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Metabolic and Bariatric Surgery Patients' Preoperative Dieting Attempts and Associations With Postoperative Outcomes

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ABSTRACT

Purpose: Pre-operative eating disorders are well documented within the metabolic and bariatric surgery (MBS) population, yet subthreshold dieting attempts are less understood. The objectives of this study were to define and categorize patients' preoperative dieting attempts, and to determine how attempts are associated with postoperative outcomes, eating disorders, and demographics.

Materials and Methods: Three hundred twenty-one patients (81.0% female; 68.3% White) who had MBS (57.3% Roux-en-Y) between 2019 and 2020 were included. Preoperative dieting attempt responses were categorized as provider-managed, non-medically managed, and self-directed attempts; subtypes of dieting methods (e.g., low calorie) were described. Descriptive analyses were conducted for attempt categories and subtypes, and between attempts and readmissions, complications, eating disorders, and demographics. ANOVAs determined associations between attempts and %TWL at 6 and 12 months.

Results: Patients reported an average of five to six preoperative dieting attempts; self-directed attempts were the most common (91.9%), and exercise was the most common subcategory (70.7%). Patients with ≥ 1 provider-managed attempt were less likely to experience a complication ($p < 0.001$) and more likely to experience readmission ($p = 0.018$). Patients with 1 self-directed attempt were less likely to experience a complication ($p = 0.045$) and readmission ($p < 0.001$). Patients who experienced ≥ 2 low fat diet attempts were more likely to have complications ($p < 0.001$) and readmissions ($p = 0.008$); patients with ≥ 2 VLCD attempts were more likely to have a complication ($p < 0.001$). Patients who experienced ≥ 2 non-medically managed attempts had higher preoperative BMIs ($p = 0.03$).

Discussion: Given that patients engaged in frequent dieting attempts that fall outside formal assessments, future work should seek to expand pre-operative assessments.

1 | Introduction

Metabolic and bariatric surgery (MBS) is the most effective method of achieving sustainable long-term weight loss, particularly when diet, exercise, and drug therapy have not been successful [1]. Primary mechanisms of weight loss across procedures include inducing satiety, reducing hunger, and impeding the ability to overconsume [2]. In combination, these factors promote a shift in postoperative eating behaviors that can lead to significant weight loss [3]. However, patients with MBS are more likely to have disordered eating [4–6], heightened reactivity around food [7], and dysregulated hunger and satiety cues [8] than the general population, all of which can interfere with the success of the primary weight loss mechanisms associated with surgery. There is evidence that patients with these types of postoperative eating patterns have suboptimal weight loss [9, 10], a need for revisional surgery [11], and poor psychosocial outcomes [12].

The most common type of preoperative diets recommended to patients are energy-restricted diets, in which the weight loss market is currently valued at $75 billion USD [13]. Energy-restriction diets have been associated with poor long-term weight management outcomes [14–16], such as weight regain [17], effectively creating "repeat customers." These diets have been linked to the development of uncontrollable food cravings [18, 19], binge eating [20], emotional eating [21], malnourishment [22], and eating disturbances [23], all of which decrease the success of future attempts at eating behavior change. Additionally, these types of diets often position eating behaviors in ways that increase the likelihood of developing disordered eating, anxiety around food consumption, and increase the internalization of weight stigma [24].

Patients pursuing MBS are typically assessed for diagnosable eating disorder (ED) pathology, particularly for binge eating disorder and bulimia nervosa, as part of a preoperative psychological evaluation [10]. Some providers also collect information about patients' previous preoperative attempts at dieting, weight loss and management, although these reports are infrequently considered as contributing to or part of possible disordered eating [4, 5] or of importance when considering possible impact on postoperative outcomes. Although the effects of binge eating disorder and emotional eating pathology on postoperative outcomes are well-documented, little is known about sub-threshold and general eating pathology connected to a history of dieting attempts, which may seem unproblematic at first glance even to trained providers [25, 26].

The majority of literature in this area details specific types of dieting or weight loss attempts that were unrelated to postoperative weight loss. Overall, patients endorsed using self-directed and commercial dieting programs more often than medically-supervised or anti-obesity medications [27, 28]. Researchers have also noted no effects from preoperative dieting and weight loss attempts on long term postoperative weight loss [27, 29]. For example, Deb and colleagues [27] reported that neither the total number of attempts nor the total duration of attempted weight loss methods in years had any effect on preoperative BMI or weight loss at 12 month postsurgery. Other researchers have noted that requiring medically-managed preoperative weight loss attempts may not be helpful and instead needlessly inhibit access to surgery [30–32].

The primary objective of this study was to define and categorize the types of patients' self-reported preoperative weight loss and dieting (referred to as "dieting" herein) attempts, updated to reflect recent dieting and weight loss phenomena. The secondary objective was to determine how dieting attempts associated with current and previously diagnosed EDs (Binge Eating Disorder, Unspecified Eating Disorder), postoperative 3-month readmissions, 30-day complications, and weight loss over 12 months were assessed, including trends in patient demographics. An examination of the comprehensive diet and exercise histories of patients seeking MBS will provide novel information about the seemingly innocuous preoperative dieting behaviors that may need to be addressed to increase the chances of successful postoperative outcomes.

2 | Methods

2.1 | Study Design

The current study was a secondary data analysis from a descriptive study examining preoperative psychiatric and behavioral predictors of MBS outcomes from electronic health record data [4, 5]. The prior studies focused on associations between patient demographics and DSM diagnoses from the pre-operative psychological evaluation outcomes, follow-up rates with the psychologist, and postoperative outcomes. This was the first study using this data to examine previous dieting attempts and disordered eating behaviors.

2.2 | Procedures

During the pre-operative psychological evaluation, patients completed a clinical interview assessing for psychiatric, ED, and substance use diagnoses. Patients were seen for their initial evaluation between August 2019 and December 2020. The original sample included 508 participants. 187 participants were excluded from this study according to the following criteria: not receiving MBS at the clinic for any reason despite completing the evaluation ($n = 186$) and not having any readmission data up to 3 months post-surgery ($n = 1$). The remaining participants ($N = 321$) represented 63.2% of the original sample.

The final analytic sample was composed of 321 patients who had completed their preoperative psychological evaluation during this timeframe with a singular psychologist, had %TWL data available for at least one visit post-surgery, had readmission data available for 3 months post-surgery, were $\geq$ 18-years-old, and had a BMI $\geq$ 35 with weight-related medical problems or $\geq$ 40 with no comorbidity [33]. Patient demographics, current and historical diagnoses, and postoperative outcomes were

extracted from the electronic health record. All data collection procedures were approved by the Institutional Review Board of The Ohio State University.

