6% | <0.01 |

BMI, Body mass index; EWL, Excess weight loss.
[a] EWL ≥ 50% (N = 78); [b] EWL < 50% (N = 70); [c] In past year: 0/1/2+.

TABLE 2. *Multivariate Regression Predicting Successful Weight Loss after LRYGB*

| Predictor | OR | 95% CI |
|---|---|---|
| ≥1 surgical appointment in past year | 8.2 | 2.3–30.1 |
| ≥1 postoperative support group meeting | 3.7 | 1.3–10.9 |
| High physical activity | 3.5 | 1.2–8.3 |
| Single or divorced | 3.2 | 1.2–8.5 |
| Preoperative diabetes | 0.2 | 0.06–0.8 |
| Low self-esteem* | 0.3 | 0.08–0.8 |
| Binge Eating Scale score | 0.9 | 0.8–1.0 |
| Ethnicity: white | 2.5 | 0.8–7.6 |
| Preoperative BMI | 1.0 | 0.9–1.0 |
| Preoperative EWL > 5% | 2.2 | 0.6–7.6 |
| Social support: emotional score | 1.2 | 0.7–1.9 |
| Months elapsed from surgery | 1.0 | 1.0–1.0 |
| Abnormal Eating Inventory: Control score† | 0.9 | 0.3–2.4 |
| Male sex | 1.1 | 0.3–3.9 |
| Age | 1.0 | 1.0–1.1 |

OR, odds ratio; CI, confidence interval; BMI, Body mass index; EWL, Excess weight loss.

* Rosenberg self-esteem score < 15; †Eating Inventory Control score > 13.

## Discussion

Surgeon follow-up, attendance of postoperative support groups, marital status, and physical activity were associated with successful weight loss after bariatric surgery. Low self-esteem and binge eating were associated with a lower chance of success. The strongest predictors of success were ≥1 surgical appointment in the past year, ≥1 postoperative support group meeting, and high level of physical activity.

Previous studies have focused on specific factors for association with weight loss. In our comprehensive study of patient behaviors, the strongest predictors of successful weight loss were support modalities. Social support may improve weight loss after surgery by helping patients to deal with lifestyle changes and stressors. Our results confirm that patients who do not follow-up after surgery have worse outcomes,[10, 11] and patients who attend postoperative support groups have better weight loss.[12, 13] Single patients may lose more weight due to having more time for physical activity.[14] Patients with inadequate support can be identified preoperatively and targeted for early intervention, such as closer follow-up and encouragement to participate in support groups.

The literature is varied on the association between psychiatric problems or maladaptive eating and weight loss after surgery. This may be due to the variety of survey instruments used, or the focus being mainly on preoperative habits. Postoperative low self-esteem and binge eating were significant predictors of failure in our study. Patients with poor self-esteem may do worse after surgery due to having a harder time in coping with changes in their body image.[15, 16] Patients with binge eating may have a more difficult time adjusting to the necessary dietary changes. Further studies are necessary to determine the specific eating and psychiatric patterns most predictive of poor outcomes.

This retrospective study has some limitations. We were not able to gather preoperative information on patient behaviors such as eating patterns, self-esteem, and exercise habits. We were also not able to gather data on some psychosocial factors that may impact weight loss (*e.g.,* sexual abuse, alcohol use, and sweets eating) due to concerns that survey length may impact response rate.

In summary, patient behaviors associated with successful weight loss after LRYGB include surgeon follow-up, social support, self-esteem, and physical activity. Prospective studies are necessary to determine the true impact of psychosocial factors on weight loss, and the best interventions for patients at high risk for weight loss failure.

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