

# A Survey of Bariatric Surgery Patients' Interest in Postoperative Interventions

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## Abstract

**Background** A substantial minority of bariatric surgery patients display clinically significant weight regain and recurrence of obesity-related comorbidities. Although postoperative follow-up and behavioral interventions are associated with better weight loss outcomes, many patients fail to attend or receive these services. More information is needed to better target and increase the probability of sustained treatment in those patients experiencing postoperative weight regain. The purpose of this study was to understand the challenges that patients perceive themselves to be facing and assess their receptivity and preferences for postoperative interventions.

**Methods** A survey developed by the authors was sent to patients who received bariatric surgery from a program based in an academic medical center between September 2008 and December 2010 ( $n=751$ ).

**Results** Data from 154 responders indicate that the vast majority of individuals who have undergone bariatric surgery are satisfied with surgery and their weight losses; however, most reported being on a trajectory of weight regain. Patients endorsed concerns about both current eating behavior and, additionally, future weight regain. In addition, these patients expressed strong interest in participating in postoperative programs aimed at stopping and reversing regain.

**Conclusions** The results provide novel information about bariatric surgery patients' receptivity to and preferences for interventions after bariatric surgery.

**Keywords** Bariatric surgery · Postoperative management

## Introduction/Purpose

Bariatric surgery is considered to be the most effective treatment for extreme obesity [1]. Short-term follow-up reveals substantial weight losses and improvements in comorbidities and psychosocial outcomes [2, 3]. However, weight regain occurs for many within the first 2 to 6 years after surgery [4, 5]. For example, in a sample of over 2000 patients who underwent bariatric surgery, patients, on average, experienced weight regain (though typically <5 %) between years 2 and 3 after surgery [6]. At the same time, approximately 30 % of patients fail to maintain the expected postoperative weight losses [6–8]. The magnitude of regain varies to some degree depending on type of surgery received, with gastric banding patients experiencing greater regain on average [4]. Across procedure types, a substantial minority of patients display clinically significant regain and recurrence of obesity-related comorbidities [4].

Regain is largely attributed to behavioral factors, including poor adherence to the recommended postoperative diet [8].

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Prior to surgery, patients are taught the basic weight control behaviors necessary to be successful (e.g., self-monitoring of food intake). However, these behaviors can be difficult to maintain, and most patients are not taught behavioral and psychological skills to help them engage in these behaviors over the long term [9]. The provision of these specialized skills following surgery may help patients adhere to the dietary and behavioral changes necessary for long-term weight control [10]. Greater utilization of behavioral services postoperatively, as well as more frequent follow-up with the bariatric program, has been associated with better long-term weight outcomes [11–16]. A review of postoperative programs targeting weight outcomes revealed that behavioral interventions result in greater weight losses compared to treatment as usual or no treatment [17].

Despite the demonstrated need for postoperative care, many patients do not return to recommended medical follow-up post-surgery appointments. Specifically, only 40 % of patients return for each of their first four annual follow-up visits [18], and 72 % of patients miss post-surgical appointments up to 2 years after surgery [19]. In addition, bariatric surgery patients tend to drop out of postoperative behavioral intervention research studies at high rates [10, 20]. The cause of such low retention is not known. Perhaps, bariatric surgery patients do not perceive a need for further intervention after surgery. It may also be that patients have little faith in behavioral interventions, as they presumably did not result in long lasting weight losses prior to surgery.

To facilitate maximum utilization of post-surgery behavioral services, a better understanding of patient preferences for these services is necessary. Current research has not yet established what types or aspects of interventions patients would find most beneficial postoperatively. In addition, it is also important to better understand the challenges that patients perceive themselves to be facing after the initial weight loss phase to better tailor these services.

The present study was designed to assess patients' receptivity and preferences for postoperative interventions within the first several years after surgery, i.e., when many patients experience weight regain and are lost to follow-up from the bariatric program [4–6].

## Materials and Methods

### Survey Development

The authors developed a survey for this study, which was based on relevant postoperative challenges documented in the literature as well as expert opinion. Specifically, the survey was designed to assess patients' experiences since receiving surgery, including self-reported weight outcomes, postoperative satisfaction, challenges with maintaining weight losses, as

well as interest in and preferences for postoperative programs targeting weight regain. Questions related to patients' evaluation of postoperative weight were adapted from classifications described in Foster et al. [21] (i.e., evaluating post-surgery weight as “dream,” “happy,” “acceptable,” or “disappointed”).