2.3 | Measures

2.3.1 | Clinical Demographics

Demographics included patient age, sex, highest educational attainment, employment status, insurance type, and marital status at the time of the psychological evaluation. Participants received Roux-en-Y gastric bypass (57.3%) or sleeve gastrectomy (42.7%). All past or current psychiatric diagnoses were coded by category (yes, no). ED diagnoses included any (19.7% of all patients), binge eating disorder (6.1% of all patients), and unspecified eating or feeding disorder (9.4% of all patients). During the pre-operative psychological evaluation, patients met with a single psychologist to complete a clinical interview and assessments in which eating disorders and disordered eating were assessed based on DSM–5 criteria.

2.3.2 | Anthropometrics

Patient weight, height, and BMI were extracted from the pre-operative psychological evaluation, at the date of surgery, and postoperative clinical visits (2- or 3-, 6-, and 12-month). Change in BMI (ΔBMI) and %TWL were calculated from the date of surgery through each follow-up [34]. Any post-operative readmissions within 3 months and 30-day complications were obtained from the electronic health record, coded as yes or no.

2.3.3 | Patient Reported Dieting Attempts

Patients were asked open-ended questions by the psychologist regarding previous methods attempted for weight loss throughout their lifetime, regardless of whether initial and/or sustained weight loss was achieved. Patients' self-reported pre-operative dieting attempts were coded into categorical variables including main categories ($n = 3$) and sub-categories ($n = 9$) by the authors using a codebook.

The main three categories included: *provider-managed attempts*, which included subcategories (1) prescription weight loss medications, (2) physician-managed diets or programs, (3) dietitian-managed diet or program; *non-medically managed attempts*, included subcategories (4) over-the-counter medications and supplements, (5) commercial diet programs, and (6) fad or specialty diets; and *self-directed attempts*, which included the sub-category (7) self-monitoring of caloric or macro intake, (8) self-directed dieting, and (9) exercise. These categories were similar (although not identical) to those used by Gibbons and colleagues [28] to describe types of dieting attempts. Each main category and sub-category variable were coded for 0, 1, or ≥ 2 attempts. The most frequent patient reported examples were noted for applicable sub-categories (i.e., prescription medication, over-the-counter medications or supplements, commercial diet programs, fad and specialty diets, self-monitoring, and self-directed diets).

Dieting attempts were additionally separately coded for 8 subtypes based on defining characteristics. Each dieting attempt named in the dataset was cross-checked for information on the appropriate commercial, product, or organization website. Daily caloric and macronutrient intakes were evaluated only if they were explicitly offered on a website or in associated company materials. All dieting attempts not explicitly associated with a commercial program or trademarked product (e.g., "apple cider vinegar shots") did not receive a label due to the lack of appropriate reference information. All standards for what constituted "high" or "low" daily intake values were created based on nutritional Daily Reference Values and acceptable caloric and macronutrient distribution ranges determined by the National Institutes of Health [35]. The cutoff for high protein diets was not calculated in grams as the Daily Reference Values for protein are based on individual weight.

Based on the above criteria, diets recommending the consumption of 1200–1800 kcal/day were labeled as (1) *low calorie diets* and (2) < 1200 kcal/day were labeled *very low calorie diets* (VLCD). Diets recommending < 100 g carbs/day or < 40% of daily total intake (DTI) were labeled as (3) *low carb diets*; < 80 g fat/day or < 25% of DTI were labeled as (4) *low fat diet*, whereas $\geq$ 120 g fat/day or $\geq$ 35% of DTI were labeled as (5) *high fat diet;* and $\geq$ 200 g protein/day or $\geq$ 35% DTI were labeled as (6) *high protein diet*. Two additional labels were applied: attempts were labeled (7) *appetite suppressant* for prescription medications, over-the-counter supplements, and injections that purport to suppress appetite as the primary mechanism of weight loss; and (8) *eating disorder behavior* for instances where disordered eating as a form of weight management was directly labeled by the patient (e.g., "abusing laxatives"). Each subtype variable was coded for 0, 1, or ≥ 2 attempts.

2.4 | Analysis

To determine the types of previous dieting attempts, descriptive statistics were conducted for each type of category and subtype (frequency, percentage). Only the subtypes of previous dieting attempts with at least 30% prevalence in the sample were utilized (low calorie diet, low carb diet, very low calorie, high protein diet, high fat diet, appetite suppressant) in the analyses. Chi-square analyses determined associations between current and past ED diagnosis with type of dieting attempt. Chi-square analyses also determined associations between type of previous dieting attempt with 3 months readmissions and 30-day complications. ANOVAs were conducted to determine associations between type of dieting attempts with %TWL at 2 or 3 months (depending on procedure), 6 months, and 12 months. To determine associations between patient demographics and dieting attempts, a series of Chi-square tests (race, ethnicity, sex, insurance, marital status, education, employment) and independent *t*-tests (age) were conducted depending on the nature of the demographic variables. The

criterion for significance was set at $p < 0.05$. All analyses were conducted using SPSS Version 28 (IBM). Missing %TWL or BMI data at follow-up indicated that patients did not complete the visit.

3 | Results

3.1 | Clinical Demographics

The clinical demographics of the sample are shown in Table 1. The average age of patients at surgery was 41 years with a BMI of 48.65 ± 8.39 at the time of their psychological intake. The majority of the sample identified as female (81.0%), White (64.1%), partially or fully employed (72.9%), with above a high school diploma or GED (76.0%) and received private health insurance (60.5%). The sample was split between patients who identified as married or cohabitating (55.8%) and single or widowed/divorced/separated (44.3%), and who received the Roux-en-Y Gastric Bypass (57.3%) versus the Sleeve Gastrectomy (42.7%) surgical procedure. Few patients experienced one or more readmissions (7.5%) within three months post-surgery or had at least one 30-day complication (29.8%).

3.2 | Preoperative Dieting Attempts

Information about patients' preoperative dieting attempts is in Table 2. Patients reported average 5.39 ± 2.07 preoperative dieting attempts. Of the main three categories, 66.1% of patients reported at least one provider-managed attempt, 85.1% reported at least one non-medically managed attempt, and 91.9% reported at least one self-directed attempt.

