




Preoperative Medical Weight Management in Bariatric Surgery: a Review and Reconsideration

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Abstract Bariatric surgery is the most robust treatment for extreme obesity. The impact of preoperative medical weight management sessions designed, in theory, with the primary goal of promoting preoperative weight loss, is unclear. This paper reviews studies that have investigated the relationship between preoperative weight loss and bariatric surgical outcomes, both with respect to postoperative weight loss and complications. We conclude that the most robust of preoperative interventions has not been implemented or evaluated in a manner which would conclusively assess the value of this element of care. We offer a reconsideration of the role of preoperative medical weight management and provide recommendations for future research in this area.

Keywords Preoperative weight loss · Medical weight management · Bariatric surgery · Obesity

Bariatric surgery is the most effective treatment for obesity, providing 20–35 % initial body weight loss within 12–18 months of surgery [1]. These weight losses are durable, with the majority of patients maintaining a large percentage of their initial weight loss over the first postoperative decade [2–4]. Advancements in surgical process including

laparoscopic approach, robotic assist, and safety culture have established the efficacy and safety of the most commonly performed procedures [5]. Furthermore, professional societies have produced a number of guidelines with the goal of establishing best practices for bariatric care [1, 6]. To standardize the best practices, the American Society of Metabolic and Bariatric Surgery (ASMBS) and the American College of Surgeons formed the Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program in 2012 and published quality-focused standards for bariatric surgery practices in 2014 and updated in 2016 [7].

Much of the focus of these guidelines is the systematic identification and evaluation of an appropriate patient from a medical and surgical perspective. The guidelines also emphasize the role of the multidisciplinary, integrated health team—dietitians, nurses, mental health professionals, etc.—in pre- and postoperative care. An important element of this care is preoperative medical weight management (MWM), where patients are asked to engage in a program designed to produce weight loss prior to surgery and, theoretically, reduce the risk of surgical complications and maximize postoperative weight loss. Having these recommendations come from professional guidelines written by recognized, national thought leaders have intuitive appeal; unfortunately, local insurance companies typically dictate, through policies, that patients complete MWM sessions of a specific duration (typically 3 to 6 months) or lose a certain amount of weight in order to receive insurance preauthorization coverage for surgery [8].

The role of the insurance companies in the implementation of these clinical recommendations has made it difficult to evaluate the true clinical value of preoperative MWM. The benefit of these sessions, with respect to postoperative weight loss or complications (surgical, behavioral, or psychosocial) is unclear. While some studies have suggested the preoperative weight loss impacts surgical outcomes, others have not.

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Unfortunately, many of these studies have suffered from methodological limitations that make it difficult to make conclusive statements on the relationship. Furthermore, there are practical consequences related to the practice of MWM. Requiring weight loss or MWM prior to surgery has been viewed as an additional barrier to treatment by both clinicians and patients [9]. Others have suggested that the practice may be discriminatory and that the delay or denial of surgery may exacerbate obesity and its comorbidities [8].

In this paper, we will review the current literature on MWM, specifically the relationship between preoperative weight loss and postbariatric surgery outcomes, both with respect to postoperative weight loss and complications. Additionally, we will propose an alternative perspective on MWM as a means to prepare patients by providing support to implement behaviors associated with postoperative success. We also will address the limitations of current literature and restrictions insurance mandates impose on future research and evaluation of the true benefits of MWM.

History of the Preoperative Requirements for Bariatric Surgery

The clinical criteria for bariatric surgery in the USA have been influenced predominantly by the Consensus Development Conference Panel on Gastrointestinal Surgery for Severe Obesity [10]. Convened and published in 1991, the goal of the National Institutes of Health panel was to establish agreed upon guidelines both surgical and nonsurgical treatments for severe obesity including many of the patient selection criteria, such as BMI and presence of comorbidities, still in practice today. The guidelines also stated that individuals who were appropriate for bariatric surgery should be deemed by an experienced clinician to have a low probability of successful weight loss with nonsurgical weight loss methods. This statement implied less radical means of weight loss should be attempted prior to surgical intervention, indirectly establishing the practice of MWM.

