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Clinical characteristics of Roux-en-Y Gastric Bypass patients with death from accidental overdose or intentional self-harm: A descriptive study

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Abstract

Purpose: The objective of this descriptive study was to identify clinical characteristics of Roux-en-Y Gastric Bypass (RYGB) patients who died from intentional self-harm or accidental overdose postoperatively.

Materials and Methods: This retrospective, descriptive study included RYGB patients from a large rural medical center that completed surgery between January 2004 and December 2014 and died from intentional self-harm or accidental overdose through December 2015. Specific causes of death were obtained from the National Death Index and clinical data from electronic health records. Clinical characteristics explored were age, sex, time to surgery, weight loss expectations, postoperative weight loss, medication, diagnoses, psychiatric histories (diagnoses, self-harm, suicidal ideation and behaviors, medications, substance use, preoperative Beck Depression Inventory-II scores), pain, social support and reported life stressors.

Results: Overall, twenty-two patients of 146 total deceased patients died from intention self-harm ($n = 6$) or accidental overdose ($n = 16$) over the study period (77.3% female, mean age at time of surgery = 38.4 ± 9.1 years). Younger age (< 40 years), history of self-harm or depression, preoperative pain and use of opioids at the time of surgery emerged as common characteristics in weight-loss surgery patients who died from intentional self-harm or accidental overdose. No trends regarding social support, life stressors, or actual or expected weight loss were identified.

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Statement of Human Rights: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

For this type of study, formal consent is not required.

Conclusion: Certain weight-loss surgery patients may be at risk for death from self-harm or overdose and may benefit from greater surveillance postoperatively.

Keywords

weight-loss surgery; self-harm; overdose; suicide; accidental overdose

While weight-loss surgery conveys a variety of benefits for many patients, some experience adverse sequelae postoperatively. One of the most concerning post-surgery outcomes is the potential for premature mortality from external causes, including intentional self-harm and accidental overdose [1-9].

Weight-loss surgery patients may be at risk for suicide after surgery [5, 6], though overall, fewer than 1% of patients die from self-harm [8, 10]. Most completed suicides occur within 2-3 years of surgery (70%) [8, 9]. In 2010, completed suicide rates in Pennsylvania weight-loss surgery patients were 13.7 per 10,000 among men and 5.2 per 10,000 among women, compared to 2.4 per 10,000 among men and 0.7 per 10,000 women in the general population [6]. A recent systemic review [5] evaluating completed suicide after weight-loss surgery also found elevated suicide rates (4.1 per 10,000). Hypothesized determinants of intentional, fatal self-harm after weight-loss surgery include inadequate weight loss or gains in quality of life, weight regain or comorbidity reoccurrence, psychosocial concerns, unrealistic expectations, mobility issues or poor self-esteem [2, 5, 7], but few data have thoroughly evaluated these hypotheses.

Fatal overdose, whether intentional or accidental, has been observed in some weight-loss surgery patients. Adams et al. [11], found overdose as the cause of death in 15 of 90 weight-loss surgery patients who died from non-disease causes (16.7%). Bhatti and colleagues [12] found overdose to be the most common method of self-harm in weight-loss surgery patients, accounting for approximately 73% of self-harm-related emergency room visits. In the Swedish Obesity Study (SOS), substance abuse was documented in 51% of gastric bypass patients that experienced non-fatal self-harm episodes [7]. Reductions in the amount of medications and substances required after weight loss to achieve desired therapeutic levels or effects, changes in the way substances and medications are absorbed [5, 13] and psychosocial changes may contribute to the risk of overdose postoperatively. The prevalence of alcohol use disorders is higher postoperatively compared to preoperatively [14], which may also contribute to overdose risk.

Clinical factors associated with overdose or intentionally-caused deaths are poorly understood. Estimates of previous histories of self-harm or suicidality in weight-loss surgery populations range from 3% - 11% [7, 15-18], and may be indicative of future self-harm behaviors. Davidson and colleagues [9] found younger gastric bypass patients (< 35 years), particularly younger females, to be more likely to die from external causes. Morgan and Kwok [3] found younger age, previous psychiatric hospitalizations for depression, gastrointestinal complications and a lack of private insurance to be associated with self-harm behaviors postoperatively. Greater weight-related stigma [17] is associated with suicidal ideation or behavior in bariatric surgery candidates, though this relationship has not been evaluated postoperatively. More investigations of clinical factors associated with fatal self-

harm or overdose-related events after surgery are needed to improve informed consent to surgery and patient care.