### Survey Administration

Patients who received bariatric surgery from the Penn Metabolic and Bariatric Surgery Program between September 2008 and December 2010 ( $n=754$ ) were identified. A letter via mail or email (depending on the contact information available) requesting the completion of a brief survey was sent. A subset of non-responders were sent reminders (via email or telephone) to complete the survey ( $n=225$ ). Patients were given the option of completing this survey online via Qualtrics (an online survey platform), hardcopy (postage paid return envelopes were provided), or via telephone. Patients who completed the survey were entered into a raffle for one of three \$100 gift cards to an online retailer to incentivize participation.

### Statistical Analysis

Descriptive statistics (i.e., means and standard deviations) were run for all variables, using the Statistical Package for the Social Sciences, SPSS, version 22. Independent sample  $t$  tests and chi-square tests were utilized to evaluate differences between Roux-en-Y gastric bypass (RYGB) and laparoscopic adjustable gastric banding (LAGB) patients; cell sizes for the sleeve and “other” surgeries precluded analysis. An alpha level of 5 % ( $p<0.05$ ) was established as statistically significant for all analyses.

## Results

Among the 754 patients who had surgery during the time period, three patients' medical records indicated that they were deceased. Therefore, a total of 751 patients were sent the survey. Thirty-five surveys were returned to sender without delivery due to either insufficient or wrong addresses. Out of the 716 surveys delivered, 154 were completed yielding a response rate of 21.5 %.

Characteristics of the respondents are reported in Table 1. The sample was predominately female, White, and non-Hispanic, which is representative of the general patient population within the program. The majority of participants underwent RYGB (i.e., 72.7 %), and the mean time since surgery was  $3.2 \pm 0.6$  years.

**Table 1** Respondent characteristics

	Mean ( $\pm$ SD) or % of sample
Age (years)	51.7 $\pm$ 11.3
Time since surgery (years)	3.2 $\pm$ 0.6
Women (%)	74.7
White (%)	79.7
African-American (%)	17.6
Other ethnicity (%)	2.6
Non-Hispanic (%)	97.4
Gastric bypass (%)	72.7
Gastric sleeve (%)	5.8
Gastric banding (%)	21.4

### Weight Loss

Self-reported weights are summarized in Table 2. Participants reported a mean maximum percent weight loss of 33.4 $\pm$ 11.4 % ( $M_{RYGB}$ =36.6 $\pm$ 9.3 %;  $M_{LAGB}$ =25.7 $\pm$ 12.5 %; calculated using participant self-reports of pre- and postoperative weights). At the time of completing the survey (mean of 3.2 $\pm$ 0.6 years since surgery), mean percent weight loss was 27.8 $\pm$ 13.7 % ( $M_{RYGB}$ =31.9 $\pm$ 11.0 %;  $M_{LAGB}$ =17.4 $\pm$ 15.4 %). The majority of survey responders (i.e., 84.4 %; 85.8 % of RYGB, 93.5 % of LAGB) reported weight regain at the time of survey completion, with 55.8 % (49.5 % of RYGB, 74.2 % of LAGB) regaining at least 10 % of their lost weight since surgery.

### Satisfaction with Weight Loss

As found in Table 3, the majority of participants reported being either satisfied or extremely satisfied with the overall

results of surgery (i.e., 75.0 % of responders) and their post-operative weight loss (i.e., 66.1 % of responders). However, considerably fewer participants reported satisfaction with their current eating behavior (i.e., 38.4 %). Of note, participants who received RYGB, compared to those who underwent LAGB, reported greater satisfaction with results of surgery ( $\chi^2$  (4)=18.14,  $p$ <.01, Cramer's  $V$ =.36), postoperative weight loss ( $\chi^2$  (4)=13.97,  $p$ <.01, Cramer's  $V$ =.31), and physical appearance ( $\chi^2$  (4)=15.09,  $p$ <.01, Cramer's  $V$ =.32). The two groups did not differ with respect to satisfaction with their eating behavior, physical activity, or social support.

