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Opioids and Bariatric Surgery: A Review and Suggested Recommendations for Assessment and Risk Reduction

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Prescription opioid use has increased significantly over the past 25 years due to a number of factors including efforts to help patients struggling to cope with pain, overprescribing by providers and marketing by pharmaceutical companies. However, opioids provide euphoria as well as analgesia.[1] This euphoria coupled with iatrogenic physical dependence and addictive qualities has contributed to an epidemic of opioid abuse, addiction and overdose.[2] The increased use of opioids for treating non-cancer chronic pain and the increased use of higher-dose and higher bioavailability formulations has added to what the Centers for Disease Control and the Department of Health and Human Services have referred to as an'epidemic'.[1] Clinicians struggle to weigh the potential benefits of long-term opioids therapy (i.e., use of legitimately obtained prescribed opioids at least five days per week for 90 days) with the risk of misuse or addiction.[3] Recently, the Centers for Disease Control (CDC) has issued prescribing guidelines to address the issue of opioid over-use.[4]

Obesity and Chronic Pain Co-Morbidity

Patients with severe obesity are more likely to experience chronic pain and related increased functional and psychosocial complications related to chronic pain conditions.[5] Chronic pain also has quality of life implications in patients with severe obesity and has been the subject of a prior review A large-scale survey of over 1 million US residents demonstrated a linear relationship between Body Mass Index (BMI) and chronic pain prevalence.[6] Compared to individuals with normal BMIs, individuals who were overweight reported 20% greater rates of chronic pain, people with Class I obesity reported 68% greater, those with Class II reported 136% greater, and those with clinically severe Class III obesity reported 254% greater rates of chronic pain. [7]

Recent research has indicated that although pain ratings and overall medication use is significantly reduced following bariatric surgeries, opioid use not only continues but

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increases for a significant sub-set of patients.[2,8,9] Of particular concern, new onset use and abuse have been noted.[2,8–10] The following review will outline the literature on pre- and post-operative opioid use prevalence, mechanisms of risk, as well as predictors and assessment of problematic use in bariatric populations pre- and post-operatively. This review will also outline appropriate education/informed consent procedures for patients as well as treatment options.

Prevalence of Opioid Use Before and After Bariatric Surgery

Four large prospective studies have been published which examine the prevalence of bariatric surgery patients who continue or initiate opioid use following bariatric surgery.[2,8,9,11] Raebel and colleagues[8,11] published prevalence rates and predictors of continued opioid use up to three years following bariatric surgery and new onset opioid use within the first post-operative year. Data were generated by analyzing the electronic health records of nearly 12,000 patients who underwent bariatric surgery at one of several geographically diverse centers across the US. Pre-operatively, Raebel and colleagues[8] found that approximately 8% (933/11719) of patients chronically used prescription opioids (defined as 10 or more dispensings over ≥ 90 days or having a been prescribed at least a 120 day supply of opioids in the year prior to surgery) and 36% of the cohort used some prescribed opioids in the year prior to surgery (defined as 1–9 dispensings or a dispensed quantity ranging from 1 to less than 120 day supply). Chronic opioid use among bariatric surgery candidates (76% RYGB, 15% LAGB, 2% LSG, 7% other) at 8% is higher than those in the general population at approximately 3%.[4,7] Among patients who met criteria for chronic prescription opioid use in the year prior to surgery, 77% continued chronic use in the year following surgery, 20% reduced to some use, and 3% had no use. Among patients who met criteria for chronic opioid use, mean daily morphine equivalents increased from pre-surgery (45 mg) to post-surgery (51.9 mg) and mean opioid potency also significantly increased following surgery. There was also a shift toward the use of more Schedule II opioids in the year following surgery among preoperative chronic users compared with the year prior to surgery. Although musculoskeletal and some other forms of pain may improve following bariatric surgery, these data convincingly—and concerningly---demonstrate that the majority of patients who use opioids chronically prior to surgery sustain a chronic usage pattern in the year following surgery and often escalate the dose, potency, and schedule of opioids used.

The subsequent study published by this research group[11] focused on the patterns of post-operative prescription opioid use among nearly 11,000 bariatric surgery patients who used “some” (39.1%) or no (60.9%) prescription opioids in the year prior to surgery. Among this sample, 4% of patients began using opioids chronically in the year following bariatric surgery (76% RYGB, 15% LAGB, 2% LSG, 7% other). Interestingly, the development of chronic opioid use in the year post-surgery differed between those who used “some” opioids in the year prior to surgery and those who used none, at 8.1% and 1.3%, respectively. Among patients who used (some) opioids prior to surgery, about half continued intermittent use in the year after surgery and 42.5% used no opioids during this time. The mean daily morphine equivalents increased from 2.1 to 3.0 from pre-to-post surgery in this group. The majority (69.4%) of patients who did not use opioids prior to surgery continued as non-opioid users the after surgery.

