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Psychopathology, Disordered Eating, and Impulsivity as Predictors of Outcomes of Bariatric Surgery

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Abstract

Outcomes of bariatric surgery, while frequently impressive, are not universal and vary between patients and across surgical procedures. Between 20–30% of patients experience suboptimal weight loss or significant weight regain within the first few postoperative years. The reasons for this are not fully understood, but likely involve both physiological processes, behavioral factors, and psychological characteristics. Evidence suggests that preoperative psychosocial status and functioning can contribute to suboptimal weight losses and/or postoperative psychosocial distress. Much of this work has focused on the presence of recognized psychiatric diagnoses and with particular emphasis on mood disorders as well as binge eating disorder (BED). Several studies have suggested that the presence of preoperative psychopathology is associated with suboptimal weight losses, postoperative complications, and less positive psychosocial outcomes. Contemporary psychological theory suggests that it may be shared features across diagnoses, rather than a discrete diagnosis, that better characterizes psychopathology. Mood and substance use disorders (SUDs), as well as BED, share common features of impulsivity, although clinicians and researchers often use complementary, yet different terms, such as emotional dysregulation or disinhibition (i.e., loss of control over eating, as applied to food intake), to describe the phenomenon. Impulse control is a central factor in eating behavior and extreme obesity. It also may contribute to the experience of suboptimal outcomes after bariatric surgery, including smaller-than-expected weight loss and psychosocial distress. This paper reviews the literature in these

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areas of research and articulates a direction for future studies of these complex relationships among persons with extreme obesity.

Psychosocial Status and Psychopathology in Candidates for Bariatric Surgery

Extreme obesity is associated with a significant psychosocial burden, including impairments in quality of life, body image, sexual behavior, and other areas of psychosocial functioning.[1] This distress, along with the physical burden of obesity and its comorbidities, is believed to contribute to the decision to have bariatric surgery. A number of studies have documented the presence of recognized psychiatric diagnoses in bariatric surgery patients and its hypothesized contribution to postoperative outcomes.[2–3] Several have described the prevalence of psychopathology in candidates for bariatric surgery using structured diagnostic instruments. Lifetime estimates of any psychiatric diagnoses ranged from 36.8% −72.6%, which are higher than those reported in most studies of the general population. Mood disorders (including major depressive disorder, bipolar disorder, as well as less severe mood disorders) were the most frequent diagnoses, seen in 22.0%−54.8% of patients. Substance use disorders (SUDs) were found in up to 35.7% of patients and alcohol abuse or dependence in up to 33.2%. BED, defined as eating an unusually large amount of food within a short period of time coupled with a loss of control over eating, has been diagnosed in 4.6% to 27.1% of patients.

As would be anticipated, the presence of a current psychiatric diagnosis (as compared with lifetime), assessed when the patient presented for surgery, was less common. Up to 55% of candidates for surgery across studies received a current psychiatric diagnosis. Mood disorders again were the most common diagnoses seen in up to 31.5%. BED ranged from 3.4%−41.9%. Current substance use was seen in less than 2% of patients. A recent meta-analysis confirmed that depression (19%) and binge eating disorder (17%) were the most commonly seen diagnoses at the time of surgery.[4]

These studies, in general, have been highly informative. However, they are not without limitations. Many have suffered from methodological concerns, including small sample sizes or lack of an appropriate comparison group. Individuals from racial minority groups have been underrepresented. Further, establishing psychiatric diagnoses prior to bariatric surgery is challenging. Perioperative guidelines recommend that patients undergo a clinical evaluation with a mental health professional prior to surgery.[5–7] Some patients are believed to engage in “impression management” during these evaluations, minimizing symptoms of psychopathology to present themselves in the most favorable light and to obtain a recommendation for surgery from the mental health professional.[8]

Recent theoretical advances from the more general literature on psychopathology may help inform future thought on its application to bariatric surgery. Marek and colleagues recently argued that studies which have focused on the relationship between specific diagnoses and postoperative outcomes may have failed to account for other psychological constructs that may be shared across diagnoses.[9] Advances in psychiatric diagnoses in the past decade have

encouraged the use of structural models that can explain relevant comorbidities,[10–11] rather than rely on discrete diagnoses. Such an approach may be particularly relevant to identifying factors that may be associated with poor postoperative outcomes.[9]