In a previous study, Lent et al. [8], found an elevated risk of externally-caused death in younger bariatric surgery patients compared to non-surgical controls matched on age, weight, sex and diabetes status. The present study expanded this work by evaluating additional clinical factors of weight-loss surgery patients who died from intentional self-harm or accidental overdose from a cohort of 3,236 weight-loss surgery patients. Specifically, the objective of this study was to define the clinical and psychosocial histories of Roux-en-Y gastric bypass (RYGB) patients who died from intentional self-harm or accidental overdose using data from their health records. This exploratory, descriptive study assessed: 1) known factors related to self-harm or overdose in RYGB patients (i.e., age, sex, history of self-harm or depression); and 2) novel or underexplored factors that may relate to risk of death by self-harm or overdose for future study (i.e., psychosocial factors, weight-loss achieved versus expectations, medication use).

Materials and Methods

Twenty-two patients completed RYGB at a large, rural comprehensive medical center between January 2004 and December 2014 (n = 3,236 possible RYGB patients) and died from intentional self-harm or accidental overdose through December 2015.

Data for the 22 RYGB patients were derived from three sources: 1) specific cause of death was obtained through an application to the National Death Index (NDI) and details of this procedure were previously reported [8]; 2) participant characteristics (age, sex, surgery type, etc.) at the time of surgery, medications (preoperative psychotropic and opioid; postoperative opioid) and diagnoses (problem list or ICD codes for diabetes, hypertension, dyslipidemia, and psychiatric disorders) were collected from the electronic health record (EHR); and 3) de-identified preoperative behavioral health evaluations.

The preoperative program for weight-loss surgery involves a 6-12 month multidisciplinary curriculum (medical evaluations, dietary and nutritional counseling and psychosocial evaluation) with the goal of 10% body weight loss [19]. The psychosocial evaluation inquires about weight and dieting history, psychiatric history (including current and previous psychotherapy and medications), pain and related medication use, self-harm and substance use histories, motivation for surgery, readiness and understanding of the risks and postoperative diet and lifestyle, among other factors. Patients are provided a “light status” indicating clearance status for surgery from the program’s Behavioral Medicine team (i.e., “green light” = cleared; “yellow light” = delayed clearance and behavioral goals; “red light” = inappropriate candidate). Reasons for delayed clearance (“yellow light”) typically include difficulty making dietary and other behavioral changes, poor understanding, or eating or mental health concerns. A psychological assessment for depression is also administered [20, 21]. Postoperatively, patients are scheduled for follow-up visits at the bariatric surgery clinic one week, two weeks, two months, five months, eight months, and twelve months following surgery, and yearly thereafter.

A data analyst de-identified the medical records to eliminate all potential protected health information present in medical note free text, including physician names, places of work and family names. Specific variables explored included:

- **Clinical characteristics:** Age, sex, diagnoses, medications, race/ethnicity, pain status and location, and surgery type;
- **Time to surgery:** Time from initial consult with the bariatric surgery program to day of surgery;
- **Weight change:** Expectations and postoperative weight loss achieved;
- **Psychiatric histories:** Current and previous diagnoses, self-harm, suicidality, medications, and substance use and initial psychosocial clearance status were obtained from review of the psychosocial interview and the EHR;
- **Beck Depression Inventory-II (BDI-II).** The BDI-II [20] is administered during psychosocial evaluations as part of clinical treatment and is a 21-item measure of depressive symptomology. A total score of 0-63 is possible (0-13 = minimal, 14-19 = mild, 20-28 = moderate, and 29-63 = severe);
- **Social support and life stressors:** Marital status, plans for care after surgery, and reported non-health related life stressors (i.e., work, family, legal financial, etc.).

Select EHR data were also reported for patients that died from internal causes and for the overall RYGB cohort. This study was approved by the health system's Institutional Review Board.

