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## A Review of the Psychosocial Aspects of Clinically Severe Obesity and Bariatric Surgery

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### Abstract

For the past two decades, clinically severe obesity (operationalized as a BMI  $\geq 40$  kg/m<sup>2</sup>) has increased at a more pronounced rate than less severe obesity. As a result, the surgical treatment of obesity (bariatric surgery) has become a more widely accepted, yet still underutilized, treatment for persons with severe obesity and significant weight-related health problems. Psychologists play a central role on the multidisciplinary team involved in the preoperative assessment and postoperative management of patients. They also have played a central role in clinical research which has enhanced understanding of the psychosocial and behavioral factors that contribute to the development of severe obesity as well as how those factors and others contribute to postoperative outcomes. This paper, written specifically for psychologists and other mental health professionals who currently work with these patients or are considering the opportunity to do so in the future, reviews these contributions over the past twenty years. The paper highlights how this work has become a fundamental part of international clinical care guidelines, which primarily focus on preoperative psychosocial screening. The paper also outlines avenues for future research in the field, with a specific focus on the need for additional behavioral and psychosocial interventions to promote life-long success after bariatric surgery.

### Keywords

obesity; bariatric surgery; psychopathology; quality of life

### Prevalence and Significance of Clinically Severe Obesity

Presently, almost 40% of American adults have the disease of obesity, defined by a body mass index (BMI)  $\geq 30$  kg/m<sup>2</sup> (Hales et al., 2018). Furthermore, 9.7% of women and 5.6% of men have severe obesity, defined by a BMI  $\geq 40$  kg/m<sup>2</sup> (Hales et al., 2018). While the percentage of Americans with obesity has increased by approximately 200% in the past two decades, the percentage with a BMI  $\geq 40$  kg/m<sup>2</sup> has increased by over 600% (Sturm & Hattori, 2013). Clinically severe obesity affects adults and adolescents from all racial, ethnic, and socioeconomic groups. However, it differentially affects both African- and

Hispanic-Americans, as well as individuals from underserved populations, more generally (Flegal, Kruszon-Moran, Carroll, Fryar, & Ogden, 2016). Obesity, and severe obesity in particular, is associated with increased mortality as well as approximately 200 comorbidities, including type 2 diabetes, hypertension, heart disease, sleep apnea, osteoarthritis, and several forms of cancer (Nguyen, Blackstone, Morton, Ponce, & Rosenthal, 2014). More severe forms of obesity, operationalized by a greater BMI, is associated with higher total health care, medical, and pharmacy costs (Suehs, et al., 2017).

## Surgical Treatment of Clinically Severe Obesity

Lifestyle modification (including caloric restriction, increased physical activity, and behavioral modification instruction), pharmacotherapy, and bariatric surgery are the obesity treatment approaches supported by the most robust empirical evidence (Still, Sarwer, & Blankenship, 2014; Wadden & Bray, 2018). Bariatric surgery is advised for persons older than 18 years and with a BMI  $\geq 40$  kg/m<sup>2</sup> or those with a BMI  $\geq 35$  kg/m<sup>2</sup> in the presence of weight-related comorbidities (Mechanick et al., 2013).

Approximately 200,000 individuals are believed to undergo bariatric surgery in the United States each year (Nguyen et al., 2013). However, only 1 in 100 Americans who meet the BMI criteria for bariatric surgery have surgery performed. African- and Hispanic-Americans, who are differentially affected by severe obesity, represent only 25% of individuals who undergo the surgery annually. This profound health disparities issue is likely the result of a number of factors, including insurance coverage, access to quality medical care, as well as patient-provider communication issues (Gasoyan, Tajeu, Halpern, & Sarwer, 2019).

The two most common surgical procedures are the Roux-en-Y gastric bypass (GB) and sleeve gastrectomy (SG; Nguyen et al., 2015). The GB is the 'gold standard' and most widely studied procedure. The GB reduces food intake through the creation of a small pouch in the top portion of the stomach which is separated from the remaining stomach. The small intestine is connected to the pouch to allow for the passage of food while the remnant stomach is re-attached further down the intestinal track. Weight loss is believed to be induced by the restriction of total food intake, malabsorption of macronutrients, as well as through favorable changes in gut peptides and appetite hormones (Nguyen et al., 2015). The SG procedure involves removal of 80-90% of the stomach, which reduces stomach capacity and, subsequently, restricts food intake. The procedure also is believed to result in changes in gut hormones as well (Nguyen et al., 2015). The biliopancreatic diversion with duodenal switch and adjustable gastric banding are other surgical procedures. Both are infrequently performed in the United States secondary to concerns with malnutrition and complications, respectively.