Patients were also asked to evaluate their weights. As seen in Table 4, nearly half of survey responders reported that they were either at their "dream" weight or were "happy" with their weight (i.e., 54.0 %). Over a quarter of responders reported either being "disappointed" with their current weight (despite it being lower than their pre-surgery weight) or at or above their pre-surgery weight (i.e., 26.7 %, see Table 4). RYGB patients evaluated their weights as more positively compared to LAGB patients ( $\chi^2$  (4)=17.02,  $p$ <.01, Cramer's  $V$ =.35).

### Weight Regain

Out of those who lost at least 5 % of their weight ( $n$ =149), the mean percent regain of their maximum postoperative lost weight was 18.6 $\pm$ 23.5 % (14.5 $\pm$ 17.2 % for RYGB, 33.3 $\pm$ 23.5 for LAGB). Those who lost less than 5 % of their weight ( $n$ =5) were outliers and were therefore excluded from this analysis. The large majority of survey responders (i.e., 82.2 %) indicated being concerned with weight regain in the future, with most participants (i.e., 62.5 %) indicating they were "very concerned" about future weight regain.

**Table 2** Self-reported weight outcomes

	Full sample mean (SD)	RYGB sample mean (SD)	LAGB sample mean (SD)
Weight at surgery (kg)	138.6 (26.6)	139.5 (28.2)	128.8 (15.4)
BMI at surgery (kg/m <sup>2</sup> )	48.1 (7.8)	48.8 (8.2)	44.9 (5.7)
Highest preoperative BMI (kg/m <sup>2</sup> )	50.7 (8.6)	51.4 (8.9)	47.3 (6.1)
Highest preoperative weight (kg)	145.7 (29.1)	147.0 (30.9)	135.5 (17.4)
Lowest postoperative BMI (kg/m <sup>2</sup> )	32.0 (6.8)	30.9 (6.6)	33.0 (5.0)
Lowest postoperative weight (kg)	92.0 (22.2)	88.1 (20.3)	95.2 (17.6)
BMI at survey (kg/m <sup>2</sup> )	34.8 (8.0)	33.4 (7.6)	37.1 (7.3)
Weight at survey (kg)	99.7 (24.4)	94.5 (21.9)	106.4 (21.7)
Time at which lowest postoperative weight was achieved (years post-surgery)	1.7 (1.0)	1.7 (0.9)	1.8 (1.1)
Percent weight regain from lowest postoperative weight (%)	24.6 (63.8)	14.5 (17.2)	38.6 (49.1)

RYGB Roux-en-Y gastric bypass, LAGB laparoscopic adjustable gastric banding, BMI body mass index

**Table 3** Levels of satisfaction (% of sample)

	Extremely dissatisfied	Dissatisfied	Neutral	Satisfied	Extremely satisfied
Results of surgery	8.6	10.5	5.9	26.3	48.7
Weight loss since surgery	9.2	16.3	8.5	38.6	27.5
Physical appearance	11.8	17.6	16.3	34.0	20.3
Eating behavior	10.6	22.5	28.5	25.2	13.2
Physical activity	10.5	17.6	20.9	26.8	24.2
Social support	6.0	12.6	30.5	33.8	17.2

### Postoperative Behavioral Challenges

Table 5 describes the challenges with weight control endorsed by participants since achieving their lowest weight post-surgery (in those who lost at least 5 % of their weight post-surgery, i.e., in those who lost a clinically significant amount of weight following surgery). The most commonly endorsed challenge was having regained the ability to consume large amounts of food (endorsed by 57.9 % of participants). The remaining five challenges included in the survey were endorsed by close-to-equivalent proportions of participants, i.e., 25–36 %. Independent sample *t* tests revealed that several challenges were related to weight regain. As detailed in Table 5, those who endorsed increased hunger, the ability to consume larger amounts of food, and lack of motivation to maintain eating behavior changes regained significantly more weight compared to those who did not. Despite differential weight losses and satisfaction with surgery between RYGB and LAGB patients, there were no significant differences in endorsement of any challenges.