Analyses

Descriptive statistics were used to describe the data. The primary investigator created a list of clinical factors to report in patients' psychosocial evaluations. Two doctoral-level students independently reviewed and coded the de-identified EHR data according to the list of factors (i.e., general mental health, self-harm and addiction histories, marital status and education levels, smoking and alcohol use, life stressors and social support). Raters were blinded to the patients' cause of death.

Results

Inter-rater reliability.

Raters' coding of the preoperative psychosocial evaluation text was compared for key clinical factors of interest. For most categories, ratings were in agreement at a rate of 85% or higher. For self-harm history, raters were only in 66% accordance and therefore a third-party was invited to review the discrepant text and make a final decision.

Demographics, Clinical Characteristics and Cause of Death.

Of the 146 total post-RYGB deaths, 26 were from external causes (i.e., accidental overdose, intentional self-harm, accidents, etc.). The most frequent cause of death from external causes

was accidental overdose (61.5%). Of these 26 post-RYGB deaths, 22 were from accidental overdose (n = 16) or intentional self-harm (n = 6) and were included in analyses.

Given the use of EHR data, all deceased patients were accounted for over the study period. Mean age at the time of surgery (n = 22) was 38.4 ± 9.1 years, and the majority were female (77.3%) and White (95.5%). Patient characteristics at the time of surgery are displayed in Table 1.

For the 22 RYGB patients that died from intentional self-harm or overdose, the mean time from surgery to death via self-harm or accidental overdose was 61.0 ± 34.0 months (range <1 month to 132 months). The mean time from surgery to death via self-harm alone (n = 6) was 40.6 ± 24.7 months. Specific causes of death are listed in Table 2.

Eight patients (36.4%) were age 35 or younger at the time of surgery and 15 patients (68.2%) were age 40 or younger.

Opioid use and pain.

Of the 22 patients, 12 (54.5%) were prescribed an opioid agonist or opioid combination medication at the time of surgery, which is similar to the overall bariatric surgery population at this medical center (Table 3). At 1-2 years postoperatively, nine continued to have an opioid on their medication list. Notably, 16 patients (72.7%) experienced pain preoperatively (commonly located in the back, knees and feet).

Psychiatric Medication and Diagnoses.

As documented in the EHR, 50.0% (n = 11) had a diagnosis of depressive disorder, 9.1% (n = 2), had non-dependent abuse of drugs, and 9.1% had bipolar disorder/manic depression (n = 2).

Regarding medications, 63.6% were prescribed an antidepressant (a serotonin reuptake inhibitor [SSRI], a tricyclic, a serotonin-norepinephrine reuptake inhibitor [SNRI], or a non-specified antidepressant, Table 3). Additionally, 27.2% (n = 6) were prescribed a benzodiazepine (an anxiolytic) or other anti-anxiety medication, though no patients carried an anxiety disorder diagnosis in the EHR. Diagnoses and medications for patients that died from overdose and self-harm, that died from internal causes, and for the overall RYGB cohort are in Table 3.

Mental Health History.

Sixteen patients (72.7%) endorsed a history of previous or current mental health diagnoses or treatment during their behavioral evaluation. Presenting problems were depression (n = 12), stress/anxiety (n = 2), health concerns with behavioral components (n = 2; i.e., headaches, weight), obsessive-compulsive disorder (n = 1), bulimia (n = 1) and posttraumatic stress disorder (n = 1).

Five patients (22.7%) reported a history of inpatient psychiatric hospitalizations. Six (27.2%) endorsed a history of suicidal ideation or self-harm behaviors, including episodes of intentional overdose. Three (50.0%) of the six patients that died from intentional self-harm

had a history of suicidal ideation or behaviors, and five (83.3%) had a history of depression. Grief and/or traumatic events (i.e., deaths of relatives, some violent) were endorsed by eight patients (36.4%).

A history of binge-eating behaviors was reported by 40.9% (n = 9) of patients and a history of overeating in response to stress was reported by 50.0% (n = 11) patients.

Two patients (9.1%) reported a history of substance use or compulsive behavioral problems.