For example, mood disorders (and bipolar disorders in particular), BED, and SUDs all share the common psychological construct of impulsivity. Impulsivity refers to the absence of the ability to inhibit an automatic behavior (otherwise known as response inhibition) and the tendency to discount future consequences in favor of more immediate outcomes (known as delay discounting). Preferences for immediate over future rewards are often measured by asking individuals to choose between smaller immediate rewards (e.g., receiving $5 now) versus larger rewards at varying times in the future (e.g., receiving $25 one month from now). In addition, executive function, defined as an individual's ability to regulate attention and maintain goal-directed behavior, is thought to play a central role in impulsivity. Activity in brain regions known to be critical in executive function is also associated with impulsivity.[12] A lack of impulse control may reduce the ability to inhibit an automatic behavior (e.g., overconsumption of highly palatable snack food) and may increase the preference for immediate over long-term rewards (e.g., choosing the highly palatable snack food over a healthier option). Thus, impulsivity may contribute to the excessive weight gain seen in extreme obesity and may impact the results of bariatric surgery.

Disinhibition and Impulsivity among Persons with Extreme Obesity

Individuals with obesity, and in particular those with extreme obesity presenting for bariatric surgery, show deficits in working memory, mental flexibility, motor speed, and complex attention.[13] At the same time, metabolic dysregulation, such as insulin resistance or hyperglycemia seen in type 2 diabetes, also is associated with cognitive deficits, suggesting a potential physiological mechanism for the relationship.[14]

Dietary disinhibition, defined as a loss of control over eating, plays a central role in the overconsumption of food and the development of obesity.[15–16] Disinhibition is similar to impulsivity, the term more commonly used in the substance use and smoking cessation literatures. Similar to the role of disinhibition in obesity, impulsivity contributes to the development of and relapse to SUDs. Indeed, there is a literature supporting the role for response inhibition and delay discounting in a number of maladaptive health behaviors, including SUDs[17] and obesity.[18] Both also predict response to treatment for obesity.[19–20]

Chronic overeating and binge-eating disorder share several neurobiological and behavioral similarities with SUDs. In this regard, both may be viewed as behavioral disorders, in which intake (of food, alcohol, and/or drugs) escalates to a rate that is unhealthy and maladaptive. Others have described this relationship in the context of food addiction.[21] The condition, while the focus of a large amount of research attention in the obesity literature, is controversial and is not currently a recognized psychiatric diagnosis. The condition shares many features with binge eating disorder and is associated with broad features of other forms of psychopathology as well.

Nevertheless, the specific nature of the relationship between binge eating and substance use remains to be fully elucidated. There are similarities between binge eating and addictive disorders, including craving for the desired substance (drug or highly palatable food), a sense of loss of control when using, repeated attempts to control use despite clear adverse consequences, and the dedication of much time in obtaining and using the substance.[22] As such, facets of impulsivity (e.g., delay discounting) may represent a trans-disease process that underlies multiple health-related behaviors including substance use, physical activity, diet, and adherence to treatment regimens.[18] The disinhibition observed with obesity and binge eating, the impulsivity seen with substance use disorders, and the emotional dysregulation associated with mood disorders all likely share commonalities that may both contribute to the development of extreme obesity and also may be associated with weight loss and changes in psychosocial status after bariatric surgery.

Psychosocial Status and Psychopathology after Bariatric Surgery

In general, individuals who undergo bariatric surgery report dramatic improvements in psychosocial status and functioning postoperatively.[23] The vast majority of patients report significant reductions in symptoms of depression and anxiety in the first postoperative year. They also report significant improvements in health and weight-related quality of life. Patients also report improvements in body image, sexual functioning, and relationship satisfaction.