Within the category of provider-managed attempts, the most frequently reported sub-category was prescription weight loss medications (44.8% reporting at least one), with phentermine as the most common medication (34.9% of all participants). Within the category of non-medically managed attempts, commercial dieting programs were the most frequent sub-category reported (65.7% of patients reporting at least one), with the most frequently reported being Weight Watchers (42.4%) and a ketogenic diet (31.2%). This was followed by closely by fad and specialty diet programs at 55.8%. Within the category of self-directed attempts, the sub-category of exercise was the most commonly reported (70.7%).

Table 2 further breaks down the three main categories into nine subtypes based on characteristics specific to the diet, medication, or over-the-counter pill/supplement, and when applicable provides top examples reported by patients. The most common subtypes of diet were low calorie diets (82.2%), low carb diets (57.3%), appetite suppressants (47.7%), and VLCDs (40.2%). Notably, it was more common for participants to report ≥ 2 low calorie diet attempts (43.3%) than 1 attempt only (38.9%). Although somewhat less frequent, at least 1 attempt of high protein diets (34.9%) and high fat diets (32.7%) for dieting was still reported by over a third of participants. Most participants did not report direct disordered eating behaviors outside the eating

TABLE 1 | Clinical demographics and outcomes $N = 321$.

Age, in years	41.35 ± 10.57, 21.00–73.00
Sex	
Male	61 (19.0)
Female	260 (81.0)
Race ($n = 320$)	
White	205 (64.1)
Black	95 (29.7)
Other or multiple races	20 (6.2)
Insurance ($n = 311$)	
Public	123 (39.5)
Private	188 (60.5)
Employment	
Full/partial	234 (72.9)
Not employed	87 (27.1)
Education	
≤ High school diploma/GED	77 (24.0)
≤ Associate/bachelor's degree	205 (63.9)
≥ Graduate degree	39 (12.1)
Marital status	
Married/cohabitating	179 (55.8)
Never married/single	85 (26.5)
Widowed/divorced/ separated	57 (17.8)
Living alone	
Yes	37 (11.5)
No	284 (88.5)
Surgical procedure	
Roux-en-Y gastric bypass	184 (57.3)
Sleeve gastrectomy	137 (42.7)
Procedure delayed	
Yes	91 (28.3)
No	230 (71.7)
Weight–Intake, in kgs	137.82 ± 29.31, 83.46–296.65
BMI–Intake	48.65 ± 8.39, 34.90–90.50
Weight–Surgery, in kgs	133.39 ± 26.35, 84.14–269.89
BMI–Surgery	47.28 ± 7.71, 30.69–85.19
ΔBMI–3 Months ($n = 115$)	7.91 ± 2.82,-3.31–21.48
%TWL–3 Months ($n = 115$)	16.37 ± 4.68,-6.68–30.67
ΔBMI–6 Months ($n = 215$)	10.94 ± 3.49,-0.74–24.28
%TWL–6 Months ($n = 215$)	23.16 ± 6.03,-4.64–41.60

(Continues)

TABLE 1 | (Continued)

ΔBMI–12 Months (n = 111)	13.26 ± 5.17,-2.24–35.07
%TWL–12 Months (n = 110)	28.16 ± 8.78,-6.75–47.44
Readmissions–3 Months (n = 320)	
0	296 (92.5)
≥ 1	24 (7.5)
30 Day complications– 3 Month	
0	225 (70.1)
1	65 (20.2)
≥ 2	31 (9.6)

disorder assessment portion of the pre-operative psychological evaluation (96.9%).

3.3 | Dieting Attempts, Methods Subtypes, and Postoperative Outcomes

Tables 3 and 4 contain the analyses of dieting attempts (categories and subtypes) with postoperative readmissions and complications. Patients who experienced no provider-managed attempts (6.4% readmission rate) were less likely to have a postoperative readmission compared to patients with 1 (8.1%) or ≥ 2 (8.0%) provider-managed attempts ($X^2[15] = 28.668$, $p = 0.018$). Additionally, patients who experienced 1 self-directed attempt were less likely to have a postoperative readmission (6.3% vs. 7.7%) compared to no self-directed attempts or ≥ 2 self-directed attempts (7.9%; $X^2[18] = 61.762$, $p < 0.001$).

TABLE 2 | Descriptions of previous dieting attempt categories, subcategories, examples, and dieting method subtypes (N = 321).

Categories and subcategories	Attempts	Number (%)	Patient-reported examples	Number (%)
1. Provider-managed attempts	0	109 (34.0)		
	1	137 (42.7)		
	≥ 2	75 (23.4)		
1a. Prescription medication	0	177 (55.1)	Phentermine (any formulation)	112 (34.9)
	1	105 (32.7)	Bupropion (any formulation)	10 (3.1)
	≥ 2	39 (12.1)	Other	45 (14.0)
1b. Physician-supervised diets/Programs	0	290 (90.3)		
	≥ 1	31 (9.6)		
1c. Registered dietitian/Nutritionist (RDN) consults	0	227 (70.7)		
	≥ 1	94 (29.3)		
2. Non-medically-managed attempts	0	48 (15.0)		
	1	77 (24.0)		
	≥ 2	196 (61.1)		
2a. Over-the-counter (OTC) medications/ Supplements	0	247 (76.9)	Hydroxycut	16 (5.0)
	≥ 1	74 (23.1)	Other	66 (20.6)
2b. Commercial diet programs	0	110 (34.3)	Weight watchers	136 (42.4)
	1	129 (40.2)	Slimfast	52 (16.2)
	≥ 2	82 (25.5)	Other	147 (45.8)
2c. Fad and specialty diet programs	0	142 (44.2)	Keto	100 (31.2)
	1	119 (37.1)	Liquid diet/Cleanse/Meal replacements	46 (14.3)
	≥ 2	60 (18.7)	Other	109 (34.0)
3. Self-directed attempts	0	26 (8.1)		
	1	79 (24.6)		
	≥ 2	216 (67.3)		
3a. Self-monitoring	0	195 (60.7)	Counting calories/Macros	54 (16.8)
	≥ 1	126 (39.3)	Other	88 (27.4)

(Continues)

TABLE 2 | (Continued)

Categories and subcategories	Attempts	Number (%)	Patient-reported examples	Number (%)
3b. Self-directed diets	0	135 (42.1)	Reducing carbohydrate intake	72 (22.4)
	1	90 (28.0)	Reducing caloric intake	45 (14.0)
	≥ 2	96 (30.0)	Other	65 (59.1)
3c. Exercise	0	94 (29.3)		
	≥ 1	227 (70.7)		