Beck Depression Inventory-II (BDI-II).

Preoperative BDI-II scores were available for 18 of 22 patients (81.1%) with a mean of 9.9 ± 8.6 (range = 0 to 26), indicating minimal depressive symptoms. The mean score for patients that died from self-harm was 6.5 ± 4.4 (minimal depression), though scores were not available for two patients.

Time to surgery.

Mean number of days for patients (N = 22) to undergo surgery from the time of initial consultation was 357 ± 229.4 days.

Expected and Actual Weight Loss.

The majority of patients (>95%) reported reasonable expectations for weight-loss outcomes (30-40% of body weight).

Overall, mean total body weight loss at 12 months post-surgery was $34.7\% \pm 5.8\%$ (range 23.5% to 45.1%).

The Body Mass Index (BMI) of patients that died from self-harm or accidental overdose decreased from $45.7 \pm 7.3 \text{ kg/m}^2$ to $32.5 \pm 8.5 \text{ kg/m}^2$ (-28.8% BMI change; latest available weight before death, $M=47.6 \pm 37.4$ postoperative months). Patients who died from self-harm demonstrated a -36.4% BMI change from surgery to the latest available weight before death.

Social support and life stressors.

At the time of the presurgical evaluation, 10 patients were married or engaged, four were unmarried or divorced, and five patients' relationship statuses were unknown. Four of the six patients who died from self-harm were married (66.6%). Two patients reported occupational stressors, two reported family issues, and one reported financial issues.

Psychosocial clearance.

Nine patients were not initially cleared for surgery (40.9%, "yellow light", Table 3). Reasons for lack of initial clearance were dietary behaviors, lack of weight loss progress or understanding surgery, smoking and mental health concerns.

Discussion

In the study cohort, 15.1% of weight-loss surgery patient deaths were attributable to accidental and intentional overdose (i.e., medication, drugs, alcohol, etc.) and intentional self-harm by firearm. The rate of deaths due to these external causes in this study is moderately higher than previously reported in 2007 (45 of 440, 10.2%) [10]. Reasons for the discrepancy in the rate of deaths from overdose or suicide over the past decade may be the burgeoning opioid crisis, or the differing sample sizes and demographics. Investigation of these rates in larger, more diverse cohorts, is warranted. Patients in our study that died intentionally did so after postoperative year one, which has been previously reported [10], with most deaths occurring within the first three postoperative years.

Several noteworthy trends were evident. Two-thirds of the patients that died intentionally were prescribed an antidepressant at the time of surgery and the vast majority had a diagnosis of depression or bipolar disorder. However, scores on depression assessments indicated minimal depression at the time of evaluation. Future studies should further explore the relationship between a history of depression, regardless of depressive symptomology during the preoperative evaluation period, and the risk for self-harm postoperatively. Morgan and colleagues [3] found a history of hospitalizations for depression preoperatively to be associated with self-harm postoperatively, and several other studies indicated depression among other psychiatric issues to underlie post-surgery completed suicides [2, 22, 23]. While the number of completed suicides in our cohort was small ($n = 6$), our findings indicate that patients with a history of depression may benefit from preoperative counseling about this risk and from regular postoperative surveillance and screening for mood changes.

More than two-thirds of patients who died from accidental overdose or self-harm were age 40 or younger at the time of surgery. Patients who died from accidental overdose were more than six years younger at the time of surgery than patients who died from self-harm, and almost 10 years younger than the greater RYGB cohort at this medical center [8]. Davidson and colleagues [9] did not find a survival benefit for surgery patients under the age of 35 years because of a high rate of externally-caused deaths. Collectively, our studies indicate younger age to be a risk factor for premature death from self-harm, overdose and other external causes in weight-loss surgery patients.

The average length of time to surgery was approximately 12 months within the context of a 6 to 12-month preoperative program. Reasons for surgical delay included mental health concerns, maladaptive eating habits, and a lack of readiness for weight-loss. Of the patients that died via accidental overdose, half did not initially clear their psychosocial evaluation compared to 31% in the overall cohort. Greater surveillance of patients with extended time to surgery may help to mitigate postoperative risk, but further study and replication in other cohorts is recommended for more definitive conclusions on this potential marker of risk.