Recently, prevalence rates of and predictors associated with post-surgery prescribed opioid use were examined in the prospective Longitudinal Assessment of Bariatric Surgery −2 (LABS-2) study.[2] LABS-2 included adults planning to undergo a first bariatric surgery (70% RYGB, 25% LAGB, 4% LSG) procedure at one of six clinical centers across the US and patients were followed for up to seven years post-surgery. The LABS-2 data provide prevalence rates of opioid use prior to surgery and post-surgery at 6 months and each year for 7 years following surgery[2]. Since dose was not collected in the LABS-2 study, opioid use was defined as "regular" if it occurred daily, weekly, or as needed over the prior 90 days. Prior to surgery, 14.7% of bariatric surgery candidates regularly used an opioid medication and this percentage initially dropped to 12.9% at six months post-surgery. However, over the longer duration of follow-up in this study, a pattern similar to other researchers demonstrating increased opioid use over time is shown. At year 7 post-surgery, 20.3% of patients regularly used opioids, which represented a significant increase over baseline. Despite some methodological differences, rates of initiation of opioid use by one-year post-operatively were ~4% in both cohorts. However, the LABS-2 data showed a lower prevalence of continued regular opioid use compared to the data published by Raebel et al[8] at 53%, versus 77%, respectively. It is unclear whether methodological differences (for example, lack of dose and therefore inability to calculate morphine daily equivalents, dispensing frequency in the LABS-2 study, self-reported prescription use and lack of adherence data as opposed to pharmacy dispensing records) or other factors accounted for this difference.

Most recently, prescription opioid use following RYGB bariatric surgery was reported from the Scandinavian Obesity Surgery Register (SOReg)[9]. Prescribing records were examined from a national registry from 35,612 patients who underwent a primary gastric bypass surgery in Sweden between 2007 and 2013. Patients were categorized as pre-operative high opioid consumers (HOC, mean of >10 mg/day oral morphine equivalents [n=1628]) or low opioid users (LOC, mean of ≤ 10 mg/day oral morphine equivalents [n=33,984]) and dosing data were examined for two years prior to and after bariatric surgery. Among the HOC, there was no difference between mean morphine equivalents used before or after surgery. Among the LOC group, there was a significant increase in mean daily morphine equivalent use following surgery. Concerningly, the daily morphine equivalents more than doubled following surgery in the LOC group. Among the LOC group, 2.2% of patients became HOC following surgery. In the HOC, only about one-fourth of patients reduced or discontinued opioid use, whereas three-fourths of patients either continued or increased their consumption after surgery.

Collectively, these four large cohort studies consistently demonstrate that the majority of patients who use daily/chronic opioids prior to surgery continue to use them in this manner post-surgery and that there is a small but meaningful subset of patients who use limited or no opioids prior to surgery who develop chronic usage in the year(s) following bariatric surgery. Morphine daily equivalent doses and opioid potency has been shown to increase among chronic opioid users postoperatively. It is not clear whether this is due to addictive qualities of the drugs, tolerance development, changes in the rate and/or extent of absorption or other altered pharmacokinetic processes (which have not been examined with the majority of opioids and formulations thereof), changes in the opioid receptor system, or other physiological or psychological changes. In the absence of data, it may be premature to draw conclusions about causality of escalating opioid dosages post-surgery.

Pharmacological and Biological Mechanisms of Risk

Anatomical and physiological changes that follow bariatric surgery, particularly RYGB and LSG, may contribute to biologically-mediated risk factors that promote increased substance use disorders following surgery. Pharmacokinetic changes, particularly in the rate and extent to which opioid medications are absorbed, and changes in the reward pathways following surgery, may be potential contributors to increasing opioid use following surgery. Research also suggests that exposure to higher doses of all opioids and the use of long-acting opioids (e.g., methadone, oxycodone) is associated with an increased risk of overdose.[12]

Pharmacokinetic changes following RYGB and LSG have been well-characterized for alcohol use but less well described with opioids. Data have consistently shown that maximum (peak) alcohol concentrations are higher and more rapidly attained after RYGB compared to pre-surgery levels[13,14,15] or non-surgical controls.[16] Data are less consistent related to the LSG with the majority of data showing findings analogous to those observed with RYGB with raapidly attained, higher than pre-surgical, maximum concentrations[17,18] and other data showing no significant changes following surgery.[19] A study examining the pharmacokinetics of morphine oral solution before and up to 6 months after RYGB showed approximately a pre-to-post-surgery three-fold increase in maximum concentration and a reduction in the time to reach maximum concentration from 53 to 7 minutes along with a minor increase in overall drug exposure (area-under-the-plasma concentration time curve; AUC).[20] A later study by this research group examined the pharmacokinetics of extended release oral morphine in patients who underwent RYGB versus BMI matched nonsurgical controls and found no differences between groups in AUC, maximum concentration, or the time it took to reach it.[21] Currently, pharmacokinetic data concerning opioids following LSG are limited to one case report that found that methadone serum concentrations increased early (5 days) following LSG and further increased by 7 months post-operatively, suggesting the need for careful monitoring of methadone pharmacotherapy in post-bariatric surgery patients. [22]

