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ORIGINAL CONTRIBUTIONS

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Abstract

Background Opioids are commonly prescribed after laparoscopic bariatric surgery but have untoward effects including dependence and diversion. Prior investigation revealed that over three-fourths of discharge opioids prescribed to our patients went unused.

Objectives To determine the feasibility of an opioid sparing discharge protocol following laparoscopic bariatric surgery.

Methods A total of 212 opioid-naïve patients undergoing laparoscopic bariatric surgery were examined and divided into two groups; 106 prior to (Cohort A) and 106 after implementation of an opioid sparing discharge protocol (Cohort B). Opioids were converted to morphine milligram equivalents (MME) and post-operative consumption was examined. Data was described as mean ± standard deviation.

Results No patients in Cohort B and 54.7% (58) in Cohort A received an opioid discharge prescription (37.5 MME). Of the 154 patients that remained, only 1.3% (2) received one after discharge. Cohort A took greater amounts of opioids than Cohort B after discharge (4.74 ± 11 vs. 0.21 ± 2 MME; $p < 0.001$). During hospitalization, Cohort A took greater amounts of opioids (6.92 ± 11 vs. 2.74 ± 5 MME; $p < 0.001$) but lower amounts of methocarbamol (759 ± 590 vs. 966 ± 585 mg; $p = 0.011$). No patient requested an opioid prescription refill or presented to the emergency room secondary to pain.

Conclusion Following laparoscopic bariatric surgery, an opioid sparing discharge protocol is feasible with < 2% of patients receiving opioids after discharge and no increase in emergency room visits. Education regarding these protocols may impact the amount of opioids taken during hospitalization.

Keywords Opioids · Diversion · Opioid sparing protocol

Introduction

Over prescribing of opioids following surgery contributes to the opioid crisis through diversion of pills and the potential for new persistent opioid use. Most patients who fill opioid prescriptions after a surgical procedure report that a portion of their pills goes unused [1]. Furthermore, 75% of patients admitted that their pills were not stored in a secure location or safely disposed of, which contributes to the abundance of prescription drugs that are used for nonmedical purposes. This can be unsafe and even lethal [1].

It has been reported that after both minor and major surgical procedures, the rates of new persistent opioid use are similar [2]. Morbid obesity and bariatric surgery may both be independent risk factors for opioid use [3, 4]. One year following bariatric surgery, Smith et al. found that 6.3% of opioid-naïve patients became new persistent opioid users which was associated with worse outcomes

Key points
- Opioids are overprescribed after many types of surgeries.
- Diversion and dependence are potential consequences of opioid prescribing.
- Most laparoscopic bariatric surgery patients do not take discharge opioids.
- Discharge without opioids is feasible after laparoscopic bariatric surgery.

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including decreased weight loss, decreased overall satisfaction, and less improvement in body image and depression [5]. Enhanced recovery after surgery (ERAS) programs have been implemented for multiple procedures to reduce length of stay and optimize outcomes. One strategy to facilitate these goals is to limit the use of narcotics while providing alternate nonopioid analgesic medications for pain control. However, there is a paucity of information and no defined consensus in the literature regarding opioid prescribing following bariatric surgery.

Despite limiting the amount of discharge opioids prescribed to our bariatric surgery patients to five pills and only to those patients who requested a prescription, we found that less than half of these patients took any opioids and less than a quarter of the total pills prescribed were actually consumed [6]. Based on these findings, we were interested in further reducing our discharge opioid prescribing and were curious if this was practical. Thus, our aim in this study was to determine the feasibility of implementing an opioid sparing discharge protocol in minimally invasive bariatric surgery patients.

Methods

We performed a retrospective cohort study at a single institution. Institutional review board approval was obtained prior to collecting any data. This included a chart review of 212 opioid-naïve patients undergoing either laparoscopic sleeve gastrectomy (LSG) or laparoscopic Roux-en-Y gastric bypass (LGB). These patients were subsequently divided into two groups; 106 prior to (Cohort A) and 106 after implementation (Cohort B) of an opioid-free discharge protocol between 7/1/2019 and 2/9/2021. Patients using opioids preoperatively within 90 days of surgery were excluded from this study. Prior opioid use was verified via the medical record and by examining the Michigan Automated Prescription Service (MAPS) to check for filled opioid prescriptions. Patients who did not attend their 2-week follow-up appointment were excluded.