In our study, 16 weight-loss surgery patients died from accidental overdose. Most patients reported notable pain before surgery and half were prescribed an opioid at the time of surgery. Many of these patients continued to have an opioid listed as an active medication up to two years after surgery. Postoperative guidelines recommend the use of opioid-sparing

strategies unless otherwise contraindicated [24]. Opioids following weight-loss surgery may be used to avoid the potential gastrointestinal side effects associated with certain pain medications. We were not, however, able to obtain specific information regarding the substance related to fatal overdoses in our cohort because of limited cause of death information available in the EHR. Given the risk of developing alcohol use disorders following certain weight-loss procedures [14], the high prescribing rates of opioids in this population [25], and the potential for psychosocial changes postoperatively, greater monitoring of substance use and of medication levels with weight loss is recommended.

Weight change achieved in patients that died intentionally or from accidental overdose was in accordance with weight loss expectations expressed during their preoperative evaluations (30-40% body weight), and all patients achieved weight loss greater than 20% at one-year post-surgery. We did not detect any notable trends in regards to social support or life stressors, or in reporting of previous compulsive behaviors in patients who died from accidental overdose.

This study has several strengths. To the best of our knowledge, this is the first study to utilize patients' preoperative psychosocial evaluations in combination with other electronic health records to identify clinical characteristics in patients that died from accidental overdose or suicide. However, the small sample size (N = 22) and lack of a control group for comparison limit these findings. Additionally, some patients seeking weight-loss surgery may have underreported their mental health histories to avoid denial or delay of surgery. "Faking good," however, would cause our findings to err on the conservative side. Finally, our cohort did not yet experience deaths in patients with sleeve gastrectomy, but future studies could include sleeve patients when evaluating the risk of externally-caused mortality.

Though the potential for death after weight-loss surgery from suicide or overdose is of serious concern, the risk is relatively small and most patients do experience significant improvements in health and well-being. Our findings indicate that depression history, younger age, pain and extended time to surgery may signal the need for changes in clinical care and are targets for future study.

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References

1. Lagerros YT, Brandt L, Hedberg J, Sundbom M, Boden R. Suicide, Self-harm, and Depression After Gastric Bypass Surgery: A Nationwide Cohort Study. *Ann Surg* 2017;265(2):235–43. [PubMed: 27387654]
2. Mitchell JE, Crosby R, de Zwaan M, Engel S, Roerig J, Steffen K, et al. Possible risk factors for increased suicide following bariatric surgery. *Obesity (Silver Spring)*. 2013;21(4):665–72. [PubMed: 23404774]