A rapid and exaggerated peak concentration may be important since prior studies in the drug abuse literature have demonstrated a relationship between the rate at which a substance enters the central nervous system and the risk for abuse/dependence.[23] Currently the opioid pharmacokinetic literature is too limited to draw conclusions about the majority of frequently prescribed opioids but extant data do suggest that the formulation (e.g., liquid versus extended release) of the opioid has a significant impact on pharmacokinetic findings. Liquids, which are not subject to the disintegration and dissolution processes that solid dosage forms have to undergo, are often more rapidly and readily absorbed and may lead to different pharmacokinetic and therapeutic outcomes relative to immediate release solid dosage forms (e.g., tablets, capsules) or extended release formulations which require a prolonged period of time in the gastrointestinal tract in order to achieve adequate absorption. Several opioids are available in multiple formulations and this may be an important factor governing the rate and extent of absorption of a given opioid. Among the opioids, there is significant variability in pharmacokinetic properties that make it difficult to extrapolate findings between agents. Prior literature has shown that drugs such as hydrocodone, oxycodone, and tramadol are the most frequently prescribed opioids among the bariatric surgery population[2] and pharmacokinetic data addressing these agents and their various formulations is needed.

Animal work also supports an association between RYGB and morphine administration which suggests that there may be a biological basis, independent of weight loss, responsible for the increase in opioids observed following bariatric surgery. Specifically, Biegler and colleagues[24] showed rats subjected to RYGB demonstrated higher morphine-seeking behavior and consumption compared with SHAM-operated weight matched control rats. Biological data which can clearly elucidate factors driving an increase in opioid use are limited and associations are speculative. Data showing significant changes in the mu opioid receptor system in the brain, along with changes in the dopamine reward system. Positron emission tomography (PET) data suggest that mu opioid receptor availability is lower in bariatric surgery candidates with extreme obesity relative to lean nonsurgical controls, and that weight loss following bariatric surgery appears to result in higher mu opioid receptor availability compared to preoperative PET scans.[25] There have also been studies examining the dopamine reward system and D2 receptor availability and findings have been mixed; thus the impact of these changes on the clinical outcome is unclear.[26–29]

Psychosocial risk factors for Opioid Use in the General Population

Risks associated with problematic use of substances—primarily alcohol—have been a topic of study within the more recent bariatric literature. Generally, patients with a history of impulse control deficits or prior substance abuse may be at higher risk for developing maladaptive coping strategies post-surgery. Prior findings have shown that preoperative history of substance use is correlated with postoperative substance use.[11,30] It has been suggested, although not empirically demonstrated, that dependence from one substance (e.g., nicotine) may transfer to another substance (e.g., food), which may thereby contribute to weight gain. Evidence suggests that substance abuse may diminish when eating behavior prevails[31] in part because drugs and food may activate common brain reward circuitry.[32] Patients with a history of substance abuse should be assessed for addictions pre- and postoperatively as well as receive psychoeducation about reoccurrence. Evidence from more general populations suggests that patient risk factors including a family history of substance use[33] and a personal history of substance use disorders (e.g., alcohol, benzodiazepines, illicit drugs) increases the risk of prescription opioid misuse or abuse.[34] Edlund and colleagues[35] reviewed the medical records of more than 15,000 veterans and found that a personal substance abuse history was the single strongest predictor of therapeutic opioid abuse or addiction.[35] These patients may transition to opioids from alcohol or other illicit substances. Further, research has demonstrated that patients with substance use disorders are more likely to receive opioids and to receive them in higher dosages.[36]

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Psychosocial Risk Factors for Opioid Use Identified in the Bariatric Surgery Literature

More specifically, a number of risk factors have been identified as predictive of opioid use in post-operative bariatric populations. Many of these findings come from the previously described LABS-2 study and from the large cohort study by Raebel et al.[11] Bariatric patients with greater baseline pain scores, lower reductions or worsening of pain post-operatively and starting or continuing non-opioid analgesics are at higher risk for both continued and post-surgery initiation of opioids independent of surgery type.[2] Other risk factors included public versus private insurance, a history of orthopedic surgery (i.e., back, hip, knee or ankle), and a subsequent bariatric procedure. Contrary to their hypotheses, greater improvement in mental health after surgery was also linked to a higher risk of post-surgery initiation of opioids.[2] Past research has also shown that bariatric patients who are preoperative chronic opioid users might receive higher doses of opioids for pain management, which may be related to an increased pain sensitivity, a decrease in pain detection thresholds, and altered pain processing postoperatively.[8]