Subtypes	Attempts	Number (%)	Explanation
Low calorie diets	0	57 (17.8)	1200–1800 kcal/day (most often ≤ 1500 kcal/day), regardless of medical supervision
	1	125 (38.9)	
	≥ 2	139 (43.3)	
Very low calorie diets (VLCDs)	0	192 (59.8)	< 1200 kcal/day (most often ≤ 800 kcal/day), regardless of medical supervision
	1	115 (35.8)	
	≥ 2	14 (4.4)	
Low carb diets	0	137 (42.7)	< 100 g carbs/day, or < 40% of total daily intake
	1	119 (37.1)	
	≥ 2	65 (20.2)	
Low fat diets	0	267 (83.2)	< 80 g fat/day, or < 25% of total daily intake
	1	54 (16.8)	
High fat diets	0	216 (67.3)	≥ 120 g fat/day, or ≥ 35% of total daily intake
	≥ 1	105 (32.7)	
High protein diets	0	209 (65.1)	≥ 200 g protein/day, or ≥ 35% of total daily intake
	≥ 1	112 (34.9)	
Appetite suppressants	0	168 (52.3)	Prescription medication, over-the-counter pill, or injection that purports to suppress appetite as the primary mode of weight loss/management
	1	102 (31.8)	
	≥ 2	51 (15.9)	
Disordered eating	0	311 (96.9)	Directly expressed method of disordered eating (i.e., "abuse of laxatives")
	≥ 1	10 (3.1)	

$*p < 0.05$; $**p < 0.001$.

Patients who experienced 1 provider-managed attempt (24.1%) were less likely to have a 30-day complication compared to patients who did not experience a provider-managed attempt (30.3%) or ≥ 2 provider-managed attempts (40%; $X^2[25] = 38.258$, $p = 0.044$). Similarly, patients who experienced 1 self-directed attempt (24.1%) were less likely to have a complication compared with those who experienced no self-direct attempts or ≥ 2 attempts (30.8% and 31.9%, respectively; $X^2[10] = 18.671$, $p = 0.045$). Patients who experienced no non-medically managed attempts (41.7%) were more likely to have complications compared to patients with 1 attempt (29.9%) or ≥ 2 attempts (27.0%; $X^2[45] = 104.160$, $p < 0.001$).

For specific subtypes, patients who experienced ≥ 2 low fat diet attempts were more likely to have 30-day complications and readmissions (complications: 25.0%; readmissions: 12.5%) compared to patients reporting only 1 attempt (21.7%; 10.9%) or no attempts (31.5%; 6.8%) (complications: $X^2[20] = 95.736$,

$p < 0.001$; readmissions: $X^2[4] = 13.860$, $p = 0.008$). For VLCDs, patients who experienced ≥ 2 attempts were more likely to have 30-day complications (50.0%) than patients who only experienced 1 attempt (24.3%) or no attempts (31.8%; $X^2[10] = 28.730$, $p < 0.001$).

Table 5 displays the results of the ANOVA analysis of dieting attempt categories and %TWL. The only significant result was between non-medically managed attempts and BMI at the psychological evaluation, in which patients who experienced ≥ 2 non-medically managed attempts had higher BMIs compared to those who experienced 0 or 1 non-medically managed attempts (F [2, 318] = 3.44, $p = 0.03$). A post hoc comparison using the Tukey HSD test indicated that the mean BMI for patients who had 1 non-medically managed attempt (50.81 ± 9.13) was significantly higher compared to patients with ≥ 2 non-medically managed attempts (48.02 ± 7.94); there was no significant difference for those with 0 non-medically managed attempts.

TABLE 3 | Dieting attempt categories and readmissions and complications.

	No Readmissions	≥ 1 Readmissions
Provider attempts*		
0	102	7
1	125	11
≥ 2	69	6
Non-medically managed attempts		
0	45	3
1	72	5
≥ 2	179	16
Self-directed attempts**		
0	24	2
1	74	5
≥ 2	198	17

	No 30-Day Complications	≥ 1 30-Day Complication
Provider attempts*		
0	76	33
1	104	33
≥ 2	45	30
Non-medically managed attempts**		
0	28	20
1	54	23
≥ 2	143	53
Self-directed attempts*		
0	18	8
1	60	19
≥ 2	147	69

3.4 | Dieting Attempts and Eating Disorder Diagnoses

There were no significant results based on historical or current ED diagnoses with readmissions or 30-day complications (see Table 7).

3.5 | Dieting Attempts and Clinical Demographics

There were no significant associations based on participant sex, race, and marital status with dieting attempt categories (see Table 6). Participants who were partially or fully employed were more likely to have utilized provider-managed attempts (47.0% with one attempt, 24.4% with ≥ 2 attempts) compared with participants who were not currently employed (31.0% with one attempt, 20.7% with ≥ 2 attempts) ($X^2[2] = 11.364$, $p = 0.003$).

Participants with public health insurance were more likely to have ≥ 2 non-medically managed attempts (67.0% vs. 50.4% for private health insurance), as well as participants who were currently employed (65.9% vs. 48.3%), received at least one college degree (61.5% for associates/bachelor's and 82.1% for graduate degree, vs. 49.4% for high school diploma/GED only), and were not currently living alone (62.3% vs. 51.4%) (insurance: X^2 [2] = 12.493, $p = 0.002$; employment: X^2 [20] = 8.483, $p = 0.014$; education: X^2 [4] = 14.294, $p = 0.006$; living alone: X^2 [9] = 21.835, $p = 0.009$). For self-directed attempts, participants who received the sleeve gastrectomy reported ≥ 2 attempts more often (73.7%) than patients who received Roux-en-Y gastric bypass (62.5%) (X^2 [2] = 6.483, $p = 0.039$).

4 | Discussion

Our findings show that before undergoing MBS, patients reported an average of five to six previous attempts at dieting, which was slightly higher than previously reported [27]. Self-directed dieting attempts were the most frequently reported category, followed by non-medically managed attempts. Provider attempts, while the least frequent reported category, were still reported by over three in five patients, which is consistent with previous literature [27, 28]. This study is among the first to explore and define specific categories and types of preoperative attempts at dieting that fall outside formal eating disorder diagnoses and assessments. While prior literature has focused on the identification of preoperative EDs and disordered eating behaviors, the unidentified types of dieting attempts that patients have pursued prior to surgery may have negative effects on postoperative outcomes.

