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Decreasing opioid prescribing at discharge while maintaining adequate pain management is sustainable

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Abstract

Background: In 2018, using a pragmatic multimodal approach, discharge opioid prescriptions were reduced without affecting pain control management. Herein, we assessed whether this approach was sustainable and whether discharge opioid prescriptions could be further reduced.

Methods: This is a single center prospective study of patients who underwent elective outpatient procedures provided by our institution's Acute Care Surgery Division surgeons. Adult patients who underwent elective surgeries performed by surgeons in the Division of Acute Care Surgery from November 2018 to June 2021 and agreed to participate were included. The opioid prescriptions pre-populated in the order set at discharge were reduced from 20 pills to 10 pills in May 2020. Demographics, opioid information, non-opioid adjuncts prescribed, reported use of opioids prescribed, and patients' satisfaction were collected. Opioids were converted to oral morphine equivalents (OME).

Results: A total of 178 patients were included. Elective surgeries performed mainly included inguinal hernia repair (38.8%), laparoscopic cholecystectomy (30.3%), cyst excision (13.5%), and umbilical hernia (8.4%). One hundred twenty-five and 53 patients underwent an elective operation with a surgeon in the Acute Care Surgery Division before and after the number of opioids pre-populated in the order set at discharge was reduced from 20 pills to 10 pills, respectively. Reducing the pre-populated discharge opioid prescriptions led to a significant decrease in OME prescribed (75 [75–76.5] vs. 80 [75–150], $p < 0.001$) without affecting patients' satisfaction with pain management (excellent/good: 87.8% vs. 84%; $p = 0.305$)

Conclusions: Our pragmatic multimodal approach is sustainable and allows for additional opioid prescription reduction without affecting patients' satisfaction with pain management.

Keywords

Opioids; Prescribing; Surgery; Quality improvement; Sustainability

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Declaration of Competing Interest

The authors have no conflict of interest to declare.

Introduction

In the United States, the number of opioid-related deaths has increased from 2019 to 2020. In Iowa, the number of opioid deaths has increased by nearly 20 percent during this time frame [1]. Overprescribing opioids can potentially lead to addiction, as well as excess opioids present in the community [2]. Unfortunately, there is a correlation between new persistent opioid use and common general surgery procedures [3–5]. Literature on decreasing opioid prescribing during the peri-operative period has been increasing steadily in the past five years [5–9]. A study in Michigan demonstrated the widespread over-prescription of opioids to post-surgical patients. It was demonstrated that patients prescribed more overall morphine equivalents (OME) consumed more opioids than their counterparts who were prescribed less for the same procedure [5]. Additional efforts have been made to correct the problem of the contribution of post-operative opioids contributing to the opioid epidemic. The Michigan Opioid Prescription Engagement Network is a quality improvement project that works to educate clinicians on opioid best practices while measuring patient-reported consumption and physician prescribing patterns [10].

In 2018, we targeted physician and resident prescribing habit, encouraged opioid adjuncts, and focused on patient education to target reduction of OME prescribed by the acute care surgery division post-operatively focusing on five common outpatient general surgery procedures: laparoscopic cholecystectomy, laparoscopic inguinal hernia repair, laparoscopic umbilical hernia repair, open umbilical hernia repair, and open inguinal hernia repair. Prior to the initiation of our study, there was a wide variance among prescribing habits of the acute care surgery division at our institution [6]. In our previous study, we demonstrated that a pragmatic multimodal approach focused on patients' education on pain management and opioid, providers' education on responsible opioid prescribing, creating order sets to facilitate pre- and post-operative adjunct use, and decreasing the number of opioids prescribed following five elective outpatient surgeries was successful at decreasing opioid prescriptions at discharge without affecting pain control management [6].

Multiple other studies have been published with similar results of education and introduction of protocols resulting in reduced opioid prescriptions [11–14]. Kawak et al. showed that ERAS protocols decreased opioid prescribing following laparoscopic colectomies [11]. Others demonstrated that reduction in opioid prescribing is achievable in ambulatory thyroid and parathyroid surgery as well as rotator cuff repair [12,13]. Higgins et al. demonstrated a reduction in prescribing habits of surgeons following education on implementing multimodal pain control regimens, as well as patient taking less opioids even when prescribed fewer pills [15].