### Interest in Postoperative Interventions

A large majority of participants (i.e., 82.5 %) indicated that they would be interested in a general postoperative program aimed at stopping/reversing weight regain. Participants also reported on various aspects of their ideal postoperative program, as detailed in Table 6. The most commonly endorsed preferred program features included monthly, in-person, group meetings, lasting at least 9 months duration. Of note, despite an overall preference for in-person treatment, a substantial number of participants indicated interest in an Internet- or phone-based program (71.4 and 50.0 %, respectively).

### Discussion

Several years after bariatric surgery, the vast majority of patients report that they are satisfied with surgery and their weight losses. However, most report a recent trajectory of

**Table 4** Evaluation of weight outcome

Outcome	Definition	Sample	% of sample	Weight (kg)	% Regain
Dream	I have reached my dream weight, the weight I would choose to be.	Full	8.7	79.87±19.47	6.58±9.03
		RYGB	11.1	80.40±20.23	6.67±9.42
		LAGB	3.0	—	—
Happy	I am happy with my weight, but, ideally, I would like to weigh less.	Full	45.3	93.29±21.75	9.88±8.47
		RYGB	51.9	91.25±19.43	9.89±8.44
		LAGB	27.3	89.06±7.46	10.18±9.76
Acceptable	I am not particularly happy with my weight, but it is acceptable since it is less than my pre-surgery weight.	Full	19.3	106.09±25.81	44.26±1.36
		RYGB	19.4	99.17±20.32	15.15±10.46
		LAGB	21.2	116.09±25.11	28.66±23.03
Disappointed	I am disappointed with my weight, although it is less than my pre-surgery weight, I do not view it as successful in any way.	Full	24.0	110.73±20.33	37.26±38.11
		RYGB	16.7	107.28±23.88	29.62±26.10
		LAGB	39.4	108.37±14.97	50.09±54.42
At or above pre-surgery weight	I am at or above my pre-surgery weight.	Full	2.7	134.15±16.01	125.78±43.50
		RYGB	0.9	—	—
		LAGB	9.1	137.89±17.34	138.00±53.74

Note: — indicates cell size of 1, so no mean or standard deviation was calculated

RYGB Roux-en-Y gastric bypass, LAGB laparoscopic adjustable gastric banding

**Table 5** Challenges faced by survey sample who lost at least 5 % weight from surgery and their associations with mean percent weight regain

	Participants endorsed (%)	Weight regain of endorsers (%)	Weight regain of non-endorsers (%)	<i>t</i>	<i>p</i>
Increased hunger	32.2	24.3±25.0	15.9±22.7	−2.04	0.04*
Increased food cravings	35.5	20.7±22.6	17.5±24.3	−0.77	0.44
Can consume larger amounts of food	57.9	21.9±27.4	14.2±16.5	−2.10	0.04*
Lack of motivation to maintain eating behavior changes	25.0	26.2±24.6	16.2±23.0	−2.25	0.03*
Lack of motivation to be physically active	36.0	22.7±25.4	16.8±22.7	−1.43	0.16
Difficulty adhering to postoperative diet	33.6	19.5±22.8	18.2±24.2	−0.33	0.75

\**p*<0.05

weight regain (which is consistent with objectively tracked postoperative weights [4–6]) and endorse concerns about both future weight regain and their eating behavior. In addition, these patients expressed strong interest in participating in postoperative programs aimed at stopping and reversing regain. Despite experiencing greater weight losses and higher satisfaction with weight loss, individuals who had RYGB reported similar challenges to those who underwent LAGB, underscoring interest in and need for post-surgical interventions regardless of the procedure type or magnitude of weight loss.

Based on these results, the poor retention of bariatric surgery patients does not appear to be due to a lack of concern for weight regain, a lack of desire for support following surgery, or low faith in behavioral interventions. Instead, it may be that challenges in retaining bariatric surgery patients over the long-term are largely due to more external factors such as geographical constraints and time limitations. For example, travel distance has shown to be a factor in decreased attendance of long-term follow-up in RYGB patients (i.e., at 6-month follow-up) [22]. In a study of the efficacy of in-person postoperative dietary counseling by Sarwer and colleagues [10], patients struggled to return for every-other-week counseling sessions and a large percentage had to be completed by telephone. These data suggest that it is not feasible to implement in-person interventions for many patients. Thus, it may be important to design interventions that are delivered remotely. Our survey data showed strong interest in remote treatment (especially as delivered via Internet, with 71.2 % of participants indicating interest). Although responders preferred an in-person intervention, specifics regarding the location of the treatment were not provided for this answer choice. Thus, it is possible that responders would have preferred a remotely-delivered intervention if the in-person intervention was not closely located to them.