Somewhat surprisingly, a number of factors associated with substance use disorders in smaller studies of bariatric patients[37] were not related to continued or post-surgery initiated opioid use in the LABS-2 study [2]. Specifically, demographic variables such as gender, age, and socio-economic status were not predictive. Further, psychosocial variables such as social support, depression, anti-depressant medication usage, decrements in mental health related quality of life and history of psychiatric hospitalizations were not significantly different between those who continued opioid use, those who initiated opioid use and those who did not use opioids. Finally, known predictors of substance use disorder risk such as smoking, alcohol consumption and illicit drug use history also failed to predict opioid use. The only exception was use of benzodiazepines, which was associated with increased risk on ongoing opioid use.[2] It is unclear why these predictors were not significant in the LABS-2 data. Differences in data collection instruments or methods, study design, or assessment time-frames may be factors. It is also important to note that the LABS-2 data could not assess dosage and therefore factors associated with escalating dose could not be explored. Contrary to the proposed mechanism that opioid use increases post-surgery to replace non-steroidal anti-inflammatory drugs (NSAIDs) use, starting NSAIDs was associated with post-surgery increase in both continued and initiated opioid use. While continued use of NSAIDs was not significantly associated with continued opioid use.

Preoperative factors that were related to the likelihood of developing new onset post-surgery opioid use were examined by Raebel and colleagues[11] and included drug factors such as an increasing total days supply pre-operatively (vs. no use), the use of non-narcotic analgesics, antianxiety medications, and tobacco use. Conversely, patient factors such as being older and having a laparoscopic band procedure (vs. RYGB) were associated with a decreased likelihood of experiencing new onset opioid use following surgery. Unfortunately, the limited predictors identified across studies suggest that identifying at-risk populations pre-operatively may be more difficult. Future, larger, prospective trials should examine risk factors that have been previously identified in smaller cohort studies including family history of substance abuse, poor coping, life stressors[38] and disordered eating patterns.[39]

Clinical Implications for Bariatric Surgery Patients

Opioids not only directly activate brain analgesia and reward regions but also simultaneously mediate a learned association between receipt of the drug and the physiological and perceptual effects of the drug.[12] Therefore, repeated opioid use strengthens these learned associations and over time become part of the desire (i.e., craving) for the drug's effects whether they are analgesic or pleasurable. For a patient in chronic pain, even mild levels of pain can trigger the learned associations between pain and drug relief. The conditioned urge for relief can lead to inappropriate opioid use outside prescribed scheduling. There is also an increasingly compelling literature linking bariatric surgery with a higher risk of suicide[40] and it is not clear from existing literature whether substance use is a meaningful contributor to this observation.

Tolerance (i.e., decrease in opioid potency with repeated administration) is an expected result from repeated opioid use. Tolerance to the analgesic and euphoric effects of opioids develops quickly which is why prescribing opioids long-term for their analgesic effects will typically require increasingly higher doses in order to maintain the initial level of analgesia. The repeated use of opioids can also lead to hyperalgesia (i.e., state of heightened pain sensitivity), which can contribute to inappropriate dose increases. [(30)]

Physical dependence triggers the physiological adaptations that initiate withdrawal symptoms after abruptly discontinuing an opioid regiment.[12] The severity and duration of withdrawal symptoms vary based on the type, dose, and duration of opioid prescribed. In the context of chronic pain management, the discontinuation of opioids requires dose tapering in order to prevent withdrawal symptoms.

Diagnostic criteria of tolerance and withdrawal are not included for a diagnosis of a Therapeutic Opioid Addiction (TOA) because physical dependence is a normal response to appropriate long-term use.[41] Diagnosis of a TOA instead utilizes criteria that include characteristics of addiction, including mental preoccupation (e.g., obsessive thinking about the drug), loss of control (e.g., compulsive drug taking), and continued use despite consequences (e.g., psychological, medical, legal problems). A positive diagnosis requires the presence of all three criteria.

While opioid discontinuation reverses the tolerance and physical dependence for someone with a TOA, the underlying changes associated with addiction persist. Patients are particularly vulnerable to overdosing as their intense drive to take the drug persists, but the tolerance that protected them from overdosing before is absent.[12]

Assessment:

A challenge for bariatric providers is the overlap between chronic pain and severe obesity. As a result, a significant subset of pre-operative patients (8–15% based on previously reviewed studies) are on chronic opiate therapy. Determining appropriate use, iatrogenic use and problematic use can be challenging. The Opioid Risk Tool is used as a screener for potential opioid abuse in patients beginning opioid therapy for pain management.[42] This tool identifies current age between 16 and 45, family history of substance abuse, personal history of substance abuse, history of preadolescent sexual abuse, and mental illness as risk factors.