Each patient in both cohorts was part of an ERAS protocol which included preoperative education and multimodal pain management in the perioperative period including intraoperative bilateral transversus abdominis plane (TAP) blocks. Both cohorts were provided preoperative education about the risks of opioid use and our discharge protocol of receiving routine non-opioid analgesics for pain management. Those in Cohort A were educated about the option to receive discharge opioids and those in Cohort B were educated about not receiving discharge opioids. Our ERAS protocol, operative technique, and order sets were unchanged between cohorts. In the preoperative care unit, celecoxib and dexamethasone were given. A total of 90 mL of 0.25% bupivacaine was utilized per patient during the bilateral TAP block and an additional 30 mL of 0.25% bupivacaine was injected intraperitoneally in the subdiaphragmatic space in the left upper quadrant. Intraoperative anesthesia included lidocaine, ketamine, and dexmedetomidine and acetaminophen was infused at the conclusion of the operation. Postoperatively scheduled celecoxib and acetaminophen and as needed methocarbamol were utilized for pain management. Methocarbamol relaxes skeletal muscles and is postulated to alter the perception of pain. By suppressing the central nervous system, it likely exerts its effects on muscle through its ability to suppress muscle spasm, increasing mobility and decreasing pain.

Postoperative opioids taken in the inpatient setting were recorded in morphine milligram equivalents (MME). As an example, 1 tablet of 5 mg oxycodone converts to 7.5 MME. They were given to patients at the discretion of nurses on the floor with reference to the "Numerical Pain Rating Scale," with administration only for a score of seven or above when there was breakthrough pain after non-opioid analgesics were given. Each patient in Cohort A was offered a prescription for five pills of 5 mg oxycodone at time of discharge. Patients in Cohort B were not offered or given a prescription for opioid medication. All patients were given prescriptions for celecoxib and acetaminophen upon discharge. The amount of each medication taken at home was obtained and recorded by our registered dietitian at the patient's 2-week postoperative follow-up appointment.

Demographics and comorbidities including age, gender, race, body mass index (BMI), hypertension, hyperlipidemia, diabetes mellitus, obstructive sleep apnea, arthritis, and degenerative disk disease were examined. Operative time and length of stay were compared between cohorts, as well as inpatient and outpatient opioid medication consumption. Inpatient methocarbamol and outpatient celecoxib and acetaminophen were recorded. It was also noted if any patients requested a refill of an opioid medication or visited the emergency department secondary to complaints of pain. All opioid prescriptions were verified using the MAPS system.

Between-cohort comparisons of categorical variables were made using the chi-square test for association or Fisher's exact test. In numerical data where the conditions for parametric analysis could be assumed, comparisons were made using the *t* test and where the conditions for parametric analysis could not be assumed, comparisons were made using the Mann-Whitney *U* test. Correlations were calculated as Spearman's rho. Data are presented as means with standard deviations. Throughout this study, a p-value ≤ 0.05 (two-tail) was considered statistically significant. Following initial data entry using Microsoft Excel, Minitab version 19

Statistical Software (State College, PA) or Langsrud on-line calculator (http://www.langsrud.com/fisher.htm) was used for performing the analyses.

Results

A total of 237 total patients were originally evaluated in this study and 25 patients were excluded due to preoperative opioid use as noted in the medical record or MAPS. The majority of patients were female (88%), and the average preoperative BMI was 46.8. There were no significant differences in characteristics between cohorts (Table 1).