Many of the types of attempts were not significantly associated with postoperative outcomes, which was also consistent with previous literature [27–31]. This suggests that, despite shifts in available weight loss and dieting methods over the past 20 years, their associations with MBS patient outcomes do not reach statistical significance. However, the broader categories (non-medically managed, provider-managed, self-directed dieting attempts) yielded some important information about what types of attempts are important for consideration beyond simply evaluating direct disordered eating behaviors. Although research has focused on associations between patients' preoperative high energy intake and postoperative outcomes, this study demonstrated complex associations between preoperative attempts at low or reduced energy intake and postoperative outcomes. Findings that patients who reported one or more provider-managed or two or more self-directed attempts were more likely to have postoperative readmissions, as well as the increased likelihood of patients reporting more than 2 non-medically managed attempts having higher BMIs at the time of evaluation, demonstrated the potential negative effect on presenting BMI of repeated dieting and weight cycling among patients presenting for surgery [36]. This suggests that preoperative weight cycling of repetitious over- or undereating may lead to poorer postoperative weight loss. It may also be that those patients engaged preoperatively in weight management in a healthcare system may have more

TABLE 4 | Dieting subtypes and readmissions and complications.

	No Readmissions	≥ 1 Readmissions
Very low calorie diets		
0	176	16
1	107	7
≥ 2	13	1
Low calorie diets		
0	53	4
1	118	6
≥ 2	125	14
Low carb diets		
0	126	11
1	110	9
≥ 2	60	4
Low fat diets*		
0	248	18
1	41	5
≥ 2	7	1
High fat diets		
0	198	17
1	95	7
≥ 2	3	0
High protein diets		
0	191	17
1	100	6
≥ 2	5	1
Appetite suppressants		
0	155	12
1	96	6
≥ 2	45	6
Disordered eating behaviors		
0	286	24
1	8	0
≥ 2	2	0

	No 30-Day Complications	≥ 1 30-Day Complication
Very low calorie diets**		
0	131	61
1	87	28
≥ 2	7	7
Low calorie diets		
0	38	19
1	87	38
≥ 2	100	39
Low carb diets		
0	88	49
1	87	32
≥ 2	50	15
Low fat diets**		
0	183	84
1	36	10
≥ 2	6	2
High fat diets		
0	148	68
1	74	28
≥ 2	3	0
High protein diets		
0	142	67
1	79	27
≥ 2	4	2
Appetite suppressants		
0	121	47
1	71	31
≥ 2	33	18
Disordered eating behaviors		
0	218	93
1	5	3
≥ 2	2	0

(Continues)

TABLE 4 | (Continued)

*$p < 0.05$; **$p < 0.001$.

medical risk, placing them at higher odds of readmission and complications.

It is worth noting that patients with higher BMIs who reported a history of non-medically managed attempts do not have statistically different postoperative weight loss compared with those without higher preoperative BMIs and non-medically managed attempts. This, combined with the lack of significant associations between any category of dieting attempts and %TWL, suggests that MBS may equalize patients' postsurgical weight loss. Future research should include %TWL data up to 24 months to examine if any differences would emerge at time points much further out from surgery.

Prior research on VLCDs for preoperative weight loss, while limited, has been mixed, with some finding that it reduced

TABLE 5 | Dieting attempt categories and %TWL at 6 and 12 Months.

BMI at Psychological Evaluation (n = 321)	M ± SD	n
Provider attempts		
0	48.73 ± 8.89	109
1	48.59 ± 7.72	137
≥ 2	48.63 ± 8.91	75
Non-medically managed attempts *		
0	47.74 ± 8.52	48
1	50.81 ± 9.13	77
≥ 2	48.02 ± 7.94	196
Self-directed attempts		
0	46.31 ± 6.67	26
1	48.56 ± 7.53	76
≥ 2	48.96 ± 8.84	216
6-month %TWL (n = 215)	**M ± SD**	**n**
Provider attempts		
0	23.58 ± 6.46	76
1	23.14 ± 6.37	89
≥ 2	22.53 ± 4.63	50
Non-medically managed attempts		
0	22.23 ± 5.34	36
1	22.80 ± 6.58	49
≥ 2	23.55 ± 6.01	130
Self-directed attempts		
0	24.68 ± 5.90	20
1	22.74 ± 6.00	54
≥ 2	23.10 ± 6.07	141
12-month %TWL (n = 110)	**M ± SD**	**N**
Provider attempts		
0	28.49 ± 10.03	38
1	28.74 ± 8.14	41
≥ 2	27.00 ± 8.11	31
Non-medically managed attempts		
0	25.69 ± 8.76	18
1	30.50 ± 10.08	27
≥ 2	27.88 ± 8.10	65
Self-directed attempts		
0	29.26 ± 8.84	10
1	27.70 ± 9.77	29
≥ 2	28.20 ± 8.46	71

*$p < 0.05$; **$p < 0.001$.

postoperative complications [37, 38] and others finding that it made no difference [39, 40]. The findings from this study may help to explain this discrepancy: reporting two or more previous attempts at VLCDs significantly increased the risk of postoperative complications, but having only one previous attempt was a protective factor instead. Future work could explore how preoperative weight loss mandates, which favor VLCDs for their high short-term weight loss, contribute to postoperative complications when undergone repeatedly by a patient. Although there is no known literature covering low fat diets prior to MBS, future research should explore the role of low fat diets in postoperative readmissions and 30-day complications.

There were few prominent demographic differences between patients utilizing different forms of dieting pre-surgery, with the notable exception of non-medically-managed attempts, which were more likely to be reported by patients with public health insurance, who were fully or partially employed, had at least some college, and did not live alone. Although household income was not available in this study, the majority of these variables (employment, some college education, and cohabitation) aligned with higher economic status, in which fad diets, commercial diets, and over-the-counter supplements may be more available.

This study found no significant associations between ED diagnosis and postoperative outcomes. In prior work, it was established that patients who were diagnosed with ED during the pre-operative psychological evaluation were delayed in proceeding to surgery [4, 5]. It is possible that these patients were provided with behavioral health referrals for ED treatment and acquired skills to manage disordered eating symptoms, which may have reduced their chances of having postoperative complications.