Assembled in 1995 and published in 1998, the NIH Expert Panel on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults provided treatment recommendations for individuals based on BMI and the presence of weight-related comorbidities. In addition to echoing the criteria from the 1991 panel, this committee recommended weight loss surgery as an option for persons with obesity of whom less-invasive methods of weight loss have failed [11]. This statement further solidified the need for preoperative MWM, even though studies suggested that most candidates for bariatric surgery were “dieting veterans” who already had a lengthy history of efforts, and unfortunately failures, with more conservative weight loss treatments [12].

In an effort to update the 1991 and 1998 guidelines and perhaps move away from required MWM, the 2004 Consensus Conference of ASMBS published bariatric-specific guidelines. This statement concluded, “Bariatric surgery candidates should have attempted to lose weight by non-operative means...but should not be required to have completed formal nonoperative obesity therapy as a precondition for the operation [13]”. While this statement made efforts to de-emphasize preoperative MWM, the practice was beginning to develop widespread acceptance as a preoperative requirement by third-party payers. This occurred in the absence of evidence supporting the importance or contribution of these evaluations and sessions to postoperative outcomes. Prior to 2005, only two studies had been published on the subject, wherein both concluded that preoperative weight loss was both practical and safe but also suggested that larger preoperative weight loss was associated with larger postoperative weight losses [14, 15].

In 2011, the ASMBS released the position statement on preoperative supervised weight loss requirements. Written by the ASMBS Clinical Issues Committee, this statement concluded that “Policies such as these [prolonged preoperative diet efforts prior to insurance carrier approval of bariatric surgery] that delay, impede, or otherwise interfere with life-saving and cost-effective treatment, which has been proved to be true for bariatric surgery to treat morbid obesity, are unacceptable without supporting evidence [16]”.

Despite these position statements which have argued against the requirement of MWM, the practice remains a standard element of preoperative care in the USA. A number of studies conducted over the past 15 years have investigated the relationship between preoperative weight loss and postoperative outcomes. As detailed below, investigators have operationalized preoperative weight loss efforts in a number of ways. They also have studied the relationship to both surgical complications and postoperative weight loss (Table 1).

Preoperative MWM and Postoperative Complications

In 2008, the AACE/TOS/ASMBS Bariatric Surgery Clinical Practice Guidelines reviewed the studies which, to that time, had investigated the relationship between preoperative weight loss and postoperative complications [18]. The six studies reviewed received a grade B and the best evidence level of 2 conclusion that preoperative weight loss should be considered in cases where it may improve technical aspects of the surgery. Since that time, five additional studies have investigated the relationship and several authors have written reviews of this literature with mixed conclusions. Livhits et al. conducted a systematic review including 1 randomized controlled trial, 10 retrospective cohort studies, and 4 prospective cohort studies

Table 1 Potential advantages and disadvantages to MWM

Potential advantages	Potential disadvantages
<ul style="list-style-type: none"> • Opportunity to lose weight through less-invasive means [10] • Greater postoperative or total weight losses [14, 15, 17] • Improved technical aspects of surgery [18] • Shorter operating time [19–22] • Shorter length of stay [22] • Opportunity to practice postoperative behavior changes 	<ul style="list-style-type: none"> • Inconsistent definition, treatment, and measurement of MWM • Unnecessary dieting as bariatric surgery patients are already considered dieting veterans [12] • Lack of insurance coverage for visits [23] • Discouraging for patients [24] • Possibly unnecessary delay of necessary treatment [24]

[25]. Pooled results of the three studies reporting operating time found mean operating time was 23 min shorter in the preoperative weight loss group (95% CI 13.8–2.8) [19–21]. From these observations, the authors recommended that patients be encouraged to achieve a 10 % excess weight loss preoperatively in order to qualify for surgery.

Cassie and colleagues provided a more recent review of this literature. In an effort to be more inclusive and contemporary, the authors also reviewed studies that had been presented as presentations at professional meetings and that may not have been subjected to the same level of peer review as published studies [22]. Merged results from these studies showed a 12.5-min decrease in operative time within laparoscopic RYGB; however, the authors note inconsistency within methods of measuring operative time. Data from eight of the studies within the review reported an 18.8 ± 10.6 % complication rate in those who lost weight preoperatively compared to 21.4 ± 13.1 % in those who had not lost weight ($p = 0.02$). Mean length of stay for those who lost weight prior to surgery was 3.34 ± 0.83 days versus 3.98 ± 1.49 days for those who had not lost weight ($p = 0.05$). Despite these significant differences, the authors concluded that variations in the methodology across studies precluded them from making strong statements on the relationship between preoperative weight loss and surgical complications.