3. Morgan DJ, Ho KM. Incidence and Risk Factors for Deliberate Self-harm, Mental Illness, and Suicide Following Bariatric Surgery: A State-wide Population-based Linked-data Cohort Study. *Ann Surg* 2017;265(2):244–52. [PubMed: 27433913]
4. Omalu BI, Cho P, Shakir AM, Agumadu UH, Rozin L, Kuller LH, et al. Suicides following bariatric surgery for the treatment of obesity. *Surg Obes Relat Dis* 2005;1(4):447–9. [PubMed: 16925267]
5. Peterhansel C, Petroff D, Klinitzke G, Kersting A, Wagner B. Risk of completed suicide after bariatric surgery: a systematic review. *Obes Rev* 2013;14(5):369–82. [PubMed: 23297762]
6. Tindle HA, Omalu B, Courcoulas A, Marcus M, Hammers J, Kuller LH. Risk of suicide after long-term follow-up from bariatric surgery. *Am J Med* 2010;123(11):1036–42. [PubMed: 20843498]
7. Neovius M, Bruze G, Jacobson P, Sjöholm K, Johansson K, Granath F, et al. Risk of suicide and non-fatal self-harm after bariatric surgery: results from two matched cohort studies. *Lancet Diabetes Endocrinol* 2018;6(3):197–207. [PubMed: 29329975]
8. Lent MR, Benotti PN, Mirshahi T, Gerhard GS, Strodel WE, Petrick AT, et al. All-Cause and Specific-Cause Mortality Risk After Roux-en-Y Gastric Bypass in Patients With and Without Diabetes. *Diabetes Care*. 2017.
9. Davidson LE, Adams TD, Kim J, Jones JL, Hashibe M, Taylor D, et al. Association of Patient Age at Gastric Bypass Surgery With Long-term All-Cause and Cause-Specific Mortality. *JAMA surgery*. 2016.
10. Omalu BI, Ives DG, Buhari AM, Lindner JL, Schauer PR, Wecht CH, et al. Death rates and causes of death after bariatric surgery for Pennsylvania residents, 1995 to 2004. *Arch Surg* 2007;142(10):923–8; discussion 9. [PubMed: 17938303]
11. Adams TD, Gress RE, Smith SC, Halverson RC, Simper SC, Rosamond WD, et al. Long-term mortality after gastric bypass surgery. *N Engl J Med* 2007;357(8):753–61. [PubMed: 17715409]
12. Bhatti JA, Nathens AB, Thiruchelvam D, Grantcharov T, Goldstein BI, Redelmeier DA. Self-harm Emergencies After Bariatric Surgery: A Population-Based Cohort Study. *JAMA Surg*. 2016;151(3):226–32. [PubMed: 26444444]
13. Hagedorn JC, Encarnacion B, Brat GA, Morton JM. Does gastric bypass alter alcohol metabolism? *Surg Obes Relat Dis* 2007;3(5):543–8; discussion 8. [PubMed: 17903777]
14. King WC, Chen JY, Mitchell JE, Kalarchian MA, Steffen KJ, Engel SG, et al. Prevalence of alcohol use disorders before and after bariatric surgery. *JAMA*. 2012;307(23):2516–25. [PubMed: 22710289]
15. Sansone RA, Wiederman MW, Schumacher DF, Routsong-Weichers L. The prevalence of self-harm behaviors among a sample of gastric surgery candidates. *J Psychosom Res* 2008;65(5):441–4. [PubMed: 18940374]
16. Dawes AJ, Maggard-Gibbons M, Maher AR, Booth MJ, Miake-Lye I, Beroes JM, et al. Mental Health Conditions Among Patients Seeking and Undergoing Bariatric Surgery: A Meta-analysis. *JAMA*. 2016;315(2):150–63. [PubMed: 26757464]
17. Chen EY, Fettich KC, McCloskey MS. Correlates of suicidal ideation and/or behavior in bariatric-surgery-seeking individuals with severe obesity. *Crisis*. 2012;33(3):137–43. [PubMed: 22343060]
18. Windover AK, Merrell J, Ashton K, Heinberg LJ. Prevalence and psychosocial correlates of self-reported past suicide attempts among bariatric surgery candidates. *Surg Obes Relat Dis* 2010;6(6):702–6. [PubMed: 21111382]
19. Wood GC, Chu X, Manney C, Strodel W, Petrick A, Gabrielsen J, et al. An electronic health record-enabled obesity database. *BMC Med Inform Decis Mak* 2012;12:45. [PubMed: 22640398]
20. Beck AT, Steer RA, Brown GK. Beck depression inventory-II. San Antonio 1996.
21. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med* 2001;16(9):606–13. [PubMed: 11556941]
22. Smith SC, Edwards CB, Goodman GN, Halversen RC, Simper SC. Open vs laparoscopic Roux-en-Y gastric bypass: comparison of operative morbidity and mortality. *Obes Surg* 2004;14(1):73–6. [PubMed: 14980037]
23. Pekkarinen T, Koskela K, Huikuri K, Mustajoki P. Long-term Results of Gastroplasty for Morbid Obesity: Binge-Eating as a Predictor of Poor Outcome. *Obes Surg* 1994;4(3):248–55. [PubMed: 10742782]

24. Schumann R, Jones SB, Cooper B, Kelley SD, Bosch MV, Ortiz VE, et al. Update on best practice recommendations for anesthetic perioperative care and pain management in weight loss surgery, 2004-2007. *Obesity (Silver Spring)*. 2009;17(5):889–94. [PubMed: 19396068]
25. Raebel MA, Newcomer SR, Reifler LM, Boudreau D, Elliott TE, DeBar L, et al. Chronic use of opioid medications before and after bariatric surgery. *JAMA*. 2013;310(13):1369–76. [PubMed: 24084922]

Table 1.