4.1 | Limitations

This study had limitations that are important to consider when looking at future research. Perhaps most relevant is that these findings were based exclusively on self-report data during patients' preoperative psychological evaluation, with no other standardized prompts or follow-up questions employed by the psychologist to assess previous dieting attempts. It is possible that further assessment could have yielded more detailed, comprehensive, or accurate information about past dieting attempts. In addition, the categories used for analysis were created by the authors (with respect to the National Institutes of Health dietary guidelines) rather than using a validated scale. The psychological evaluations were completed by a single psychologist and the data only included the initial evaluation. While the demographics of the sample were in line with typical samples of bariatric surgery patients [41], they were not generalizable to male or gender nonconforming patients or patients from racial/ethnic minority groups. It is worth noting that patients may underreport problematic eating behaviors to avoid a delay for MBS. Indeed, socially desirable responses have been demonstrated in various samples of patients pursuing MBS [42]. Finally, this data was collected between 2019 and 2020, prior to the second generation of anti-obesity medications such as semaglutide, setmelanotide, and tirzepatide [43]. Future studies should purposively include patients with MBS who have had experiences with these medications.

TABLE 6 | Dieting attempt categories and clinical demographics.

	0 Provider Attempts	1 Provider Attempt	≥ 2 Provider Attempts	*n*
Sex				
Male	22	28	11	61
Female	87	109	64	260
Race				
White	73	85	47	205
Black	30	44	21	95
Other or multiple races	6	8	6	20
Insurance				
Public	64	84	40	188
Private	44	49	30	123
Employment				
Full/Partial*	67	110	57	234
Not employed	42	27	18	87
Education				
≤ High school Diploma/GED	27	35	15	77
≤ Associate/Bachelor's degree	68	88	49	205
≥ Graduate degree	14	14	11	39
Marital status				
Married/Cohabitating	63	73	43	179
Widowed/Divorced/Separated	20	21	16	57
Never married/Single	26	43	16	85
Living alone				
Yes	14	14	9	37
No	95	123	66	284
Surgical procedure				
Roux-en-Y gastric bypass	65	73	46	184
Sleeve gastrectomy	44	64	29	137
Procedure delayed				
Yes	35	36	20	91
No	74	101	55	230

	0 Non-Medically Managed Attempts	1 Non-Medically Managed Attempt	≥ 2 Non-Medically Managed Attempts	*n*
Sex				
Male	14	16	31	61
Female	34	61	165	260
Race				
White	28	44	133	205
Black	16	27	52	95
Other or multiple races	4	6	10	20
Insurance				
Public*	18	44	126	188
Private	28	33	62	123

(Continues)

TABLE 6 | (Continued)

	0 Non-Medically Managed Attempts	1 Non-Medically Managed Attempt	≥ 2 Non-Medically Managed Attempts	n
Employment				
Full/Partial*	32	48	154	234
Not employed	16	29	42	87
Education				
≤ High school Diploma/GED*	17	22	38	77
≤ Associate/Bachelor's degree	31	48	126	205
≥ Graduate degree	0	7	32	39
Marital status				
Married/Cohabitating	23	43	113	179
Widowed/Divorced/Separated	10	12	35	57
Never married/Single	15	22	48	85
Living alone				
Yes*	11	7	19	37
No	37	70	177	284
Surgical procedure				
Roux-en-Y gastric bypass	31	41	112	184
Sleeve gastrectomy	17	36	84	137
Procedure delayed				
Yes	16	23	52	91
No	32	54	144	230

	0 Self-Directed Attempts	1 Self-Directed Attempt	≥ 2 Self-Directed Attempts	n
Sex				
Male	2	14	61	61
Female	24	65	171	260
Race				
White	19	50	136	205
Black	6	21	68	95
Other or multiple races	1	7	12	20
Insurance				
Public	17	49	122	188
Private	8	27	88	123
Employment				
Full/Partial	19	56	159	234
Not employed	7	23	57	87
Education				
≤ High school Diploma/GED	7	20	50	77
≤ Associate/Bachelor's degree	15	47	143	205
≥ Graduate degree	4	12	23	39

(Continues)

TABLE 6 | (Continued)

	0 Self-Directed Attempts	1 Self-Directed Attempt	≥ 2 Self-Directed Attempts	*n*
Marital status				
Married/Cohabitating	14	46	119	179
Widowed/Divorced/Separated	6	15	36	57
Never married/Single	6	18	61	85
Living alone				
Yes	2	9	26	37
No	24	70	190	284
Surgical procedure				
Roux-en-Y gastric bypass*	14	55	115	184
Sleeve gastrectomy	12	24	101	137
Procedure delayed				
Yes	5	23	63	91
No	21	56	153	230

*$p < 0.05$; **$p < 0.001$.

TABLE 7 | Eating disorders and readmissions, ER visits, and complications.

	No Readmissions	≥ 1 Readmissions	*n*	$X^2(df)$	*p*
Binge eating disorder					
No	272	22	294	0.746(3)	0.862
Yes	24	4	26		
Any other eating disorder					
No	274	22	296	0.827(3)	0.843
Yes	22	2	24		
	No ER Visits	**≥ 1 ER Visits**	*n*	$X^2(df)$	*p*
Binge eating disorder					
No	246	48	294	1.121(4)	0.891
Yes	22	4	26		
Any other eating disorder					
No	247	49	296	0.937(4)	0.919
Yes	21	3	24		
	No 30-Day Complications	**≥ 1 30-Day Complications**	*n*	$X^2(df)$	*p*
Binge eating disorder					
No	209	86	295	4.370(5)	0.497
Yes	16	10	26		
Any other eating disorder					
No	210	87	297	1870(5)	0.867
Yes	15	9	24		

References

1. H. Buchwald, Y. Avidor, E. Braunwald, et al., "Bariatric Surgery: A Systematic Review and Meta-Analysis," *JAMA* 292, no. 14 (October 13, 2004): 1724–1737, https://doi.org/10.1001/jama.292.14.1724.

2. A. F. Dixon, J. B. Dixon, and P. E. O'Brien, "Laparoscopic Adjustable Gastric Banding Induces Prolonged Satiety: A Randomized Blind Crossover Study," *Journal of Clinical Endocrinology and Metabolism* 90, no. 2 (February 2005): 813–819, https://doi.org/10.1210/jc.2004-1546

3. S. Fischer, E. Chen, S. Katterman, et al., "Emotional Eating in a Morbidly Obese Bariatric Surgery-Seeking Population," *Obesity Surgery* 17, no. 6 (June 2007): 778–784, https://doi.org/10.1007/s11695-007-9143-x.