The National Institute of Drug Abuse (NIDA) offers validated, quick screening tools for use in primary care that are also beneficial for use in a bariatric program (see https://www.drugabuse.gov/sites/default/files/pdf/screening_qr.pdf). Such tools, however, focus on opioid use that does not adhere to the recommended use as prescribed by a doctor, including dosage and how often the medication is taken. Such patterns are important to assess and could include behaviors such as running out of opioids early, receiving from multiple physicians or pharmacies who are unaware of the other prescriptions, taking more than are prescribed, supplementing prescribed opiates with ones received by other means (e.g., bought off street, “borrowed” from family member). Care providers can utilize state registries to assess some of these concerning behaviors. Team members should also be watchful for “red flags” during assessment such as: 1) complaints that prescription opiates are not working properly and are no longer effective; 2) display of excessive knowledge about a specific medication and attaching significance about its particular efficacy; 3) worry about having enough pills; 4) excessive focus on timing of pills to the extent that daily activities revolve around dosing schedules; 5) continued use when condition should have alleviated and/or resisting of cessation or decreasing dosages of the opiate; 6) complaints about prescribers who refuse to write prescription, who don’t prescribe enough or who don’t take symptoms seriously; 7) self-medicating by increasing doses or supplementing with other medications (e.g., addition of a benzodiazepine). Given the previously described relationship of chronic pain and non-opioid pain medication use, a brief assessment of current, usual, worst and best pain ratings and a pain history may be a helpful adjunct to the usual medical and psychological pre-surgical evaluation.

Contraindications:

The AACE/ASMBS/TOS guidelines for bariatric surgery identify current alcohol or substance abuse/dependence as a contraindication for surgery.[43] This contraindication was also noted by the National Institutes of Health consensus statement on weight loss surgery over 25 years ago[44] and is utilized consistently across surgical programs. Less guidance has been provided on opioid use. While non-prescription opioids (e.g., heroin, non-prescribed opioids) would likely be a contraindication for most providers, the use of opioid maintenance therapy (e.g., methadone, Suboxone) presents a challenge to programs. Programs should secure records and recommendations from outside providers of substance abuse treatment and should require a period of maintenance without relapse. Given that relapse rates are highest in the first year, many providers require a minimum of 12 months without problematic use/misuse.[45] Little is known about what level of opioid use would lead a surgical program to delay or deny surgery. Problematic behaviors such as those listed above may lead to required substance disorder treatment prior to approval for surgery.

For the many individuals who are prescribed opioids prior to surgery, pre-operative education is indicated. Informing patients on the risks associated with opioid use and that weight loss does not necessarily result in less pain medication over time can be part of the informed consent. Previous psycho-educational programs focusing on alcohol and substance risk following bariatric surgery have been described[46] with benefit noted for both knowledge, intent to drink alcohol and use of healthy alternative coping mechanisms. Such programs should be adapted for use in patients using opioids pre-operatively and those determined to be at higher risk for post-surgical opioid use (e.g., patients with past opioid problematic use, chronic pain conditions currently managed with NSAIDs).

Consents and Behavioral Contracts:

Consent forms and behavioral contracts are often used to motivate patients and reduce risks related to alcohol post-bariatric surgery.[45] They also should be viewed as an educational and safety tool and, when done properly, help patients have greater participation in their own care. Patients with a history of more problematic opioid use may be asked to sign an informed consent (see Appendix A). This communicates the team's concern to the patient about potential problems with their use. Further, it may help reduce liability risk to the provider by documenting that the patient was informed and having the patient's signature acknowledging receipt. Finally, it also serves to initiate further discussion with the patient about their individual risk factors, concerns and warning signs of misuse. For patients who have a documented history of opioid dependence, abuse or misuse, who have been less adherent overall, or when the multi-disciplinary team notes heightened concerns, a behavioral contract may also be helpful. A behavioral contract clearly communicates the behavioral expectations of the team (e.g., explicitly stating how many opioids will be prescribed post-operatively, requirement of utilizing alternative pain control methods) and the patient signs their agreement to these recommendations prior to approval for surgery. Behavioral contracts utilize stronger language than an informed consent and could include agreement to submit to ongoing toxicology screenings, consultation from pain medicine or agreement to attend an abstinence program.

Treatment Implications:

There are common strategies that can help mitigate risks associated with opioid use, including limiting the prescribed opioid to the lowest effective dose for the shortest effective duration. Regular monitoring (e.g., urine drug screening before every prescription is written) and reassessment provide opportunities to taper and discontinue opioid therapy among patients who are not benefitting or among patients who are engaging in risky behaviors such as consuming a large quantity of alcohol, using benzodiazepines concurrently, or misusing their medication (e.g., poor adherence to opiate medication regiment). These risks indicate the need to educate patients (and patients' families if included in the discussion with patient consent) about overdose risks, the use of an opioid treatment agreement, and more frequent follow-up. Referring some patients to participate in specialty addiction treatment may be indicated.