The large majority of individuals who undergo bariatric surgery experience substantial weight loss which is accompanied by significant improvements in weight-related comorbidities. With the GB and SG, patients typically reach their maximum weight loss of 20-35% of body weight 12 months after surgery (Adams et al., 2017; Courcoulas et al., 2018). Over longer periods of time, the GB is associated with greater weight loss than the

SG (Salminen et al., 2018; Shoar & Saber, 2017). Weight losses of this magnitude are associated with significant improvements in morbidity and mortality, even after accounting for the risks associated with the surgical procedure. For example, at the end of the first postoperative year 83% of patient who underwent GB and 55% who had undergone SG achieved improvement or remission from type 2 diabetes (Hutter et al., 2011). At approximately 6 years postoperatively, 32% of patients who underwent bariatric surgical procedure, as compared to 12% treated medically, experienced remission of hypertension (Jakobsen et al., 2018).

Approximately 5-10% of patients experience significant surgical or medical complications postoperatively (Nguyen et al., 2013). The early complication rate is comparable to that seen with total knee replacement, hysterectomy, or gall bladder surgery (Nguyen et al., 2013). Thus, both the GB and SG are considered highly effective and safe interventions. Over time, some weight regain occurs. Within the first postoperative decade, patients, on average, typically regain approximately 10% of the weight loss seen in the first postoperative years (Adams et al., 2017; Courcoulas et al., 2018). Nevertheless, the magnitude and durability of these losses are far superior to those seen with lifestyle modification and pharmacotherapy.

## Multidisciplinary Assessment of Candidates for Bariatric Surgery

Individuals interested in bariatric surgery undergo an intensive preoperative evaluation process, perhaps most similar to that seen in solid organ transplantation (Block & Sarwer, 2013). Many patients are required by their third party payers to undergo surgery at accredited programs (Tewksbury, Williams, Dumon, & Sarwer, 2017). These are often found in academic medical centers or in programs that have been certified to have the equipment and personnel to appropriately provide pre-, peri-, and postoperative care to patients.

Most programs introduce patients to bariatric surgery in an informational session, where surgeons and other members of the bariatric team (nurses, dietitians, and mental health professionals) explain the requirements of the program. Patients subsequently meet with a range of medical professionals (internal medicine physicians, cardiologists, gastroenterologists, etc.) to receive clearance that they are medically appropriate for surgery. Third party payers typically require that patients engage in several months of preoperative medical weight management prior to surgery. Most programs and third party payers also require that patients undergo a mental health evaluation preoperatively.

Mental health professionals have been viewed as an important part of pre- and postoperative care of bariatric care since the 1990s (National Institutes of Health Consensus Development Conference on Gastrointestinal Surgery, 1992). Subsequent national practice guidelines originally published in 2008, and updated in 2013, recommended the use of a formal psychosocial evaluation of patients who presented with symptoms of psychopathology (Mechanick et al., 2008; 2013). This recommendation was echoed by an international expert panel in 2016 (DeLuca, et al., 2016) as well as other widely cited reviews published over the past two decades (i.e., Marek, Heinberg, Lavery, Rish, & Ashton, 2016; Sarwer, Wadden & Fabricatore, 2005). Also in 2016, the American Society for Metabolic and Bariatric Surgery released comprehensive recommendations for the preoperative psychosocial evaluation of

candidates for surgery (Sogg, Laurenti, & West-Smith, 2016). The manuscript outlined best practices and highlighted the clinical areas that warrant the greatest attention. Many of the domains emphasized are highlighted below.

## **Presurgical Psychological Screening Prior to Bariatric Surgery**

The psychological evaluation prior to bariatric surgery serves several purposes (Sarwer, Allison, Bailer, Faulconbridge, & Wadden, 2013; Sogg et al., 2016; Wadden & Sarwer, 2006). First, the evaluation is used to identify significant psychological contraindications for surgery (e.g., substance abuse, or severe, poorly controlled depression). The evaluation also provides an opportunity to help the patient understand the environmental and behavioral contributors to the development of extreme obesity and, more importantly, provide psychoeducation on the dietary and behavioral requirements of the procedure. A standard psychological interview is necessary, but not sufficient, for evaluating bariatric surgery candidates (Fabricatore, Crerand, Wadden, Sarwer, & Krasucki, 2006; Heinberg, Ashton & Windover, 2010). A detailed assessment of eating behaviors, stress and coping, social support, expectations for weight loss, health outcomes and psychosocial impact are largely accepted as being an important part of the evaluation (Heinberg et al., 2010; Sogg et al., 2016; Wadden & Sarwer, 2006). Capacity to provide informed consent also is assessed.