Roux-en-Y gastric bypass patient characteristics at the time of weight-loss surgery (N=22).

Characteristic	Percentage or Mean $\pm$ SD
Age (years)	38.4 $\pm$ 9.1
Sex	
Male	22.7%
Female	77.3%
Race	
White	95.5%
Black	4.5%
Body Mass Index (BMI, kg/m ²)	45.5 $\pm$ 7.3

Table 2.

Specific self-harm or overdose-related deaths in Roux-En-Y Gastric Bypass patients (N = 22)

Cause of Death	N (%)
Accidental poisoning (overdose) by and exposure to other and unspecified drugs, medicaments and biological substances	12 (54.5%)
Intentional self-harm by other and unspecified firearm and gun discharge	3 (13.6%)
Intentional self-poisoning (overdose) by and exposure to other unspecified drugs, medicaments and biological substances	3 (13.6%)
Accidental poisoning (overdose) by and exposure to other unspecified drugs medicaments and biological substances	2 (9.1%)
Accidental poisoning (overdose) by and exposure to narcotics and psychodysleptics [hallucinogens], not elsewhere classified	2 (9.1%)

Table 3.

Comparative pre and peri-operative clinical characteristics of RYGB patients that died from accidental overdose or intentional self-harm (N=22)

Clinical Factor	Accidental Overdose n = 16	Intentional Overdose or Other Self-Harm n = 6	Internal Causes N=124	Overall Cohort N=3,236
Age, years (M ± SD) *	36.6 ± 7.2	43.0 ± 12.6	55.0 ± 9.0	45.9 ± 11.2
Surgical BMI (kg/m ²) *	46.9 ± 7.5	42.6 ± 6.3	48.9 ± 7.8	46.9 ± 7.9
Sex, % (n)				
Male	18.8% (3)	33.3% (2)	30.1% (38)	19.8% (642)
Female	81.8% (13)	66.7% (4)	69.4% (86)	80.2% (2594)
Initial Psychosocial Evaluation Clearance ("Light Status"), % (n)				
Green (cleared)	43.8% (7)	83.3% (5)	52.4% (65)	58.9% (1907)
Yellow (delayed)	50.0% (8)	16.7% (1)	39.5% (49)	31.0% (1002)
Unknown	6.3% (1)	0.0% (0)	8.1% (10)	10.1% (327)
Alcohol use *, % (n)				
Yes	25.0% (4)	50.0% (3)	20.2% (25)	34.4% (1113)
No	68.6% (11)	16.7% (1)	60.5% (75)	57.0% (1843)
Unknown	6.3% (1)	33.3% (2)	19.4% (24)	8.7% (280)
Smoking history, % (n)				
Yes	56.3% (9)	33.3% (2)	61.3% (76)	66.4% (2147)
No	37.5% (6)	33.3% (2)	25.8% (32)	26.7% (864)
Unknown	6.3% (1)	33.3% (2)	12.9% (16)	7.0% (225)
Diabetes, % (n)	31.3% (5)	16.7% (1)	60.5% (75)	36.7% (1186)
Psychiatric Diagnoses, % (n)			Clinical interview N/A	Clinical interview N/A
Depressive or Bipolar Disorder	50.0% (8)	83.3% (5)		
Anxiety Disorder	0.0% (0)	0.0% (0)		
Nondependent Abuse of Drugs	6.3% (1)	16.7% (1)		
Select Medications *, % (n)				
Antidepressant (SSRI/NRI, Tricyclic, Other)	62.5% (10)	66.7% (4)	57.3% (71)	56.0% (1811)
Benzodiazepine/other Anti-Anxiety	56.3% (9)	16.7% (1)	35.5% (44)	30.8% (998)
Opioid Agonist or Opioid Combo	50.0% (8)	66.7% (4)	65.3% (81)	50.1% (1621)
Antipsychotic	12.5% (2)	16.7% (1)	0.8% (1)	1.1% (35)

* time of surgery.