There are various alternative pharmacologic and nonpharmacologic treatment options for pain management.[12] Pharmacologic alternatives include nonopioid analgesics (e.g,, acetaminophen), nonselective NSAIDs, Cyclooxygenase-2 inhibitors, anticonvulsants (gabapentin or pregabalin), and antidepressants (e.g., tricyclics, serotonin and norepinephrine reuptake inhibitors). Interventional and neural stimulation therapies are available (e.g., epidural injection, brain, spinal cord, and nerve stimulation). Peripheral nerve blocks (e.g., transverse abdominis plane block) and anesthetic options may be appropriate for some patients and consults with or referrals to pain medicine or anesthesiology services may be warranted for more complicated pain management situations. Biofeedback has also been shown to be an effective intervention for patients with headaches, chronic back pain, and other pain disorders. Through the use of electromyography, patients learn to modulate their pain by recognizing and managing muscle tension. Not all pharmacological alternatives may be appropriate for all patients (i.e., NSAIDs are generally not recommended after RYGB) and some medications are more appropriate for some types of pain than others.

Other nonpharmacologic treatment options include Cognitive Behavioral Therapy (CBT),[47] Acceptance and Commitment Therapy,[48] and complementary medicine practices (e.g., yoga, meditation, and acupuncture). Interventions designed to enhance a patient's self-efficacy in managing chronic pain and other symptoms have been incorporated in therapeutic approaches like CBT for chronic pain and multidisciplinary chronic pain treatment programs. Bolstering a patient's self-efficacy can begin in the acute post-operative period by teaching him/her relaxation strategies such as guided imagery, which has been shown to reduce pain, use of analgesic medication, and negative affect.[49]

Conclusions

In spite of significant weight loss and reduction in pain and medical co-morbidities, large scale studies have demonstrated that post-operative bariatric patients do not reduce opiate use and may increase morphine equivalents over time. Aspects of opioid therapy, psychosocial risks and altered pharmacokinetics may help explain these concerning findings. Adequate screening, pre-operative education, alternative pain management, and ongoing monitoring (pre- and post-operatively) are needed to mitigate the risk of opioid use disorders in bariatric populations.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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References

1. Sehgal N, Colson J, Smith HS. Chronic pain treatment with opioid analgesics: benefits versus harms of long-term therapy. Expert Rev Neurother. 2013;13(11):1201–1220. [PubMed: 24175722]
2. King WC, Chen JY, Belle SH, et al. Use of prescribed opioids before and after bariatric surgery: prospective evidence from a U.S. multicenter cohort study. Surg Obes Relat Dis. 2017;13(8):1337–1346. [PubMed: 28579202]
3. Hausmann LR, Gao S, Lee ES, Kwoh CK. Racial disparities in the monitoring of patients on chronic opioid therapy. Pain. 2013;154(1):46–52. [PubMed: 23273103]