Many professionals use psychometric measures and/or personality inventories to further assess relevant personality characteristics or symptoms (Fabricatore et al., 2006). Psychological testing allows clinicians to gather a large amount of information quickly, assess personality or related risk factors that have been associated with outcome, can be useful in making differential diagnoses, and help discern the extent to which patients may be under- or over-reporting symptoms (Marek et al., 2016). Some clinicians use batteries of specific screening instruments; more commonly providers use broadband psychological instruments, such as the Minnesota Multiphasic Personality Inventory 2 or 2-Restructured Form (Ben-Porath & Tellegen, 2011; Butcher, Graham, Ben-Porath, Tellegen, & Dahlstrom, 2001), Personality Assessment Inventory (Morey, 1991) or Millon Behavioral Medicine Diagnostic (Millon & Antoni, 2006).

Whether the behavioral health professional is part of the bariatric surgical team or an independent consultant, the professional typically generates a report summarizing the evaluation that is shared with the bariatric team. The vast majority of patients are unconditionally recommended for surgery (Friedman, Applegate & Grant, 2007; Heinberg et al., 2010). The remaining patients, 10-20%, typically are recommended to undergo additional treatment (mental health and/or dietary counseling) and return for further evaluation in the future.

## **Psychosocial Status of Candidates for Bariatric Surgery and its Relationship to Postoperative Outcomes**

A sizable body of research has studied the relationship between preoperative psychopathology and postoperative outcomes, both with respect to weight loss and psychosocial adaptation.

## Lifetime and Current Psychopathology

At least six studies have investigated rates of psychopathology in candidates for surgery using structured diagnostic interviews (Jones-Corneille et al., 2010; Kalarchian et al., 2007; Mauri et al., 2008; Mitchell et al., 2012; Mühlhans, Horback, & de Zwaan, 2009; Rosenberger, Henderson, & Grilo, 2006). Taken together, these studies are indicative of increased psychiatric vulnerability among persons who present for bariatric surgery. Lifetime rates of any psychiatric diagnoses ranged from 36.8%-72.6%; current diagnoses were less common, reported in 20.9%-55.5% of candidates. Both are higher than estimates from the general population.

## Mood Disorders

Across the six studies, mood disorders were diagnosed in up to 31.5% candidates for surgery. Given the concerns that patients articulate with regard to body image, health-related quality of life, as well as stigma and discrimination, these reports are not particularly surprising. Additionally, depression and obesity may have shared neural pathways (Soczynska et al., 2011). Approximately 40% of candidates for bariatric surgery report current, and up to 50% a history of mental health treatment (Friedman et al., 2007; Sarwer et al., 2004), percentages higher than typically seen in the general population.

The presence of a mood disorder has been associated with smaller postoperative weight losses (de Zwaan et al., 2011; Marek, Ben-Porath, Dulmen, Ashton, & Heinberg, 2017; Müller, et al., 2019). Mood disorder symptoms change with weight loss. Postoperatively, use of psychiatric medications (primarily anti-depressant medications) decreases by approximately 10% in the first few years after surgery (Segal, et al., 2009). However, use gradually increases over time (Cunningham et al., 2012). This observation has led to some speculation that symptoms of psychopathology return as patients move further into their postoperative course. Engagement in self-harm behaviors, assessed by emergency room visits, peaks 2-3 years after surgery, the time at which most patients typically have stopped losing weight (Castaneda, Popov, Wander & Thompson, 2019). Suicidality also increases over time (Adams et al., 2007). Both findings are of great concern to the field. Two reviews have postulated a number of psychiatric, medical, psychosocial and physiologic factors that may place patients at greater risk (Castaneda et al., 2019; Mitchell et al., 2013). These include pre-existing psychopathology, issues with chronic pain, social isolation among others. These issues highlight the need for greater availability of mental health care postoperatively, an issue that has been understudied in the bariatric surgery literature for the past two decades.

## Eating Disorders

Up to 50% of candidates for bariatric surgery report some form of disordered eating (Malik, Mitchell, Engel, Crosby, & Wonderlich, 2014). Loss of control (LOC) eating, characterized by a subjective sense of loss of control over eating without reference to a specific amount of food, is perhaps the most common form of disordered eating behavior seen in candidates for surgery. Binge eating disorder (BED) is the most common eating disorder diagnosis, seen in 5 to 15% of patients (Mitchell et al., 2012). Both disordered eating and BED likely that contribute to and maintain severe obesity in the absence of treatment.