4. H. M. Kiser, A. A. Pona, B. C. Focht, et al., "Associations Between Psychological Evaluation Outcomes, Psychiatric Diagnoses, and Outcomes Through 12 Months After Bariatric Surgery," *Surgery for Obesity and Related Diseases* 19, no. 6 (June 2023): 594–603, https://doi.org/10.1016/j.soard.2022.12.018.

5. H. M. Kiser, K. J. Pratt, B. C. Focht, et al., "Preoperative Psychological Evaluation Outcomes, Reasoning, and Demographic and Diagnostic Correlates," *Obesity Surgery* 33, no. 2 (February 2023): 539–547, https://doi.org/10.1007/s11695-022-06414-0.

6. A. M. Koball, M. M. Clark, M. Collazo-Clavell, et al., "The Relationship Among Food Addiction, Negative Mood, and Eating-Disordered Behaviors in Patients Seeking to Have Bariatric Surgery," *Surgery for Obesity and Related Diseases* 12, no. 1 (January 2016): 165–170, https://doi.org/10.1016/j.soard.2015.04.009.

7. A. J. Dawes, M. Maggard-Gibbons, A. R. Maher, et al., "Mental Health Conditions Among Patients Seeking and Undergoing Bariatric Surgery: A Meta-Analysis," *JAMA* 315, no. 2 (January 2016): 150–163, https://doi.org/10.1001/jama.2015.18118.

8. H. Münzberg, A. Laque, S. Yu, K. Rezai-Zadeh, and H.-R. Berthoud, "Appetite and Body Weight Regulation After Bariatric Surgery," *Obesity Reviews* 16, no. Suppl 1 (March 2016): 77–90, https://doi.org/10.1111/obr.12258.

9. T. Amundsen, M. Strømmen, and C. Martins, "Suboptimal Weight Loss and Weight Regain After Gastric Bypass Surgery—Postoperative Status of Energy Intake, Eating Behavior, Physical Activity, and Psychometrics," *Obesity Surgery* 27, no. 5 (May 2017): 1316–1323, https://doi.org/10.1007/s11695-016-2475-7.

10. D. B. Sarwer and L. J. Heinberg, "A Review of the Psychosocial Aspects of Clinically Severe Obesity and Bariatric Surgery," *American Psychologist* 75, no. 2 (February-March 2020): 252–264, https://doi.org/10.1037/amp0000550.

11. H. Shimizu, S. Annaberdyev, I. Motamarry, M. Kroh, P. R. Schauer, and S. A. Brethauer, "Revisional Bariatric Surgery for Unsuccessful Weight Loss and Complications," *Obesity Surgery* 23, no. 11 (November 2013): 1766–1773, https://doi.org/10.1007/s11695-013-1012-1.

12. J. E. Mitchell, W. C. King, A. Courcoulas, et al., "Eating Behavior and Eating Disorders in Adults Before Bariatric Surgery," *International Journal of Eating Disorders* 48, no. 2 (March 2015): 215–222, https://doi.org/10.1002/eat.22275.

13. Marketdata Enterprises LLC. *The U.S. Weight Loss and Diet Control Market*. 17th ed. (Tampa, FL: Marketdata Enterprises LLC, March 2023). Report No.: 5313560.

14. M. R. Lowe and C. A. Timko, "What a Difference a Diet Makes: Towards an Understanding of Differences Between Restrained Dieters and Restrained Nondieters," *Eating Behaviors* 5, no. 3 (July 2004): 199–208, https://doi.org/10.1016/j.eatbeh.2004.01.006.

15. F. L. Greenway, "Physiological Adaptations to Weight Loss and Factors Favouring Weight Regain," *International Journal of Obesity* 39, no. 8 (August 2015): 1188–1196, https://doi.org/10.1038/ijo.2015.59.

16. M. Nordmo, Y. S. Danielsen, and M. Nordmo, "The Challenge of Keeping it off, a Descriptive Systematic Review of High-Quality, Follow-Up Studies of Obesity Treatments," *Obesity Reviews* 21, no. 1 (January 2020): e12949, https://doi.org/10.1111/obr.12949.

17. P. H. Dayan, G. Sforzo, N. Boisseau, L. O. Pereira-Lancha, and A. H. Lancha Jr, "A New Clinical Perspective: Treating Obesity With Nutritional Coaching Versus Energy-Restricted Diets," *Nutrition* 60 (April 2019): 147–151, https://doi.org/10.1016/j.nut.2018.09.027.

18. C. H. Gilhooly, S. K. Das, J. K. Golden, et al., "Food Cravings and Energy Regulation: The Characteristics of Craved Foods and Their Relationship With Eating Behaviors and Weight Change During 6 Months of Dietary Energy Restriction," *International Journal of Obesity* 31, no. 12 (December 2007): 1849–1858, https://doi.org/10.1038/sj.ijo.0803672.

19. A. Massey and A. J. Hill, "Dieting and Food Craving. A Descriptive, Quasi-Prospective Study," *Appetite* 58, no. 3 (June 2012): 781–785, https://doi.org/10.1016/j.appet.2012.01.020.

20. K. Schaumberg and D. Anderson, "Dietary Restraint and Weight Loss as Risk Factors for Eating Pathology," *Eating Behaviors* 23 (December 2016): 97–103, https://doi.org/10.1016/j.eatbeh.2016.08.009.

21. T. van Strien, "Causes of Emotional Eating and Matched Treatment of Obesity," *Current Diabetes Reports* 18, no. 6 (April 252018): 35, https://doi.org/10.1007/s11892-018-1000-x.

22. S. Bettini, A. Belligoli, R. Fabris, and L. Busetto, "Diet Approach Before and After Bariatric Surgery," *Reviews in Endocrine & Metabolic Disorders* 21, no. 3 (September 2020): 297–306, https://doi.org/10.1007/s11154-020-09571-8.

23. L. Bacon and L. Aphramor, "Weight Science: Evaluating the Evidence for a Paradigm Shift," *Nutrition Journal* 10, no. 69 (January 24, 2011): 9–22, https://doi.org/10.1186/1475-2891-10-9.

24. S. E. McComb and J. S. Mills, "Orthorexia Nervosa: A Review of Psychosocial Risk Factors," *Appetite* 140 (September 1, 2019): 50–75, https://doi.org/10.1016/j.appet.2019.05.005.