Herein, our primary goal was to assess the durability of our previously implemented protocol with the intention of decreasing the OME prescribed perioperatively to individual patients. We hypothesized that the culture change and opioid reduction was sustainable and applicable to more than the initial five surgeries studied by assessing whether [1] there was a difference in the procedures performed in the two time periods [2], discharge opioid prescription started to vary again, and [3] patients' satisfaction with pain control management remained high.

Methods

Ethical statement

This QI protocol was deemed exempt from review by our institutional review board (HSRD # 201808777). This quality improvement project follows the SQUIRE 2.0 guidelines for quality improvement studies. Data were prospectively collected as part of a prospective research study approved by our institutional review board (IRB # 201810859). All participants were consented prior to the beginning of data collection.

Patient population

All adult patients (18 years and older) who underwent elective outpatient procedures provided by the Acute Care Surgery Division surgeons and who agreed to participate were included in this study.

Prospective data collection

We prospectively collected data on patients who underwent elective surgeries performed by surgeons in the Division of Acute Care Surgery from November 2018 to June 2021. Data collected included demographics, comorbidities, pre-admission medication history, the frequency and type of pre-operative adjuncts used (acetaminophen, gabapentin, and non-steroidal anti-inflammatory drugs (NSAIDs)), the frequency of use of regional anesthetic, local anesthetic and/or transversus abdominis plane (TAP) blocks, the quantity of opioid prescribed at discharge, and the frequency and type of post-operative adjuncts prescribed (acetaminophen and NSAIDs). We also queried electronic medical records for the number of phone calls generated regarding pain, the number of refills that were provided, and the amount of opioid prescribed to those patients who called with concerns regarding their pain control and those who received refills. Additionally, we collected the patients' post-operative pain satisfaction rating which was reported during their follow up clinic visit.

Quality improvement

Our initial QI was previously described [6]. Briefly, we created pre-operative order sets for five elective procedures for ease and compliance. Those included pre-operative adjunct prescription with set doses as well as local anesthetic administered by the surgeon and/or a transversus abdominis plane (TAP) block. Gabapentin, acetaminophen, and celecoxib vs. ketorolac were on the order set, available to be checked as appropriate for each patient. The hernia order set included an automatic order for a TAP block. We also modified the post-operative order set to include a box to prescribe scheduled acetaminophen and ibuprofen for five days and pre-set opioids and number of pills. The opioids listed to choose from with a prefilled quantity of 20 pills were oxycodone 5 mg, tramadol 50 mg, and hydromorphone 2 mg.

Patient and surgeon education has been ongoing since the initial QI. Based on our initial results showing that patients were reporting using less opioids than prescribed [6], the number of opioids pre-populated in the order set at discharge was reduced from 20 pills to 10 pills in May 2020.

Statistical analysis

Data pre- and post-decrease in default opioid prescription were compared. Pre- and post-decrease data were compared using Chi-square, Fisher's exact test, Mann-Whitney, and Wilcoxon tests as appropriate using SPSS 28.0 (Chicago, IL, USA). Graphs were prepared using GraphPrism (San Diego, CA, USA). Linear regression analysis was used to assess the effect of decreasing the default opioid quantity prescribed on actual OME prescribed and consumed while controlling for type of surgery and sex based on univariate analysis results. $P < 0.05$ was considered significant.

Results

Patient characteristics

Patient characteristics are presented in Table 1. A total of 178 patients were consented; 125 and 53 patients underwent an elective operation with a surgeon in the Acute Care Surgery Division before and after the number of opioids pre-populated in the order set at discharge was reduced from 20 pills to 10 pills, respectively. The groups did not differ significantly in age, comorbidities (chronic pain, anxiety, depression, other psychiatric conditions, or alcohol or drug abuse) or medications these patients were on prior to admission for their elective surgery. Before the decrease in the default opioid quantity, patients were more likely to be male and to undergo unilateral laparoscopic inguinal hernia repair or open umbilical hernia repair and less likely to undergo laparoscopic cholecystectomy or takedown of loop ileostomy (Table 1).

Decreasing the quantity of opioid prescribed did not affect pain management during hospitalization

As shown in Table 2, surgeons continued using the pre-operative order sets created as part of our initial QI project with 71.3% of patients receiving adjuncts on the day of surgery and 91% receiving regional anesthesia. Only few patients received opioids (10.7%) or adjuncts (11.2%) after their surgery pre-discharge. Decreasing the quantity of opioid prescribed at discharge did not affect pain management during hospitalization (Table 2).