The relationship between disordered eating and postoperative weight loss has been investigated in a great number of studies. In several, BED diagnosed prior to surgery has been associated with suboptimal weight losses in the first few postoperative years (Chao et al., 2016; Kalarchian et al., 2002; Mitchell et al., 2001). While these weight losses are smaller than those experienced by individuals without BED, they are still far greater than weight losses seen with non-surgical treatments for obesity. Thus, preoperative binge eating is not currently considered a contraindication to surgery.

However, there is evidence to suggest that many problematic eating behaviors, like LOC eating, persist after surgery (Conceição et al., 2014; 2017). The majority of studies have demonstrated a non-significant association between preoperative LOC eating and weight loss after surgery (Alger-Mayer, Rosati, Polimeni, & Malone, 2009; Bocchieri-Ricciardi et al., 2006; Colles, Dixon, & O'Brien, 2008; Meany, Conceição, & Mitchell, 2014; White, Kalarchian, Masheb, Marcus, & Grilo, 2010; White, Masheb, Rothschild, Burke-Martindale, & Grilo, 2006). In contrast, there exists a growing body of evidence suggesting that postoperative LOC eating may adversely affect weight outcomes, as defined by sub-optimal weight loss or weight regain (Meany et al., 2014). A review of this literature found that of the 13 studies that reported on the association between LOC eating and weight outcomes, 11 indicated that postoperative LOC eating was associated with poorer weight loss and/or weight regain (Sheets et al., 2015). Taken together, the presence of binge eating and LOC are considered potential poor prognostic indicators of weight loss.

### **Anxiety Disorders**

Up to 24% of individuals presenting for bariatric surgery have been diagnosed with an anxiety disorder (Kalarchian et al., 2007). Social anxiety disorder is the most common condition, seen in 9% of patients. Interestingly, unlike depression, the point prevalence of anxiety disorders do not significantly decrease following surgery and a lifetime—but not current—anxiety disorder is negatively related to postoperative weight loss (de Zwaan et al., 2011). Nevertheless, the relationship between preoperative anxiety and postoperative outcomes is largely unclear. Persistent and untreated social anxiety may impede adherence with physical activity and support group attendance, both of which are associated with long-term outcomes. It also may contribute to difficulties with romantic and interpersonal relationships postoperatively (Sarwer, Lavery, & Spitzer, 2012).

### **Substance Use Disorders**

Approximately 10% of candidates report a history of substance use disorders (King et al., 2012; Mitchell et al., 2012). Somewhat surprisingly, a history of substance abuse has been associated with greater postoperative weight loss (Clark et al., 2003; Heinberg & Ashton, 2010). Current substance use is seen in less than 2% of candidates for bariatric surgery; an active disorder is a contraindication to bariatric surgery (Mechanic et al., 2013; DeLuca et al., 2016).

There is great concern about the increased risk of substance abuse after surgery. Much of this work has focused on the misuse of alcohol (Ertelt et al., 2008; Suzuki, Haimovici & Chang, 2012). King and colleagues (2012; 2017) found an increased rate of alcohol use

disorder beginning in the second postoperative year following bariatric surgery. The rate of alcohol misuse continues to increase over time, affecting approximately 20% of patients within the first postoperative decade (King et al., 2017).

While the mechanisms for this are not fully understood at present, laboratory studies suggest that alcohol absorption is altered by the GB, resulting in patients experiencing the effects of alcohol sooner, more intensely, and for longer periods of time (Steffen, Engel, Pollert, Li, & Mitchell, 2013). In some cases, patients in a laboratory setting are legally drunk within 5 minutes of consumption of a single serving of alcohol (Steffen et al., 2013). Other studies also have found increases in alcohol as well as nicotine, opioids, and other substances in the first two postoperative years (Conason et al., 2013; Ivezaj, Saules, & Schuh, 2014; Lent et al., 2013; Reslan, Saules, Greenwald, & Schuh, 2014).

A recent review highlighted concerns about opioid use by persons who undergo bariatric surgery (Heinberg, Pudalov, Alameddin, & Steffen, 2019). While usage declines in the first postoperative year, it increases in subsequent years. Some patients return to using medications they used preoperatively; others appear to initiate use for the first time. This pattern of results also was seen in bariatric patients who subsequently underwent body contouring procedures to address loose, hanging skin resulting from the massive weight loss (Bennett et al., 2019).