This is a defensible conclusion. Studies of this relationship have used a range of definitions to operationalize preoperative weight loss. Most study participants were simply asked to lose weight with no specific instruction to do so. Others were recommended to consume a low-calorie diet of approximately 800–1000 kcal/day, either through conventional foods or the use of meal replacement products like liquid shakes. Such approaches can produce a weight loss of approximately 5.0 kg in 2 weeks and a 10 % weight loss in 4–6 months, both of which may have a clinically meaningful impact on liver size and other weight-related comorbidities [6].

However, in the absence of specific instruction, the provision of meal replacement products (as is often done in clinical trials that investigate the efficacy of low-calorie diets), or

regular patient-provider contact to enhance compliance, studies of this issue have delivered very weak interventions that may not yield statistically or clinically meaningful results. This observation may have impacted the 2013 AACE/TOS/ASMBS Bariatric Surgery Clinical Practice Guidelines, which downgraded the best evidence level of the 2008 recommendations of encouraging preoperative weight loss to improve the technical aspects of surgery due to inconsistent results (Grade B; BEL 1) [1, 18]. At the time of this writing, the most methodologically rigorous test of the impact of preoperative weight loss on postoperative complications has yet to be undertaken.

Preoperative MWM and Postoperative Weight Loss

Other studies and reviews have looked at the relationship between preoperative weight loss and postoperative weight loss. Immediate weight loss prior to surgery reviewed by Livhits et al. included 6 of the 15 studies (5 retrospective, 1 RCT) that assessed postoperative weight loss [25]. A meta-analysis of postoperative weight loss at 12 months found that the preoperative weight loss group overall had a mean of 5 % greater excess weight loss (95% CI 2.7–7.3 %). The authors concluded that preoperative weight loss may enhance total weight loss. Assessing a larger group of studies but including poster abstracts, Cassie et al. concluded that there was insufficient data to support preoperative weight loss to improve postoperative weight loss, with only 9 of the 24 studies reporting a positive effect [22].

Ochner et al. conducted a review focusing on the content and effectiveness of preoperative diets and postoperative weight loss outcomes of 2 randomized controlled trials, 5 prospective studies, and 6 retrospective studies [26]. The authors emphasize the majority of the studies assessed reported mixed findings with one retrospective study finding an inverse relationship between preoperative weight loss and 3-month postoperative weight loss [27]. Three conclusions were drawn: (1) current preoperative requirements are ineffective

at fostering weight loss, (2) making surgery contingent upon weight loss may be effective in fostering preoperative weight loss, and (3) preoperative weight loss may lead to some improvements in postoperative outcomes.

After performing a systematic review of preoperative weight loss before gastric bypass and weight loss outcomes up to 1 year postoperatively, Kadeli and colleagues used the findings from studies with 1-year weight loss data to create a model to depict the weight loss trajectory of 6 hypothetical patients [17]. The authors found, regardless of the amount of weight gained or lost prior to surgery, patients lost a consistent 38 % body weight postoperatively; however, preoperative weight loss increased the total percentage of weight lost overall.

The most recent review by Gerber et al. summarized the literature on preoperative weight loss, regardless of length of diet [28]. The review included 2 RCTs, 7 prospective studies, 14 retrospective studies, and the Levhits and Oncher reviews previously discussed. With no additional studies provided compared to the other review examines, the authors deduced that it is not entirely clear whether preoperative weight loss predisposes persons undergoing bariatric surgery to better postoperative weight loss outcomes. The authors also suggest those who are successful at achieving weight loss prior to surgery may create a selection bias “by being more motivated to take responsibility for their new lifestyle, and thus, being more successful in achieving and sustaining satisfactory weight loss over time.”

The most recent published study on weight loss prior to surgery reported the largest population to date with 20,564 patients undergoing RYGB from the Scandinavian Obesity Registry [29]. The investigators found preoperative weight loss to be associated with increased weight loss with the greatest effect seen with BMI >45.7 kg/m² at 1 year postoperatively (OR 2.39, 95% CI 2.10–2.72, $p < 0.001$). In contrast to these findings, a study by Horwitz and colleagues evaluating insurance mandated MWM with no assessment of preoperative weight loss found no difference between mandated MWM and no MWM at both 1 and 2 years postoperatively [30]. This lack of detail on preoperative weight loss and the education and direction given within MWM also raises questions about the validity and applicability of the results.