The relationship between preoperative psychopathology and postoperative outcomes is less robust Livhits and colleagues reviewed this literature and concluded that the presence of BED and personality disorders are the psychosocial factors most strongly associated with smaller postoperative weight loss.[2] A recent meta-analysis by Dawes and colleagues similarly concluded that there was conflicting evidence on the relationship of preoperative psychopathology and postoperative weight loss.[4] A recent study that carefully assessed the presence of BED prior to surgery found no statistically significant difference in weight loss at the end of the first postoperative year between those who received the diagnosis prior to surgery and those who did not.[24] However, at month 24, surgically-treated participants without BED lost 23.9% of initial weight, compared with 18.6% for those with BED.[24]

The relationship between substance abuse and postoperative outcomes of bariatric surgery are even more interesting. A recent study found that among those enrolled in a preoperative medical weight management program, current tobacco users were significantly less likely to complete the program and undergo surgery.[25] In contrast, those who successfully achieve abstinence prior to surgery appear to be more successful. For instance, two studies have suggested that a history of substance abuse is associated with larger weight losses following bariatric surgery.[26–27] The interpretation of this counterintuitive finding is that the self-regulation skills that help patients maintain their sobriety also help patients adhere to the demands of the recommended postoperative diet. A recent study of marijuana use suggests less favorable outcomes with regard to postoperative weight loss.[28] Eighteen percent of patients who were one to two years post-surgery reported marijuana use, which represents one-third of patients who had used marijuana prior to surgery. Further, marijuana use after surgery, in particular increased use after surgery (21%), was associated with higher “food

addiction" scores, loss of control eating, eating during the night, higher eating disorder pathology, as compared with never users.[28]

Disinhibition and Impulsivity following Bariatric Surgery

Encouragingly, there are improvements in cognitive functioning in persons with extreme obesity in the first two years after bariatric surgery. Postoperatively, patients typically report decreases in disinhibition and hunger, as well as increases in cognitive restraint.[29–30] High levels of disinhibition and low levels of restraint have been associated with poor adherence to the postoperative diet and smaller weight losses in the first two postoperative years.

The physical aspects of bariatric surgery typically prevent individuals from eating the objectively large amount of food necessary to meet the diagnostic criteria of BED. However, many individuals continue to report the feeling of loss of control over their eating. The self-reported inability to control these impulses postoperatively is associated with smaller weight losses and greater emotional distress in the first few postoperative years.[31–32]

Common neurobiological substrates mediate both obesity and drug addiction. Dopaminergic and opioid receptor signaling – both central mechanisms in drug addiction – have been implicated in changes in post-surgery eating behavior.[33] Evidence that patients have difficulty with impulse control after surgery is supported by a number of studies suggesting that there is an increased risk of substance use disorder postoperatively.[31, 34] King and colleagues[35], in their seminal investigation, found an increased rate of alcohol use disorder in the second postoperative year as compared to the year prior to surgery or in the first postoperative year. More recently, this group[36] found that patients who underwent RYGB experienced higher rates of incident alcohol use disorder symptoms, illicit drug use, opioid use, and substance use disorder treatment 7 years after surgery.

Postoperative substance use has been associated with smaller postoperative weight losses, postoperative nocturnal eating, and subjective hunger.[37] Patients at greatest risk for new onset SUDs were more likely to report problems with high sugar/low fat food before surgery, further suggesting the role of impulsivity in eating behavior and substance use both before and after surgery.[38] This increase in substance use after surgery has been described as "addiction transfer"[39] and characterized as a modern example of "symptom substitution" in which abuse of one substance (food) is replaced by another (alcohol or drugs) when patients are unable to consume large amounts of food after surgery. Further evidence of this phenomenon is supported by studies showing that the reverse pattern is also observed. For example, when an individual attempts to quit smoking tobacco, highly palatable food may serve as a substitute reinforcer ultimately leading to weight gain.

Emotional dysregulation may also contribute to "addiction transfer" by limiting the ability to control the experience and expression of emotion under stressful conditions, which in turn shifts one's attention toward more immediately reinforcing goals. Indeed, similar shifts in attention and difficulty regulating emotion are often observed in depression. As noted above, symptoms of depression typically improve within the first six months of bariatric surgery as patients are in the period of most rapid weight loss. Within the first two postoperative years,

the use of anti-depressant medications also decreases; however, the use of these medications increases over time. As most patients begin to regain weight postoperatively, they also experience an erosion of the improvements in depressive symptoms and quality of life.[40] In addition, a higher-than-expected number of postoperative suicides have been documented, raising additional concerns about the return of mood disorders in some individuals who have undergone bariatric surgery.[41]