The increase in substance abuse after surgery was anecdotally described as “addiction transfer” in advance of research in the area (Sogg, 2007). The construct can be understood as a contemporary example of “symptom substitution”. Presently, the mechanisms behind the increased use of substances has not been elucidated. One may be emotional dysregulation, where individuals who struggled with emotional regulation and eating behavior prior to surgery continue to struggle with these issues postoperatively (Sarwer et al., 2019).

### **Quality of Life, Body Image, and Stigmatization**

A number of other psychosocial issues likely impact the decision to seek surgery and also may influence postoperative outcomes. Numerous studies have shown a relationship between excess body weight and decreases in both health-related as well as weight-related quality of life (Kolotkin & Anderson, 2017; Sarwer, Lavery, & Spitzer, 2012; Sarwer & Steffen, 2015). Individuals often report significant difficulties with physical (walking, climbing stairs) and occupational functioning (Speck, Bond, Sarwer, & Farrar, 2014). Persons with obesity, and severe obesity in particular, often report increased dissatisfaction with their physical appearance (Sarwer et al., 2012). This relationship is stronger for women than men, but likely impacts the decision to seek bariatric surgery for both genders (Pearl & Wadden, 2018).

Persons with extreme obesity are frequently stigmatized, if not subjected to discrimination, in a number of settings, including educational, employment and even medical settings (Puhl & Heuer, 2009). There is evidence that stigmatizing medical experiences lead persons with obesity to avoid care and, as a result, have poorer outcomes (Phelan et al., 2015). Particularly concerning, over 1 in 5 patients with obesity endorse a stigmatizing experience

with a mental health professional (Puhl & Brownell, 2006). To date, there has been little study of how these experiences may impact postoperative outcomes.

## Psychosocial Outcomes After Bariatric Surgery

In general, and somewhat independent of diagnosed psychopathology, the vast majority of patients experience and report profound improvements in psychosocial functioning after bariatric surgery. Most patients report significant reductions in symptoms of depression and anxiety at the end of the first postoperative year and before reaching their maximum weight loss (Sarwer et al., 2018; Sarwer & Steffen, 2015). Improvements in health-related quality of life follow a similar pattern, as found across numerous studies (Kolotkin & Andersen, 2017). Changes in mental health quality of life are less uniform (Szmulewicz et al., 2019) and may be more pronounced for women than men (Sarwer et al., 2013; Sarwer et al., 2014; Sarwer et al., 2018).

An interesting and developing area of research is the relationship between obesity and neurocognitive functioning. Obesity, particularly severe obesity, is an independent risk factor for deficits in cognitive functioning, particularly within the domains of attention, memory, and executive function (Gunstad, Paul, Cohen, Tate, & Gordon, 2006; Gunstad et al., 2007). Encouragingly, several studies have found improvements in cognitive functioning with the substantial weight loss seen with bariatric surgery (Alosco et al., 2014, Gunstad et al., 2011). A number of mechanisms for this improvement have been offered, including postoperative amelioration of liver pathology, gluco-regulation, hypertension, and sleep apnea (Spitznagel, Gunstad, Manderino, & Heinberg, 2015).

Although mild cognitive impairments improve after surgery, there remains variability in postoperative cognitive functioning (Alosco et al., 2014). Evidence links cognitive ability and weight loss in the first three years after bariatric surgery (Spitznagel et al., 2013a; 2013b; 2013c; 2014). However, the success of bariatric surgery depends on intensive adherence to multidisciplinary treatment recommendations both before and after surgery (Tewksbury et al., 2017). Cognitive difficulties, such as poorer working memory and executive functioning, could lead to poorer adherence which potentially explain the relationship (Spitznagel et al., 2013a; 2013b).

Despite these impressive outcomes, a subset of patients struggle with a range of psychosocial issues after bariatric surgery. These include issues with physical appearance and body image, sexual and romantic relationships, and suboptimal weight loss. (The significant issues of the return of symptoms of psychopathology and substance misuse are highlighted above.) Psychologists and other behavioral health professionals can play a critically important role in helping patients address these postoperative challenges.

### Physical Appearance and Body Image

As noted above, most patients report improvements in their physical appearance and body image following the massive weight loss seen with bariatric surgery (Sarwer et al., 2013; Sarwer et al., 2014; Sarwer et al., 2018). Some, however, report residual body image dissatisfaction associated with loose, sagging skin throughout the body. In some cases, this



skin leads to significant dermatological issues; for others, it is psychologically distressing (Sarwer & Polonsky, 2016; Sarwer & Steffen, 2015). Many patients may articulate these body image concerns during supportive psychotherapy. Others may turn to plastic surgeons for body contouring procedures. Approximately 55,000 women and men undergo body contouring procedures after weight loss annually (American Society of Plastic Surgeons, 2019). These procedures typically lead to improvements in both physical and psychosocial functioning (Sarwer et al., 2012). However, patients are often left with significant scars which also may result in body dissatisfaction (Sarwer, 2019).