Internet-based interventions may be particularly desirable in the bariatric surgery population due to cost-effectiveness, increased access, and reduced participant burden [23]. Internet-based interventions have been shown to result in meaningful weight losses [24]. For example, those

randomized to an Internet weight control program achieved 4.8 % weight loss at 12 months (versus 2.2 % for those

**Table 6** Preferences for intervention

	Percent
Frequency	
Weekly	19.7
Every other week	38.0
Monthly	42.3
Length	
About 2 months	13.6
About 4 months	10.7
About 6 months	28.6
About 9 months or longer	47.1
Format	
Group	36.7
Individual	23.7
No preference	39.6
Preferred modality	
In-person	62.7
Telephone	12.7
Internet	21.4
Text messages	3.2
Interest in phone	
Yes	50.0
No	30.6
No preference	19.4
Interest in Internet	
Yes	71.4
No	22.4
No preference	6.1
Interest in text messages	
Yes	23.1
No	68.7
No preference	8.2



assigned to a control group) [25]. Further research is necessary to assess the acceptability and effectiveness of Internet-delivered interventions for post-bariatric surgery patients.

Although a previous survey of RYGB patients (1.5 years post-surgery) indicated decreased hunger, increased fullness, and decreased drives to eat since before surgery [26], we found that improvements in these domains begin to attenuate after reaching maximum weight loss. Specifically, participants in the current study reported being able to consume larger amounts of food than they could shortly after the surgery. Participants also reported experiencing a return of hunger and food cravings (initially alleviated by the surgery), replicating other reports [27–29]. In addition, participants who endorsed experiencing increased hunger and those who were able to consume greater amounts of food displayed significantly greater weight regain compared to those who did not report these challenges. The return of hunger may not necessarily represent “failure” of the surgery but may be a normative physiological response that may not lead to significant weight regain. However, for those patients for whom these changes make weight control difficult, interventions should target these challenges directly. Such interventions may include behavioral treatment, pharmacotherapy, or the combination of both treatments.

Although this study provides important new information on patients’ postoperative experiences, it is not without limitations. The main limitation was the low response rate (i.e., 21.5 %), which is lower than reported average response rates for clinical surveys of approximately 50–60 % [30, 31]. Developers of future surveys of bariatric surgery patients may benefit from the strategies shown to enhance response rates, including contacting patients before and after sending the survey, using short surveys, and providing incentives regardless of participation [32]. It is possible that survey responders were biased towards being more likely to be interested in postoperative interventions, less satisfied with their weight losses, and/or concerned about weight regained compared to those who elected not to respond. In addition, all responders received surgery at the same medical center located in a large urban area. Therefore, the generalizability of these results to programs in other geographical locations is unknown. As indicated previously, all weight data were self-reported, though it should be noted that self-reported weights in bariatric surgery patients have been shown to be accurate [33].

## Conclusions

This survey provides novel information on bariatric surgery patients’ receptivity to and preferences for interventions after bariatric surgery. Overall, despite high

levels of postoperative satisfaction, the majority of patients are highly concerned about weight regain and are interested in postoperative interventions. Future research should evaluate intervention programs that specifically target the challenges faced by patients, such as the return of problematic internal experiences (e.g., hunger, food cravings) that makes weight control over the long-term particularly difficult. Lifestyle interventions that incorporate psychological skills that teach patients to accept these problematic internal experiences while engaging in valued behaviors, known as acceptance-based behavioral treatments [34], may be a particularly good fit for this population. In addition, remotely-delivered interventions may be promising to increase treatment utilization in this population.

**Conflict of Interest** D. B. Sarwer is a consultant for BAROnova, EnteroMedics, and Kythera and has received consulting fees from these organizations. The remaining authors have no commercial associations that might be a conflict of interest in relation to this article.

**Ethical Approval** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The study was approved by the Institutional Review Board of the University of Pennsylvania.

**Informed Consent** Informed consent was obtained from all individual participants included in the study.

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