Cohort A received more opioid prescriptions (58) upon discharge than Cohort B (0) ($p < 0.00001$, *CI* 95%). In Cohort A, 53 patients filled the prescription that they received (91%). Overall, Cohort A took greater amounts of opioids than Cohort B during hospitalization (6.92 ± 10.77 vs. 2.74 ± 5.0 MME; $p < 0.01$) and after discharge (4.74 ± 11 vs. 0.21 ± 2 MME; $p < 0.001$) (Fig. 1). Post-discharge usage of celecoxib and acetaminophen was both higher in Cohort B but not significantly different than Cohort A (Fig. 2). Only two of the 212 patients (0.9%) in our entire study called our office and requested a post-discharge opioid prescription. One of these patients called on postoperative day number three with pain at the gastrectomy and cholecystectomy extraction trocar site. The other patient called on postoperative day number 21 with gastrectomy extraction trocar site burning pain exacerbated with movement. Both of these patients were in Cohort B and were not given an opioid prescription upon discharge. No patients requested an opioid prescription refill or presented to the Emergency Department because of pain.

Table 1 Characteristics between cohorts

	Cohort A	Cohort B	*p*-value
Age, mean ± SD	43.8 ± 11.3	43.6 ±10.3	0.899
Sex, *n* (%)			
Female	94 (88.7)	93 (87.7)	0.831
Male	12 (11.3)	13 (12.3)	
Race, *n* (%)			
White	74 (69.8)	66 (62.3)	0.207
Non-white	31 (30.2)	40 (37.8)	
Preoperative BMI (body mass index, kg/m^2), mean ±SD	47.2 ± 7.1	46.4 ± 6.8	0.551
Weight kg, mean ± SD	120.9 ± 23.8	124.4 ± 23.2	0.278
Comorbidities, *n* (%)			
HTN	52 (49.1)	50 (47.2)	0.783
HLD	48 (45.3)	56 (52.8)	0.272
DM	36 (34.0)	30 (28.3)	0.373
OSA	46 (43.4)	39 (36.8)	0.327
Arthritis	29 (27.4)	37 (34.9)	0.235
DDD	8 (0.8)	4 (0.4)	0.374
Type of operation, *n* (%)			
LSG	88 (83)	65 (61.3)	< 0.001
LGB	18 (17)	41 (38.7)	
Operative time, mean (min) ± SD	83.0 ± 32.2	105.6 ± 39.7	< 0.001
LOS days, *n* (%) **excluding 3 day stays in both cohorts because *n* was so small			
1	92 (86.8)	97 (91.5)	0.165
2	13 (13.2)	7 (8.5)	

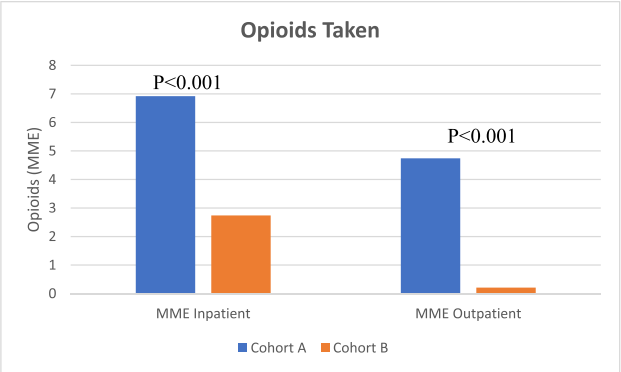

Fig. 1 Mean amount of opioids taken in each cohort as an inpatient and outpatient (MME)

Pre-operative BMI (47.2 ± 7.1 vs. 46.4 ± 6.8; $p = 0.55$) and length of stay (1.12 +/–0.33 vs. 1.07 +/–0.25; $p = 0.165$) were similar between cohorts. There was a higher number of LGB operations as compared to LSG operations in Cohort B (Cohort A 88 LSG and 18 LGB versus Cohort B 65 LSG and 41 LGB; $p < 0.01$) with a corresponding longer mean operative time in Cohort B (83.0 ± 32.2 vs. 105.6 ± 39.7 min; $p < 0.01$). Cohort A used more opioids in the PACU (1.14 ± 1.61vs.0.18 ± 0.51*MME*; $p < 0.01$) as well as throughout their entire hospital stay in comparison to Cohort B. Patients in Cohort B used significantly more methocarbamol in the hospital in comparison to patients in Cohort A (759 ± 591 mg vs. 966 ± 585; $p < 0.011$) (Fig. 3).