Within the five reviews assessing the relationship between preoperative weight loss and postoperative weight loss, there is little strong evidence to support or refute the recommendation for preoperative MWM. Only three randomized controlled trials have been published, all with differing methods and results [19, 31, 32]. Similar to studies assessing preoperative weight loss and postoperative complications, the methods of preoperative weight loss in the studies examined here were either not discussed or inconsistent both in recommendation and level of clinical intervention making any

discernable effect preoperative intervention or weight loss may have on postoperative outcomes arduous to assess.

Other Considerations

As summarized above, the impact of preoperative MWM on postoperative outcomes, both surgical complications and weight loss, is unclear. Lack of consensus on a standardized approach to MWM (one informed more by empirical study than third-party payer policy) and a number of methodological concerns with previous investigations in this area have left the field without clarity on the value of the clinical practice. At the same time, most studies of this issue have been behind other developments of the field. The latest reports show VSG now accounts for more than half of all bariatric surgeries being performed [33]. With the majority of the literature on effective comprehensive care consisting of primarily RYGB and AGB, the applicability of current recommendations to VSG is unclear. In the only prospective study of VSG patients only, Ruiz-Tovar et al. evaluated preoperative weight loss and postoperative outcome [34]. In a sample of 50 patients, preoperative weight loss was significantly correlated with 12- and 24-month weight loss. Individuals who lost more than 15 % of their excess weight prior to surgery had the largest postoperative weight losses. This finding is at odds with a recent study of both RYGB ($n = 163$) and VSG ($n = 94$) patients which found that larger preoperative weight losses predicted smaller postoperative weight losses at 2 years [35]. Unfortunately, both studies suffered from many of the methodological problems noted above, limiting the confidence that can be placed in either result.

Access to bariatric surgery is a significant issue for the field. Insurance-mandated MWM sessions of 3- to 6-month duration is often seen as a significant barrier to care rather than an intervention designed to promote the most positive postoperative outcomes. Furthermore, while insurance companies mandate MWM, they often provide substandard or no reimbursement for this care. Despite obesity treatment coverage being required by mandate of the Affordable Care Act, only 23 states' exchange plans include options for bariatric surgery coverage, and merely 13 of those states require some level of nutritional counseling coverage [23]. As a result, many bariatric programs ask their patients to pay out of pocket for these services, creating another barrier to care. With obesity disproportionately affecting disadvantaged populations [36], the lack of affordable access to comprehensive bariatric surgery care is troubling. These barriers not only interfere with the delivery of high-quality clinical care, but they also limit the ability of investigators to develop and appropriately test the most robust preoperative treatment strategies that could impact postoperative outcomes.

Preoperative MWM sessions ideally provide patients with an opportunity to be taught and begin to practice the dietary and behavioral changes required of bariatric surgery. Understanding of the specific nutritional demands of surgery is believed to be important, and a profound lack of understanding of these requirements or a lack of willingness to change behavior in response to them is considered contraindications for surgery [1]. While most, if not all bariatric programs, would agree with these statements, their true application in daily practice is unknown. Glenn et al. found that patients with a required weight loss goal before being considered a candidate for surgery reported feeling like they need to just go through the motions or expressed frustration over lack of validation from their providers for their efforts [24]. Although practitioners may disagree with the requirements, this could also be an indication of sub-optimal treatment practices and missed opportunity to educate and improve readiness with an engaged patient [37].

Discussion

There is a lack of consensus around the value of preoperative MWM prior to bariatric surgery. Many thought leaders and clinical providers strongly believe that it serves an important role in promoting postoperative outcomes. The empirical evidence supporting this belief is mixed. Third-party payers mandate that patients participate but do not provide sufficient reimbursement for the provision of care. This sends a mixed message about the perceived value and opens the door to criticism that insurance-mandated MWM is less about promoting postoperative outcomes and more about limiting access. This confluence of dynamics has indirectly resulted in most programs delivering preoperative programs that focus more on meeting the requirements for insurance coverage rather than using lessons from the obesity treatment literature to deliver the most robust, evidence-based interventions that could both produce a clinically meaningful weight loss prior to surgery and be the true test of the effect on surgical complications and weight loss.