Decreasing the pre-filled quantity of opioid pills prescribed at discharge resulted in further reduction of opioid prescription and use

As shown in Table 2, 79.2% of patients were prescribed opioid at discharge, 88.2% were prescribed adjuncts. As shown in Fig. 1, combination pills were no longer prescribed post-decrease. Hydromorphone (14.4% pre vs. 20.8% post-decrease) and oxycodone (49.6% pre vs. 73.6% post-decrease) were the most frequently prescribed opioids. Interestingly, the number of patients discharged without opioids significantly decreased after decreasing the number of opioid pills prescribed from 20 to 10 (27.2% pre vs. 5.7% post-decrease).

As shown in Fig. 2a and Table 2, the average number of opioid pills prescribed per patient was significantly lower post-decrease. The lower number of pills prescribed post-decrease also reflected a significantly lower OME prescribed per patient post-decrease (Table 2 and Fig. 2b). Interestingly, both pre- and post-decrease in the default number of opioid pills prescribed, patients reported consuming significantly fewer opioid pills than what was

originally prescribed. Decreasing the default number of opioid pills prescribed led to a significant decrease in the number of opioid pills consumed (Fig. 2a) and there was a trend towards a decrease in OME used (60 [24.4–75] pre vs. 37.5 [17–75] post-decrease, $p = 0.053$) (Fig. 2b). No significant changes in adjunct prescriptions were observed post-decrease in default number of opioid pills prescribed.

One hundred sixty-six patients (93.3%) presented for their follow up clinic visit. Of those, 134 patients (80.7%) had been discharged with an opioid prescription and 88 (65.7%) indicated that they used the opioid prescribed. They reported taking on average eight [3–10] pills representing 60 mg OME [22.5–75 mg] for three [2–5] days. As shown in Fig. 2b, the reported amount of opioid used was significantly lower than what the patients were prescribed at discharge before and after decrease. One hundred nineteen (71.7%) reported using an adjunct post-discharge. Decreasing the default number of opioid pills prescribed did not affect the number of opioid pills used ($p = 0.712$) or the number of days the patients used their opioid prescription ($p = 0.657$) or the use of adjunct ($p = 0.663$).

Controlling for gender and surgery type, linear regression analysis showed that decreasing the default number of opioid pills prescribed at discharge from 20 to 10 was associated with a significant decrease in OME prescribed at discharge ($B = -38.8$ mg OME [-21.1– -56.1]; $p < 0.001$) and OME used ($B = -25.8$ [-5.8– -45.6]; $p = 0.011$).

Regarding pain satisfaction, 24 patients (13.6%) called with concerns regarding their pain control and eight (4.5%) received an opioid prescription refill. Decreasing the default number of opioid pills prescribed did not affect the number of patients calling regarding pain control (pre 12.1% vs. post 17%, $p = 0.472$) or the number of opioid refills given (pre 4% vs. post 5.7%, $p = 0.698$) As shown in Fig. 3a, of the 166 patients who followed up in our clinic, 85.2% of patients rated their pain management as excellent or good, 13.3% as fair, and 1.5% as poor. Decreasing the default number of opioid pills prescribed at discharge from 20 to 10 did not negatively affect patients' satisfaction with their pain management (Fig. 3b and c).

Discussion

In 2018, we targeted physician and resident prescribing habit, encouraged adjuncts, and focused on patient education to target reduction of OME prescribed by the acute care surgery division post-operatively [6]. In this paper, the durability of the changes in prescribing habits of the acute care surgery division has been demonstrated given that the amount prescribed has not rebounded. With further education, the decrease in the pre-filled quantity of opioid pills prescribed at discharge resulted in further reduction of opioids prescribed. This coincided with a reduction in amount of OME used. There was no significant difference in patient satisfaction ratings regarding pain management.

The durable change showed in this study indicates a sustainable approach to changing the landscape of opioid prescribing post-operatively. Overprescribing can potentially lead to addiction and increases the availability of opioids in the community. There is a correlation between new persistent opioid use and general surgery procedures [3–5]. Our goal was

to demonstrate proven methods to decrease the unintentional negative consequences of post-operative pain control. We suspect that implementation of resident education and monthly onboarding instruction for the acute care surgery service led to a sustainable change.