4. Dowell D, Haegerich T, Chou R. CDC Guideline for Prescribing Opioids for Chronic Pain — United States, 2016. Morbidity and Mortality Weekly Report. 2016;65(1):1–49. [PubMed: 26766396]
5. Okifuji A, Hare BD. The association between chronic pain and obesity. Journal of Pain Research. 2015;8:399–408. [PubMed: 26203274]
6. Stone AA, Broderick JE. Obesity and pain are associated in the United States. Obesity (Silver Spring). 2012;20(7):1491–1495. [PubMed: 22262163]
7. Boudreau D, Von Korff M, Rutter CM, et al. Trends in long-term opioid therapy for chronic non-cancer pain. Pharmacoepidemiol Drug Saf. 2009;18(12):1166–1175. [PubMed: 19718704]
8. Raebel MA, Newcomer SR, Reifler LM, et al. Chronic use of opioid medications before and after bariatric surgery. Jama. 2013;310(13):1369–1376. [PubMed: 24084922]
9. Wallen S, Szabo E, Palmetun-Ekback M, Naslund I. Use of Opioid Analgesics Before and After Gastric Bypass Surgery in Sweden: a Population-Based Study. Obes Surg. 2018.
10. Saules KK, Wiedemann A, Ivezaj V, Hopper JA, Foster-Hartsfield J, Schwarz D. Bariatric surgery history among substance abuse treatment patients: prevalence and associated features. Surg Obes Relat Dis. 2010;6(6):615–621. [PubMed: 20207591]
11. Raebel MA, Newcomer SR, Bayliss EA, et al. Chronic opioid use emerging after bariatric surgery. Pharmacoepidemiol Drug Saf. 2014;23(12):1247–1257. [PubMed: 24733580]
12. Volkow ND, McLellan AT. Opioid Abuse in Chronic Pain--Misconceptions and Mitigation Strategies. N Engl J Med. 2016;374(13):1253–1263. [PubMed: 27028915]
13. Klockhoff H, Naslund I, Jones AW. Faster absorption of ethanol and higher peak concentration in women after gastric bypass surgery. British journal of clinical pharmacology. 2002;54(6):587–591. [PubMed: 12492605]
14. Woodard GA, Downey J, Hernandez-Boussard T, Morton JM. Impaired alcohol metabolism after gastric bypass surgery: a case-crossover trial. J Am Coll Surg. 2011;212(2):209–214. [PubMed: 21183366]
15. Pepino MY, Okunade AL, Eagon JC, Bartholow BD, Bucholz K, Klein S. Effect of Roux-en-Y Gastric Bypass Surgery: Converting 2 Alcoholic Drinks to 4. JAMA Surg. 2015;150(11):1096–1098. [PubMed: 26244751]
16. Hagedorn JC, Encarnacion B, Brat GA, Morton JM. Does gastric bypass alter alcohol metabolism? Surg Obes Relat Dis. 2007;3(5):543–548; discussion 548. [PubMed: 17903777]
17. Maluenda F, Csendes A, De Aretxabala X, et al. Alcohol absorption modification after a laparoscopic sleeve gastrectomy due to obesity. Obes Surg. 2010;20(6):744–748. [PubMed: 20358306]
18. Acevedo MB, Eagon JC, Bartholow BD, Klein S, Bucholz KK, Pepino MY. Sleeve gastrectomy surgery: when 2 alcoholic drinks are converted to 4. Surg Obes Relat Dis. 2018;14(3):277–283. [PubMed: 29305304]
19. Changchien EM, Woodard GA, Hernandez-Boussard T, Morton JM. Normal alcohol metabolism after gastric banding and sleeve gastrectomy: a case-cross-over trial. J Am Coll Surg. 2012;215(4):475–479. [PubMed: 22770864]
20. Lloret-Linares C, Hirt D, Bardin C, et al. Effect of a Roux-en-Y gastric bypass on the pharmacokinetics of oral morphine using a population approach. Clinical pharmacokinetics. 2014;53(10):919–930. [PubMed: 25141973]
21. Hachon L, Reis R, Labat L, et al. Morphine and metabolites plasma levels after administration of sustained release morphine in Roux-en-Y gastric bypass subjects versus matched control subjects. Surg Obes Relat Dis. 2017;13(11):1869–1874. [PubMed: 28864105]
22. Strømmen M, Helland A, Kulseng B, Spigset O. Bioavailability of Methadone After Sleeve Gastrectomy: A Planned Case Observation. Clinical Therapeutics. 2016;38(6):1532–1536. [PubMed: 27181614]
23. Allain F, Minogianis EA, Roberts DC, Samaha AN. How fast and how often: The pharmacokinetics of drug use are decisive in addiction. Neurosci Biobehav Rev. 2015;56:166–179. [PubMed: 26116543]