In the nonsurgical obesity literature, there is a strong, positive relationship between the frequency of patient-provider contacts and weight loss. Similarly, there is a strong relationship between self-monitoring behaviors, such as recording of daily food intake and regular self-weighing, and weight loss. While brief, monthly visits with a treatment provider can produce weight loss [38]; however, it may be smaller than 5 % deemed clinically meaningful [6]. Additional instruction and behavioral intervention is likely needed to produce a larger weight loss and can be done with electronic communications to maintain patient-provider contact [39]. The use of meal replacement products to facilitate adherence to a diet totaling 1000–1200 kcal/day also can produce a clinically meaningful

weight loss [38]. While many bariatric programs recommend this approach for patient a week or two before surgery, these strategies need to be used for longer than 2 weeks and coupled with provider monitoring to insure adherence and to likely produce the most clinically meaningful benefit. Unfortunately, these are empirical questions that have not been appropriately studied in large part because of the need of programs to balance the provision of clinical care that meets the requirements of third-party payers with the demands of methodologically sound research.

These research questions place a priority of the magnitude of preoperative weight loss and, perhaps erroneously, assume that weight loss is the most important variable. However, perhaps weight loss prior to surgery is not the strongest predictor of postoperative weight loss. It may be that specific behavioral variables, such as adherence to self-monitoring of weight, recording of food intake, or even increased physical activity, are stronger predictors of postoperative weight loss. Mitchell and colleagues recently found that changes in similar behaviors in the first few postoperative years predicted a 14 % greater weight loss [40]. Perhaps preoperative changes in these behaviors would have a similarly robust effect.

The preoperative medical weight management pathway at the University of Pennsylvania's Metabolic and Bariatric Surgery Program has established a practical method of fulfilling insurance requirements while providing patients with comprehensive care in preparation for surgery. Within the constraints of insurance providers, all patients are required to meet with a bariatric surgery physician or physician extender and a registered dietitian at least three times prior to surgery, with each visit approximately a month apart. These visits consist of a review of preoperative test results (i.e., sleep study, imaging studies, blood laboratory results) and lifestyle modification counseling (i.e., self-monitoring, smoking cessation, physical activity). This programmatic requirement also extends to self-pay and patients with insurance not mandating a preoperative weight loss period. Weight loss is encouraged with net weight maintenance at minimum being required for candidacy. MWM is described to patients as a time of preparation educationally, behaviorally, and medically. This approach also provides the bariatric clinicians with an opportunity to build and sustain rapport with patients. While the impact of this approach has not been formally studied, we believe that patient-centered, comprehensive care within a bariatric surgery program is feasible and practical if given adequate support to provide.

Conclusion

MWM in its current form does not appear to be strong enough to produce effective weight loss or meaningful outcomes. Whether this is a true failure of treatment or methodological

error is unclear. Of the studies published, there is no consistency between methods or duration due to insurance mandates placing restrictions on preoperative requirements. This creates a cycle of difficulties in that appealing to payers to eliminate mandated weight loss, and MWM cannot be successful without sufficient evidence negating the practice. An opportunity for clinically relevant research within the constraints of insurance requirements can include evaluating the content of preoperative interventions, the comparison of length of MWM, or assessing patient readiness over the continuum of MWM.

The goal of MWM is also uncertain. As suggested here, the outcome of focus may be better focused within nutrition and psychoeducation and behavior modification rather than the current measure of preoperative weight loss. Shifting MWM to focus on lifestyle modification as preparation for surgery is a realistic and sensible approach. Future research should include more behavior- and education-based outcomes rather than weight alone to determine the true benefit, if any, of MWM.

Although the data is not strong enough to support or refute the practice of MWM as a prerequisite for surgical candidacy, the requirement still exists at present. Future advocacy ventures should target insurance companies to allow clinical decision making of which patients may benefit from preoperative weight loss to reduce perioperative and immediate postoperative outcomes to be left to the bariatric surgery team.

Compliance with Ethical Standards This article does not contain any studies with human participants or animals performed by any of the authors. Informed consent does not apply.

Conflict of Interest CT is a full-time employee for Penn Metabolic and Bariatric Surgery Program and a part time student in Temple University College of Public Health.

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