### **Sexual and Romantic Relationships**

As with changes in body image, most women report significant improvements in sexual functioning (Sarwer et al., 2013; Sarwer et al., 2014; Sarwer et al., 2018; Steffen et al., 2017; 2019). Men also report improvements, but they do not appear to be of the same magnitude as those reported by women (Sarwer et al., 2015). Improvements for both genders are not universal and can be impacted by the presence of weight-related comorbidities like type 2 diabetes and hypertension, the medications used to treat these conditions, as well as the overall quality of the romantic relationship (Steffen et al., 2017).

The experience of sexual abuse, as well as the experience of physical abuse and neglect, is another important issue pre- and postoperatively (Gustafson & Sarwer, 2004). Up to one third of candidates for surgery have reported a history of sexual abuse (e.g., Grilo et al., 2005; Gustafson et al., 2006). A recent study found that two thirds of women and just less than half of the men studied reported at least 1 episode of childhood maltreatment (Orcutt et al. 2019). Among women, more severe maltreatment was associated with higher risk of lifetime psychopathology, suicidal ideation, and use of antidepressant medications.

A history of sexual abuse appears to unrelated to postoperative weight loss (Grilo, White, Masheb, Rothschild & Burke-Martindale, 2006; Hensel, Grosman Kaplan, Anvari, & Taylor, 2016). However, anecdotal reports suggest that those with a history of sexual abuse often struggle with a range of psychological issues postoperatively, including issues with social anxiety, body image dissatisfaction, and sexual functioning. These individuals may benefit from supportive psychotherapy to address these issues.

### **Suboptimal Weight Loss**

Between 10% to 25% of patients who undergo bariatric surgery experience suboptimal weight loss, either not losing the expected amount of weight or regaining a significant amount of weight in the first few postoperative years (Adams et al., 2017; Courcoulas et al., 2018). Courcoulas and colleagues, for example, observed that 23.6% of GB patients regained weight between postoperative year 1 and year 2 (Courcoulas et al., 2013). While the reasons for this are not well understood, greater early preoperative weight loss, within the first 6 months, predicts larger weight loss for both GB and SG patients at the end of the second postoperative year (Manning et al., 2015). Nevertheless, as noted above, individuals who have undergone bariatric surgery regain approximately 10% of their lost weight within the first decade (Adams et al., 2017; Courcoulas et al., 2018). This weight regain is associated with deterioration of many of the health benefits seen with bariatric surgery and

raises concerns about the need for adjunctive treatment (Panunzi et al., 2016; Sjöholm et al., 2015).

Weight regain after bariatric surgery has been attributed to both physiological as well as behavioral factors (Sarwer et al., 2008; Sarwer, Dilks, & West-Smith, 2011). Postoperatively, patients receive little or no ongoing instruction to facilitate the dietary and behavioral changes required by surgery, leaving them vulnerable to environmental influences or maladaptive behaviors that likely contributed to the development of severe obesity. For example, Mitchell and colleagues assessed 25 postoperative behaviors related to eating behavior, eating problems, and weight control practices (Mitchell et al., 2016). They found that individuals who postoperatively started to weigh themselves weekly, stopped eating when full, and stopped eating continuously during the day lost 14% more weight than those who never engaged in these behaviors and lost 6% more weight than those who have always practiced these behaviors. Mental health professionals, as well as dietitians, are well positioned to assist patients practice these behaviors postoperatively.

Success following bariatric surgery also requires chronic adherence to a rigorous, reduced calorie diet. Patients are encouraged to eat meals that are dramatically smaller than they consumed prior to surgery, eating no more than 1200-1500 kcal/d on average (Still et al., 2014). Consuming large amounts of food at a given meal, or drinking beverages while eating, can trigger nausea and/or vomiting. Many patients cannot tolerate certain foods, particularly those high in fat content, as they may trigger vomiting or diarrhea, both of which can be physically and psychologically uncomfortable. While patients are informed of these limitations prior to surgery, many struggle with compliance to the postoperative dietary recommendations (Sarwer et al., 2008). As detailed above, binge eating, as well as night eating, are relatively common among bariatric surgery patients (Allison et al., 2006; Kalarchian, Wilson, Brolin, & Bradley, 1998; Mitchell et al., 2015; White et al., 2006). The presence of both behaviors, as well as an increased frequency of “grazing” or LOC eating, has been associated with weight regain (Chao et al., 2016; Devlin et al., 2016; Ivezaj, Widermann, & Grilo, 2017; Kalarchian et al., 2002; Mitchell et al., 2001; White et al., 2006). Failure to increase physical activity after surgery also has been associated with postoperative weight gain (Bond et al., 2009).