Discussion

This study demonstrates that it is feasible to discharge patients without an opioid prescription following laparoscopic bariatric surgery. Only two patients (1.3%) in our entire study population who did not receive a discharge opioid prescription contacted our office for opioids to further manage their pain. Greater amounts of celecoxib and acetaminophen were used after discharge in patients not receiving an opioid prescription although this did not reach statistical significance. Interestingly, adoption of our opioid sparing discharge protocol was associated with a reduction in postoperative inpatient opioid use.

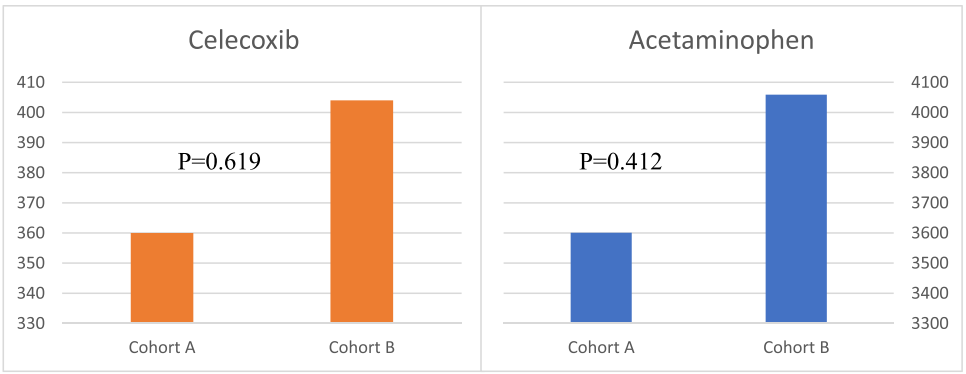

Fig. 2 Mean amount of celecoxib and acetaminophen consumed as an outpatient (mg)

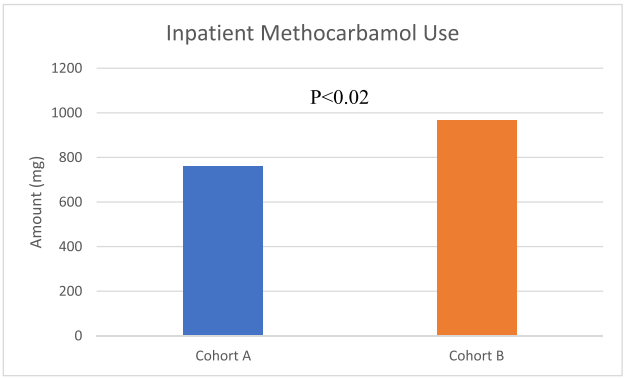

Fig. 3 Mean amount of methocarbamol use as an inpatient (mg)

There is currently no consensus and a paucity of information regarding the appropriate amount of opioids to prescribe postoperatively upon discharge in laparoscopic bariatric surgery patients. One study describes an appropriate amount should be limited to 15 opioid pills based on average number of pills prescribed and used in their population [7]. Another resource that describes a possible guideline is the Michigan Opioid Prescription Engagement Network (M-OPEN). M-OPEN provides recommendations for discharge opioid prescribing for a variety of surgical procedures established by evidenced-based literature or expert opinion when a lack of evidence exists [8]. The recommendation for LSG is based on expert opinion and is 0–10 5-mg tablets of oxycodone. Laparoscopic sleeve gastrectomy patients in our study used on average less than one 5-mg oxycodone pill to manage their pain adequately after leaving the hospital. This demonstrates the wide range of recommendations and potential for overprescribing opioid medication in the laparoscopic bariatric surgery population.

