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Original article

What variables are associated with successful weight loss outcomes for bariatric surgery after 1 year?

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Abstract

Background: Prior evidence indicates that predictors of weight loss outcomes after gastric bypass surgery fall within 5 domains: 1) presurgical factors, 2) postsurgical psychosocial variables (e.g., support group attendance), 3) postsurgical eating patterns, 4) postsurgical physical activity, and 5) follow-up at postsurgical clinic. However, little data exist on which specific behavioral predictors are most associated with successful outcomes (e.g., ≥50% excess weight loss) when considering the 5 domains simultaneously. The objective of this study was to specify the behavioral variables, and their respective cutoff points, most associated with successful weight loss outcomes.

Methods: Signal detection analysis evaluated associations between 84 pre- and postsurgical behavioral variables (within the 5 domains) and successful weight loss at ≥1 year in 274 postgastric bypass surgery patients.

Results: Successful weight loss was highest (92.6%) among those reporting dietary adherence of >3 on a 9-point scale (median = 5) who grazed no more than once-per-day. Among participants reporting dietary adherence <3 and grazing daily or less, success rates more than doubled when highest lifetime body mass index was <53.7 kg/m^2. Success rates also doubled for participants with dietary adherence = 3 if attending support groups. No variables from the physical activity or postsurgical follow-up domains were significant, nor were years since surgery. The overall model's sensitivity = .62, specificity = .92.

Conclusions: To our knowledge, this is the first study to simultaneously consider the relative contribution of behavioral variables within 5 domains and offer clinicians an assessment algorithm identifying cut-off points for behaviors most associated with successful postsurgical weight loss. Such data may inform prospective study designs and postsurgical interventions. (Surg Obes Relat Dis 2014;▮:00–00.)

Keywords: Bariatric surgery; Postoperative eating behaviors; Weight loss outcome; Signal detection analysis

Obesity is a global public health concern [1], with bariatric surgery being the most effective treatment [1,2]. While the majority of bariatric patients experience successful postsurgical weight loss outcomes (commonly defined as ≥50% excess weight loss [3–5], or %EWL) for the first 1–2 years postsurgery, a significant minority (up to 30%) may experience unsuccessful postsurgical weight loss or show gradual weight regain along with the return of associated medical co-morbidities [6,7]. Predicting which patients will lose ≥50% EWL is a challenge, with few identified modifiable risk factors. Available data suggest that

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certain pre- and postsurgical variables are associated with postsurgical weight loss success. These can be grouped into 5 domains including 1) presurgical variables [8–14], 2) postsurgical psychosocial (e.g., support group attendance) variables [12,15,16], 3) postsurgical adherence to recommendations regarding intake and eating behavior [4,8,11,17–22], 4) postsurgical adherence to recommendations for physical activity [23–25], and 5) postsurgical adherence to surgery clinic follow-up appointments [26,27].

Examples of presurgical variables positively associated with weight loss include female gender, Caucasian race, higher socioeconomic status, lower baseline body mass index (BMI) [8,9], absence of preoperative disordered eating behaviors (e.g., binge eating, emotional eating, loss of control (LOC) [10,11], lower levels of psychopathology [12] and compliance with presurgical guidelines [13]. In a recent meta-analysis of 115 studies, 3 of 16 presurgical variables were found to have evidentiary support as predictors of less successful outcomes: higher presurgical BMI (particularly super obesity, BMI >50 kg/m^2), lack of achievement of mandatory presurgical weight loss (i.e., the requirement that patients lose a certain percentage of excess weight [most commonly greater than 10% EWL] over the weeks immediately preceding surgery), and certain personality traits (e.g., lower self-directedness, higher grievance) [14].

Increasingly, surgical outcome is being connected with postsurgical behaviors. For example, postsurgical psychosocial variables associated with less successful postoperative weight outcome include reported decreased well-being, addictive behaviors [15], general (noneating related) psychopathology (e.g., depression) [12], and lower bariatric support group meeting attendance [16].

Another postsurgical domain associated with weight loss outcome includes adherence to the surgical team's recommendations for food intake and for eating behaviors. For example, Sarwer et al. [8] found that patients' self-reported ratings of their overall adherence to nutritional guidelines at 20 weeks after surgery predicted weight outcome at 92 weeks. In addition, numerous studies have linked specific postsurgical disordered eating behaviors (e.g., binge eating, grazing, a subjective sense of LOC, overeating, emotional eating) to less favorable postsurgical weight outcomes [4,11,17–22].

Postsurgical physical activity has, in some studies, also been predictive of postsurgical weight loss outcome. Although increased levels of physical activity have been significantly associated with the degree of weight loss [23,24], one intervention study targeting improvement of postsurgical physical activity did not show significant effects upon weight loss [25]. Finally, though many patients fail to attend their postsurgical follow-up appointments [26], adherence to recommendations for attendance at postsurgical follow-up appointments has been shown to be a significant predictor of weight loss outcome [27].

Notably, several gaps in the literature remain. To begin, studies identifying behaviors associated with postsurgical weight loss outcomes rarely include quantitative descriptions for at-risk behaviors, such as specifying the frequency at which a maladaptive eating behavior such as grazing (often defined as nibbling, snacking, or eating small amounts of food in an unplanned and repetitious way, although consensus has yet to be reached [4,18,19,22] on a standard definition) is likely to be problematic. In addition, studies often focus on only 1 of the 5 domains, such as the effect of adherence to a physical activity program on postsurgical weight loss. Hence, research is not yet able to offer clinicians an assessment algorithm for better identifying which patient variables within the 5 domains, when considered simultaneously, are most important for obtaining postsurgical weight outcome success.

Signal detection analysis (SDA) is used in medical decision making to evaluate the performance of diagnostic tests [28] or to identify characteristics of subgroups at risk for disease or other binary health outcomes [28,29]. The *signal* is the binary health outcome (e.g., successful postsurgical weight loss outcome), and the *detection* is the set of predictor variables. Signal detection employs recursive partitioning, an empirically driven iterative nonparametric process, to produce a series of "and/or" (Boolean) rules, based on a priori identified predictor variables, which specify subgroups of individuals who are more or less likely to have a particular binary health outcome according to a selected criterion [28]. For instance, SDA can identify the combination of demographic characteristics of distinct subgroups of individuals who are more or less likely to have successful postsurgical weight outcome. SDA uses an iterative forward procedure to specify successive cut-off points for each a priori identified predictor variable entered, incorporating specific stopping rules such as $P < .001$ and a sample size too small to further divide. Thus, a specific and optimal cut-off point for each predictor variable that significantly partitions the sample is identified. While it is important to stress that this exploratory analytical procedure does not test a hypothesis and no causal relationships can be concluded, the decision tree output provided by the SDA may form the basis of hypotheses that can later be examined empirically. The aims of the present study were to employ SDA to 1) identify which pre- and postsurgical variables, within the 5 domains and when considered together, significantly predict postsurgical weight loss outcome success; and 2) specify the optimal level at which a pre- and postsurgical variable distinguishes likelihood of weight outcome success (e.g., cutoff points).

Methods

Data collection

The study's sample was gathered from the general membership of an online bariatric support website, which sought out our team for assistance with refining a