Loss to follow up is associated with suboptimal outcomes and weight regain (Compher, Hanlon, Kang, Elkin, & Williams, 2012; Kaiser, Franks, & Smith, 2011; Livhits et al., 2010). Annual follow-up, as well as engagement in monthly support groups provides an opportunity to promote engagement in the behavioral and dietary changes necessary for success. Similarly, behavioral and psychosocial interventions delivered by the bariatric surgery program or independent practitioners also may contribute to successful weight maintenance over time. Unfortunately, loss to follow up limits the ability of mental health professionals and other members of the bariatric surgery team to identify difficulties and intervene appropriately.

## Postoperative Psychosocial and Behavioral Interventions to Improve Outcomes

In the past decade, a number of investigators have focused their attention on interventions to promote long term success after bariatric surgery (Bradley et al., 2018). Some of these interventions have been specifically focus on promoting greater, early weight loss through targeting eating behavior and/or physical activity. Others have focused on promoting psychosocial well-being in conjunction with or independent of weight loss. A meta-analysis of 11 studies in this area concluded that behavioral interventions, most commonly focused on dietary changes or eating behavior, improved weight loss 12 months after surgery (Stewart & Avenell, 2016). Most of these investigations have been small studies of low-intensity interventions. A large study of a robust lifestyle modification intervention, such as a modified version of the Diabetes Prevention Program intervention, has yet to be undertaken, despite the intuitive promise of such an approach.

Other studies have investigated the efficacy of “rescue” interventions in patients who regained weight later in the postoperative course (Bradley et al., 2016; Kalarchian et al., 2012). For example, Bradley and colleagues found that a 10 week psychotherapeutic intervention that included elements of both traditional lifestyle modification interventions as well as Acceptance and Commitment Therapy was effective in reversing weight regain patients who had regained weight after surgery (Bradley et al., 2016).

While in person interventions are demonstrating some efficacy, mHealth interventions may eliminate some of the barriers that bariatric surgery patients face with respect to loss to follow up. Bradley and colleagues (2016) adapted their Acceptance and Commitment-based intervention to be delivered via a website. Similar to the in-person intervention, all participants stopped gaining weight; 8 of the 10 lost more than 3% of their weight over the 10 weeks. Participants reported that they found the intervention easy to use and appreciated the ability to receive guidance and support without in person visits. These observations suggest great promise for mHealth interventions to promote weight loss in those who have regained weight after bariatric surgery and warrant further investigation of the approach (Bradley et al., 2018).

## Future Directions

Research on the psychosocial aspects of clinically severe obesity has developed rapidly over the past two decades. Psychologists from the United States and around the world have made substantial contributions to the pre- and postoperative mental health issues of patients. Much of this work has been supported by funding from the National Institutes of Health, a great recognition of the importance of the research questions. Findings from this work have contributed to the development of clinical care guidelines that have shaped the field, another strong statement of the contributions that psychologists have made to bariatric surgery.

The specialty, however, faces some threats. Some individuals both within and external to the bariatric surgery community occasionally question the role of the preoperative psychological evaluation. One consistent criticism has been “if the evaluation does not have predictive

value, is it worth the time, effort, and expense?" Others have focused this attention on requirements of third party payers and suggest that the required preoperative psychological evaluation serves as a barrier, rather than a facilitator, to the surgical treatment of obesity (which would be desirable to insurance companies as it would reduce health care costs related to the procedure in the short term).

A psychological evaluation is the standard of care in many areas of surgery, including organ transplantation and spinal surgery, and is frequently included in treatments for pain, bone marrow and stem cell transplantation, and craniofacial surgery (Block & Sarwer, 2013). In those areas, the goal of the evaluation is not to predict postoperative outcome, but to provide important information to the surgical team about the patient's current psychosocial functioning. This information can inform the decision about whether or not a given individual is appropriate for treatment at a given time. In that regard, the evaluation is no different than cardiac clearance or evaluation before any surgical procedure; the consultant provides a statement on the risk-benefit ratio of bariatric surgery with recommendations or treatment to optimize benefits and mitigate risks. This is quite different than the assumption of many that the psychological evaluation prior to surgery is primarily utilized as a 'gate-keeper'. If the population of individuals with clinically severe obesity increases, as expected, the role of the preoperative psychological evaluation is likely to be questioned in the future. We encourage those who work in the field to remind our clinical colleagues, hospital administrators, and third party payers that psychological considerations are issues are a central part of a long-term, optimal postoperative success and safety.