Summary and Future Directions for Research

The relationship between preoperative psychosocial status and postoperative outcomes is one of the most researched but least understood issues in the area of bariatric surgery. Concern about preoperative psychosocial status is one reason that standard clinical practice in the United States requires that individuals who seek bariatric surgery undergo a mental health evaluation prior to surgery. This evaluation is designed to identify potential psychiatric and behavioral contraindications to surgery (psychosis; severe, untreated depression; active substance abuse; or significant behavioral non-compliance) and also provide patients with psychoeducation on the dietary and behavioral challenges after surgery. Patients with psychosocial and behavioral issues, such as mood disorders and disordered eating, often are recommended for surgery even in the presence of these concerns.

Prior to surgery, patients in the United States are typically required to participate in 3 to 6 months of preoperative medical weight management. In these sessions, patients typically meet with registered dietitians who teach them the basic elements of the postoperative diet and behaviors required for optimal postoperative outcomes. The relative value and importance of preoperative medical weight management, as implemented in clinical practice, is unclear.[42] The educational value of these sessions and the relationship to postoperative outcomes, remains in need of further study.

Regardless, there is consensus that a substantial percentage of patients who undergo bariatric surgery experience smaller than expected weight losses, weight regain, or psychosocial distress after surgery. Patients with a history of psychopathology, specifically those with issues of mood regulation or disordered eating, are vulnerable to returning to maladaptive eating and activity behaviors which likely promoted the development of extreme obesity and may compromise long-term weight control. Investigations of the relationship between specific diagnoses and postoperative outcomes have shed some light on these relationships. Marek and colleagues recently have suggested that future studies utilize hierarchical, empirically supported models of constructs shared by relevant diagnoses.[9] We agree and believe that a common psychological construct, impulsivity--an important element of overeating, substance use, and mood regulation--may be a robust predictor of postoperative outcomes along with psychopathology or disordered eating. In support of this hypothesis, recent evidence identified unique prebariatric subtypes characterized by various aspects of impulsivity including reduced self-control, emotion dysregulation, and disinhibited eating.[43]

Much of the work on the psychosocial and behavioral aspects of bariatric surgery has focused on the use of patient-reported outcome measures. While many studies have used

psychometrically sound instruments, there is concern that these measures are subject to bias and can be unduly influenced by impression management by the respondents. Another approach could be the use of objective neurocognitive testing. These assessments are often used by neurologist and neuropsychologists, but are being used with greater frequency in biomedical research. Gunstad and colleagues have conducted a number of studies with this methodology, demonstrating that 1) persons with extreme obesity often demonstrate modest deficits in executive functioning; and 2) these patients typically experience improvements in these areas following substantial weight loss. Moreover, repositories such as the PhenX Toolkit and the NIH Toolbox, provide an online catalog of standardized measures with psychometric properties and normative data supporting the reliability and validity of these measures. Incorporating standardized measures provides the means to replicate and compare findings across studies, facilitates collaboration, and will ultimately bring additional methodological rigor to future studies.

As noted above, the most rigorous approach to the assessment of psychopathology is a structured diagnostic interview. Done appropriately for research purposes, these assessments require significant training and supervision of the professionals who conduct the interviews. They also are time and labor intensive. While use of such interviews is recommended for research purposes, they are likely impractical for most clinical programs. Thus, outcome studies coming from bariatric programs that do not use this approach may have results which are inconsistent with investigations that are able to use most robust research methods.

As the field of metabolic and bariatric surgery continues to evolve, it remains critically important to continue to work to understand the patient characteristics and behaviors associated with outcome, both unsuccessful and successful. Studies of these issues may shed additional light on the value of the preoperative psychological assessment and preoperative medical weight management. These studies also hold great potential to improve patient selection, refine preoperative education and intervention algorithms, and develop intervention strategies to assist patients who do not have an optimal outcome following an initial procedure.

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Highlights

- Mood and substance use disorders (SUDs), as well as BED, share common features of impulsivity.
- Impulse control is a central factor in eating behavior and extreme obesity and may contribute to the experience of suboptimal outcomes after bariatric surgery, including smaller-than-expected weight loss and psychosocial distress.
- This paper reviews the literature in these areas of research and articulates a direction for future studies of these complex relationships among persons with extreme obesity.