25. H. Gade, J. H. Rosenvinge, J. Hjelmesæth, and O. Friborg, "Psychological Correlates to Dysfunctional Eating Patterns Among Morbidly Obese Patients Accepted for Bariatric Surgery," *Obesity Facts* 7, no. 2 (2014): 111–119, https://doi.org/10.1159/000362257.

26. A. Hamilton, D. Mitchison, C. Basten, et al., "Understanding Treatment Delay: Perceived Barriers Preventing Treatment-Seeking for Eating Disorders," *Australian and New Zealand Journal of Psychiatry* 56, no. 3 (March 2022): 248–259, https://doi.org/10.1177/00048674211020102.

27. S. Deb, L. Voller, C. Palisch, et al., "Influence of Weight Loss Attempts on Bariatric Surgery Outcomes," *American Surgeon* 82, no. 10 (2016): 916–920, https://doi.org/10.1177/000313481608201012.

28. L. M. Gibbons, D. B. Sarwer, C. E. Crerand, et al., "Previous Weight Loss Experiences of Bariatric Surgery Candidates: How Much Have Patients Dieted Prior to Surgery?," *Surgery for Obesity and Related Diseases* 2, no. 2 (2006): 159–164, https://doi.org/10.1016/j.soard.2006.03.013.

29. M. Roehrig, R. M. Maseb, M. A. White, B. S. Rothschild, C. H. Burke-Martindale, and C. M. Grilo, "Chronic Dieting Among Extremely Obese Bariatric Surgery Candidates," *Obesity Surgery* 19, no. 8 (2009): 1116–1123, https://doi.org/10.1007/s11695-009-9865-z.

30. U. Chinaka, J. Fultang, A. Ali, J. Rankin, and A. Bakhshi, "Pre-specified Weight Loss Before Bariatric Surgery and Postoperative Outcomes," *Cureus* 12, no. 12 (2020): e12406, https://doi.org/10.7759/cureus.12406.

31. H. Gasoyan, G. Tajeu, M. T. Halpern, and D. B. Sarwer, "Reasons for Underutilization of Bariatric Surgery: The Role of Insurance Benefit Design," *Surgery for Obesity and Related Diseases* 15, no. 1 (2019): 146–151, https://doi.org/10.1016/j.soard.2018.10.005.

32. C. Tewksbury, N. N. Williams, K. R. Dumon, and D. B. Sarwer, "Preoperative Medical Weight Management in Bariatric Surgery: A

Review and Reconsideration," *Obesity Surgery* 27, no. 1 (2016): 208–214, https://doi.org/10.1007/s11695-016-2422-7.

33. J. I. Mechanick, C. Apovian, S. Brethauer, et al., "Clinical Practice Guidelines for the Perioperative Nutrition, Metabolic, and Nonsurgical Support of Patients Undergoing Bariatric Procedures—2019 Update: Cosponsored by Support of Patients Undergoing Bariatric Procedures—2019 Update: Cosponsored by American Association of Clinical Endocrinologists/American College of Endocrinology, the Obesity Society, American Society for Metabolic & Bariatric Surgery, Obesity Medicine Association, and American Society of Anesthesiologists," *Endocrine Practice* 25, no. 12 (December 2019): 1346–1359.

34. S. A. Brethauer, J. Kim, M. el Chaar, et al., "Standardized Outcomes Reporting in Metabolic and Bariatric Surgery," *Surgery for Obesity and Related Diseases* 11, no. 3 (May-June 2015): 489–506, https://doi.org/10.1016/j.soard.2015.02.003.

35. *Nutrient Recommendations and Databases [Internet].* (National Institutes of Health Office of Dietary Supplements, 2016), https://ods.od.nih.gov/HealthInformation/nutrientrecommendations.aspx#dri.

36. G. M. Mackie, D. Samocha-Bonet, and C. S. Tam, "Does Weight Cycling Promote Obesity and Metabolic Risk Factors?," *Obesity Research & Clinical Practice* 11, no. 2 (March-April 2017): 131–139, https://doi.org/10.1016/j.orcp.2016.10.284.

37. Y. van Nieuwenhove, Z. Dambrauskas, A. Campillo-Soto, et al., "Preoperative Very Low-Calorie Diet and Operative Outcome After Laparoscopic Gastric Bypass: A Randomized Multicenter Study," *Archives of Surgery* 146, no. 11 (November 2011): 1300–1305, https://doi.org/10.1001/archsurg.2011.273.

38. C. E. Owers, Y. Abbas, R. Ackroyd, N. Barron, and M. Khan, "Perioperative Optimization of Patients Undergoing Bariatric Surgery," *Journal of Obesity* 2012 (2012): 781546, https://doi.org/10.1155/2012/781546.

39. M. Holderbaum, D. S. Casagrande, S. Sussenbach, and C. Buss, "Effects of Very Low Calorie Diets on Liver Size and Weight Loss in the Preoperative Period of Bariatric Surgery: A Systematic Review," *Surgery for Obesity and Related Diseases* 14, no. 2 (February 2018): 237–244, https://doi.org/10.1016/j.soard.2017.09.531.

40. A. Gils Contreras, A. Bonada Sanjaume, M. Montero Jaime, et al., "Effects of Two Preoperatory Weight Loss Diets on Hepatic Volume, Metabolic Parameters, and Surgical Complications in Morbid Obese Bariatric Surgery Candidates: A Randomized Clinical Trial," *Obesity Surgery* 28, no. 12 (December 2018): 3756–3768, https://doi.org/10.1007/s11695-018-3413-7.

41. R. Welbourn, M. Hollyman, R. Kinsman, et al., "Bariatric Surgery Worldwide: Baseline Demographic Description and One-Year Outcomes From the Fourth IFSO Global Registry Report 2018," *Obesity Surgery* 29, no. 3 (March 2019): 782–795, https://doi.org/10.1007/s11695-018-3593-1.

42. M. Butt, A. Wagner, and A. Rigby, "Associations of Social Desirability on Psychological Assessment Outcomes for Surgical Weight Loss Patients," *Journal of Clinical Psychology in Medical Settings* 28, no. 2 (2021): 384–393, https://doi.org/10.1007/s10880-020-09725-5.

43. T. A. Wadden, A. M. Chao, M. Moore, et al., "The Role of Lifestyle Modification With Second-Generation Anti-Obesity Medications: Comparisons, Questions, and Clinical Opportunities," *Current Obesity Reports* 12, no. 4 (2023): 453–473, https://doi.org/10.1007/s13679-023-00534-z.