Much of the research done on the psychological issues before and after surgery has been largely conducted independent of some of the physiological changes seen with surgery. The developing work on the neurocognitive changes that occur with surgery is one example of how the combination of psychological, behavioral, and medical variables allows investigators to describe the most complete understanding of the changes that occur postoperatively. Currently, there are number of studies in progress where researchers with interest in psychological and behavioral outcomes are actively collaborating with those interested in physiological changes seen with surgery. Novel investigations focused on changes in the gut and oral microbiota after surgery, those focused on neurocognitive issues, and those on physical activity and substance use (particularly alcohol absorption) after surgery, have great potential to shape the field.

In the last decade, there has been discussion and study of the use of bariatric surgery with adolescents. Studies to date suggest that the surgery is effective and safe for individuals under the age of 18 (Inge, et al., 2017). A recent study comparing adolescents and adults who had undergone GB found, at 5 years postoperatively, no significant differences in weight loss, with adolescents and adults losing 26% and 29% of their weight respectively (Inge et al., 2019). Adolescents were significantly more likely than adults to experience remission of type 2 diabetes and hypertension. Adolescents, however, were more likely to require an abdominal reoperation. While equivalent amounts of adolescents and adults died during the 5 year postoperative period, two of the three adolescents who died experienced acute combined drug toxicity.

Concerns about the long term psychosocial and behavioral consequences of bariatric surgery in adolescents likely contribute to its general underutilization with adolescents with clinically severe obesity. Adolescents with severe obesity are at risk for the same untoward psychosocial issues as adults; issues of social isolation, stigma, and discrimination may be more pronounced. Given that most adolescent with obesity continue to have a BMI  $\geq 30$  kg/m<sup>2</sup> throughout adulthood, it is reasonable to questions if there are biases against surgical intervention in adolescents that are based more in personal beliefs and medical paternalism than empirical evidence. Some of these concerns likely fall at the intersection of bariatric surgery, psychosocial development, and an adolescents ability to engage in appropriate and sustained health maintenance behaviors as they transition to adulthood (Zeller et al., 2017). As with adults, the likely continued increase in the number of adolescents with severe obesity will provide additional opportunity to consider and study these and other relevant issues.

Psychologists in clinical practice play a central role in the preoperative assessment of patients. More recently, these professionals have turned to the development of interventions to promote lifelong, postoperative success. While some of this work has seen early success, there is need for additional studies of interventions for patients who are experiencing, or who are at risk for, suboptimal weight losses or untoward psychosocial changes. Adaptation of lifestyle modification strategies for use in novel intervention delivery modalities hold great promise to impact the long term care of patients postoperatively. In addition, mental health professionals may play an important role in addressing issues related to psychopathology (particularly issues related to substance misuse and depression/suicide) as well as promoting postoperative adherence to the demanding behavioral changes required of surgery.

## Conclusion

Obesity represents one of our country's most impactful public health issues. The disease is chronic and unrelenting, being difficult to slow at the population or individual level with most prevention and non-surgical treatment interventions currently available. Thus, obesity provides both a challenge as well as an opportunity for almost all medical and mental health professionals, regardless of specialty. Those individuals who suffer from obesity, and severe obesity in particular, do so against the backdrop of a number of environmental and socioeconomic variables which promote weight gain and make weight loss extremely difficulty. These variables, coupled with our culture's unhealthy obsession with thinness as a marker of physical beauty, often leave those with clinically severe obesity with unique behavioral and psychosocial issues that can challenge even the most experienced mental health professionals. The scope of obesity problem, and relative popularity of bariatric surgery, provides psychologists, regardless of their practice setting, an opportunity for individual professional growth within the scope of their practice and an opportunity to work with the larger public health and medical communities to combat a disease profoundly affecting the physical and mental health of tens of millions of individuals.

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Public Significance: Almost 10% of Americans have clinically severe obesity, defined by a BMI  $\geq 40$  kg/m<sup>2</sup>. Psychologists have made significant contributions to our understanding of the psychosocial and behavioral factors that contribute to the development of extreme obesity. Psychologists play a central role in the assessment of persons with clinically significant obesity who present for bariatric surgery as well as the management of patients postoperatively.