24. Biegler JM, Freet CS, Horvath N, Rogers AM, Hajnal A. Increased intravenous morphine self-administration following Roux-en-Y gastric bypass in dietary obese rats. Brain Res Bull. 2016;123:47–52. [PubMed: 26304761]
25. Karlsson HK, Tuulari JJ, Tuominen L, et al. Bariatric surgery normalizes brain opioid receptors. Mol Psychiatry. 2016;21(8):989. [PubMed: 27439757]
26. Berthoud H-R, Zheng H, Shin AC. Food reward in the obese and after weight loss induced by calorie restriction and bariatric surgery. Annals of the New York Academy of Sciences. 2012;1264(1):36–48. [PubMed: 22616827]
27. Dunn JP, Cowan RL, Volkow ND, et al. Decreased dopamine type 2 receptor availability after bariatric surgery: preliminary findings. Brain Res. 2010;1350:123–130. [PubMed: 20362560]
28. Steele KE, Prokopowicz GP, Schweitzer MA, et al. Alterations of central dopamine receptors before and after gastric bypass surgery. Obes Surg. 2010;20(3):369–374. [PubMed: 19902317]
29. van der Zwaal EM, de Weijer BA, van de Giessen EM, et al. Striatal dopamine D2/3 receptor availability increases after long-term bariatric surgery-induced weight loss. Eur Neuropsychopharmacol. 2016;26(7):1190–1200. [PubMed: 27184782]
30. Li L, Wu LT. Substance use after bariatric surgery: A review. J Psychiatr Res. 2016;76:16–29. [PubMed: 26871733]
31. Kalarchian MA, Marcus MD, Levine MD, et al. Psychiatric disorders among bariatric surgery candidates: relationship to obesity and functional health status. The American journal of psychiatry. 2007;164(2):328–334; quiz 374. [PubMed: 17267797]
32. Volkow ND, Wise RA. How can drug addiction help us understand obesity? Nat Neurosci. 2005;8(5):555–560. [PubMed: 15856062]
33. Pestka EL, Craner J, Evans M, et al. Impact of Family History of Substance Abuse on Admission Opioid Dose, Depressive Symptoms, and Pain Catastrophizing in Patients with Chronic Pain. Pain Management Nursing. 2018;19(2):115–124. [PubMed: 29153294]
34. Noble M, Treadwell JR, Tregear SJ, et al. Long-term opioid management for chronic noncancer pain. Cochrane Database Syst Rev. 2010(1):Cd006605. [PubMed: 20091598]
35. Edlund MJ, Steffick D, Hudson T, Harris KM, Sullivan M. Risk factors for clinically recognized opioid abuse and dependence among veterans using opioids for chronic non-cancer pain. Pain. 2007;129(3):355–362. [PubMed: 17449178]
36. Morasco BJ, Duckart JP, Carr TP, Deyo RA, Dobscha SK. Clinical characteristics of veterans prescribed high doses of opioid medications for chronic non-cancer pain. Pain. 2010;151(3):625–632. [PubMed: 20801580]
37. Pulcini ME, Saules KK, Schuh LM. Roux-en-Y gastric bypass patients hospitalized for substance use disorders achieve successful weight loss despite poor psychosocial outcomes. Clin Obes. 2013;3(3–4):95–102. [PubMed: 25586531]
38. Ivezaj V, Saules KK, Schuh LM. New-onset substance use disorder after gastric bypass surgery: rates and associated characteristics. Obes Surg. 2014;24(11):1975–1980. [PubMed: 24908245]
39. Reslan S, Saules KK, Greenwald MK, Schuh LM. Substance misuse following Roux-en-Y gastric bypass surgery. Subst Use Misuse. 2014;49(4):405–417. [PubMed: 24102253]
40. Mitchell JE, Crosby R, de Zwaan M, et al. Possible risk factors for increased suicide following bariatric surgery. Obesity (Silver Spring). 2013;21(4):665–672. [PubMed: 23404774]
41. Association AP. Diagnostic and statistical manual of mental disorders. Arlington, VA: American Psychiatric Publishing; 2013.
42. Webster LR, Webster RM. Predicting aberrant behaviors in opioid-treated patients: preliminary validation of the Opioid Risk Tool. Pain Med. 2005;6(6):432–442. [PubMed: 16336480]
43. Mechanick JI, Youdim A, Jones DB, et al. Clinical Practice Guidelines for the Perioperative Nutritional, Metabolic, and Nonsurgical Support of the Bariatric Surgery Patient—2013 Update: Cosponsored by American Association of Clinical Endocrinologists, The Obesity Society, and American Society for Metabolic & Bariatric Surgery(). Obesity (Silver Spring, Md). 2013;21(0 1):S1–27.
44. Health NIo. Gastrointestinal surgery for severe obesity: National Institutes of Health Consensus Development Conference Statement. Am J Clin Nutr. 1992;55(2 Suppl):615s–619s. [PubMed: 1733140]

45. Heinberg LJ, Ashton K, Coughlin J. Alcohol and bariatric surgery: review and suggested recommendations for assessment and management. Surg Obes Relat Dis. 2012;8(3):357–363. [PubMed: 22425058]
46. Ashton K, Heinberg L, Merrell J, Lavery M, Windover A, Alcorn K. Pilot evaluation of a substance abuse prevention group intervention for at-risk bariatric surgery candidates. Surg Obes Relat Dis. 2013;9(3):462–467. [PubMed: 23473996]
47. Archer KR, Devin CJ, Vanston SW, et al. Cognitive-Behavioral-Based Physical Therapy for Patients With Chronic Pain Undergoing Lumbar Spine Surgery: A Randomized Controlled Trial. J Pain. 2016;17(1):76–89. [PubMed: 26476267]
48. McCracken LM, Vowles KE. Acceptance and commitment therapy and mindfulness for chronic pain: model, process, and progress. Am Psychol. 2014;69(2):178–187. [PubMed: 24547803]
49. Chou R, Gordon DB, de Leon-Casasola OA, et al. Management of Postoperative Pain: A Clinical Practice Guideline From the American Pain Society, the American Society of Regional Anesthesia and Pain Medicine, and the American Society of Anesthesiologists' Committee on Regional Anesthesia, Executive Committee, and Administrative Council. The Journal of Pain. 2016;17(2):131–157. [PubMed: 26827847]

Highlights

- Opioid use often continues post-surgery, increases in a sub-set with new onset use also reported.
- Psychosocial factors, opioid pharmacokinetics and neurobiology may increase patients' risk.
- Careful assessment of use, misuse and abuse is necessary in this high risk population.