As previously mentioned, opioid-naïve patients are vulnerable to developing new persistent opioid use or chronic opioid use after surgery. Chronic opioid use has been shown to be more common in patients requiring opioid prescriptions upon discharge than patients who did not receive a prescription after an inpatient hospital stay [9]. Brummett et al. identified the incidence of new persistent opioid use between 3 and 6 months to range between 5.9 and 6.5% following minor and major surgical procedures whereas the nonoperative control cohort incidence was only 0.4% [2]. Different risk factors have been described in opioid dependance including tobacco use, chronic pain, mood disorders, anxiety, and alcohol abuse [2]. Patients in the bariatric surgery population have an increased incidence of these risk factors [4], making them at higher risk for postoperative opioid use. It has also been shown that new persistent opioid use following bariatric surgery is significantly associated with other detrimental effects such as decreased satisfaction, worse psychological well-being, and lower percent excess body weight loss [5]. The vulnerability of this population makes utilizing an opioid sparing discharge protocol enticing with the potential to limit the number of new persistent or chronic opioid users with improvement in overall outcomes.

A study evaluating the source of prescription medication misuse described that 50% of misusers endorsed receiving the medication from a family or relative for free [10]. It has also been reported that unused narcotics are typically kept in unsecure locations and are not disposed of in an appropriate manner [1]. This raises the concern of opioid diversion when prescription medication goes unused. In our study, 58 prescriptions of five pills of 5-mg oxycodone were given in Cohort A with 53 of them being filled, equating to 265 pills available for use. The total number of pills actually consumed in Cohort A was 67, leaving 198 pills (75%) unused. By reducing the number of opioids prescribed upon discharge, we can reduce the number of pills that are available for opioid diversion. Because nearly all of the patients in Cohort B did not call the office complaining of pain, request an opioid prescription to manage their pain, or present to the emergency room due to pain, we believe it is feasible to limit the amount of discharge opioids prescribed. In addition, these results should mitigate concerns about

having to answer multiple patient calls to the surgeon's office because of pain.

Setting patient expectations preoperatively is an important step in limiting the amount of opioids used postoperatively. It has been described that patients who received preoperative education regarding preparation for postoperative pain management used only half the quantity of pain pills as patients who did not receive this preoperative education [11]. This concept has been demonstrated for multiple surgical procedures. Each patient in both cohorts received extensive education regarding their postoperative course, including what to expect regarding postoperative pain management and the potential risks of opioids. The patients in Cohort A were provided education regarding the option for discharge opioids while those in Cohort B were provided education about our opioid sparing discharge protocol. We identified a surprising and unexpected effect of implementing our opioid sparing discharge protocol which was that these patients utilized less opioids and more methocarbamol during their hospital stay. We believe this was secondary to our targeted education of the opioid sparing discharge protocol and commitment to this protocol to reduce the risks of new persistent and chronic opioid use. This likely impacted patients' decision-making which led to a preferential increase use of methocarbamol and reduction in opioid use postoperatively. Multimodal pain control has been proven to significantly decrease the number of opioid medications used in the postoperative period [12]. Our protocol utilizes medications including methocarbamol, celecoxib, and acetaminophen, as well as intraoperative TAP blocks with bupivacaine, to optimize pain control while limiting the use of narcotics. We believe these types of strategies are critical to support an opioid sparing discharge protocol in bariatric surgery patients.

This study has several limitations. All patients included in this study underwent laparoscopic surgery at a single institution performed by the same surgeon utilizing a multimodal analgesia ERAS pathway which may not be generalizable. The retrospective nature of the data collection and non-contemporaneous study groups introduces potential bias although no differences in patient selection, surgical technique, or order sets were introduced during the study period. Over 80% of our patients were female, which is consistent with the national average of patients undergoing bariatric surgery [13]. Since male gender may be an independent risk factor for chronic opioid use after surgery [14], our study may not reliably predict postoperative opioid discharge requirements in male patients. However, no differences in opioid consumption based on gender were identified.

Conclusion

An opioid sparing discharge protocol in laparoscopic bariatric surgery patients is feasible and appears to adequately manage postoperative pain. Less than 2% of patients discharged without opioids called the office due to concerns about pain and requested an opioid prescription. An opioid sparing discharge protocol has the potential to eliminate diversion and reduce new persistent opioid use with its subsequent associated negative outcomes following bariatric surgery.

Declarations

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

Consent to Participate Informed consent does not apply.

Conflict of Interest The authors declare no competing interests.

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