We believe a key factor in our approach included patient education. Patients were informed of the plans for their post-operative pain management during their pre-operative visit. Some of our success may be related to managed expectations. Other interventions, which have found success in post-operative opioid consumption, have also targeted patient education. In fact, in Waljee et al.'s study, patients were informed about appropriate opioid use through quarterly meetings and published brochures in the peri-operative period to reduce peri-operative opioid consumption which contributed to reduction of consumption [10].

Furthermore, an additional reduction in opioid prescribed to individual patients did not affect pain control satisfaction. Interestingly, when the total OME prescribed to each patient was reduced, there was a corresponding reduction in opioid consumption. This mirrored a previous study that also demonstrated the correlation between increased amounts of opioid prescribed and additional patient consumption [5]. While our department has made a significant reduction in average opioid prescribed, there remains a statistically significant difference between amount prescribed and amount consumed. The reports of patient satisfaction with their pain control remained unchanged following the reduction of amounts of opioid prescribed. This is reassuring that further reduction did not negatively affect patient satisfaction. We suspect that there is an aspect of patient education that allows for this reduction while maintaining satisfaction. Previous studies have evaluated psychosocial therapies to alter a patient's experience of post-operative pain control [16,17]. We believe that this aspect of our approach contributed to stable patient satisfaction scores.

This study presents several limitations. This is a single institution study; thus, our data may not readily applicable to other settings. Additionally, the number of opioids taken following surgery is patient reported and may not be completely accurate. Patients with complications related to their surgery may have worse pain and, thus, increased opioid requirements; we did not collect any data regarding post-operative complications. Finally, while our initial QI only included five common outpatient general surgery procedures: laparoscopic cholecystectomy, laparoscopic inguinal hernia repair, laparoscopic umbilical hernia repair, open umbilical hernia repair, and open inguinal hernia repair; in this follow up study, we included all patients seen at our institution for an outpatient general surgery procedure. One could speculate that this could have affected our results when we reduced opioid prescription further. However, our data show that, overall, most patients post-decrease underwent one of the five common outpatient general surgery procedures selected in our initial study [6]. Seventy-seven percent of patients underwent one of those procedures in the post-reduction period. While we do not think that surgery type alone accounts for the decrease in opioid prescribed at discharge based on our multivariate analysis results and pain satisfaction post-operatively, we believe that, by including a more heterogenous population, we demonstrated that the protocol was generalizable to more than the initial population studied in the QI project. This may increase the likelihood of clinicians adopting and adhering to this practice.

Further studies are warranted to determine if we can further reduce opioid prescriptions without affecting patient satisfaction. The larger impact of this study may be demonstrated with additional studies assessing opioid prescription habits in other departments or divisions

Conclusions

Implementation of a multifaceted approach to decrease opioid prescribing in the outpatient setting is sustainable and allowed for additional reduction in opioid prescription without affecting patients' satisfaction with pain management.

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Dr. Allan has full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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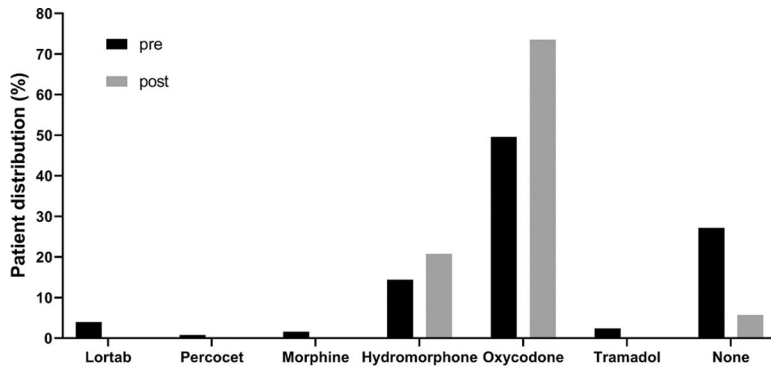


Fig. 1. Distribution of patients prescribed combination pills and/or opioids at discharge pre- and post-decrease.

Chi-square test showed a significant difference between the groups ($p < 0.01$).

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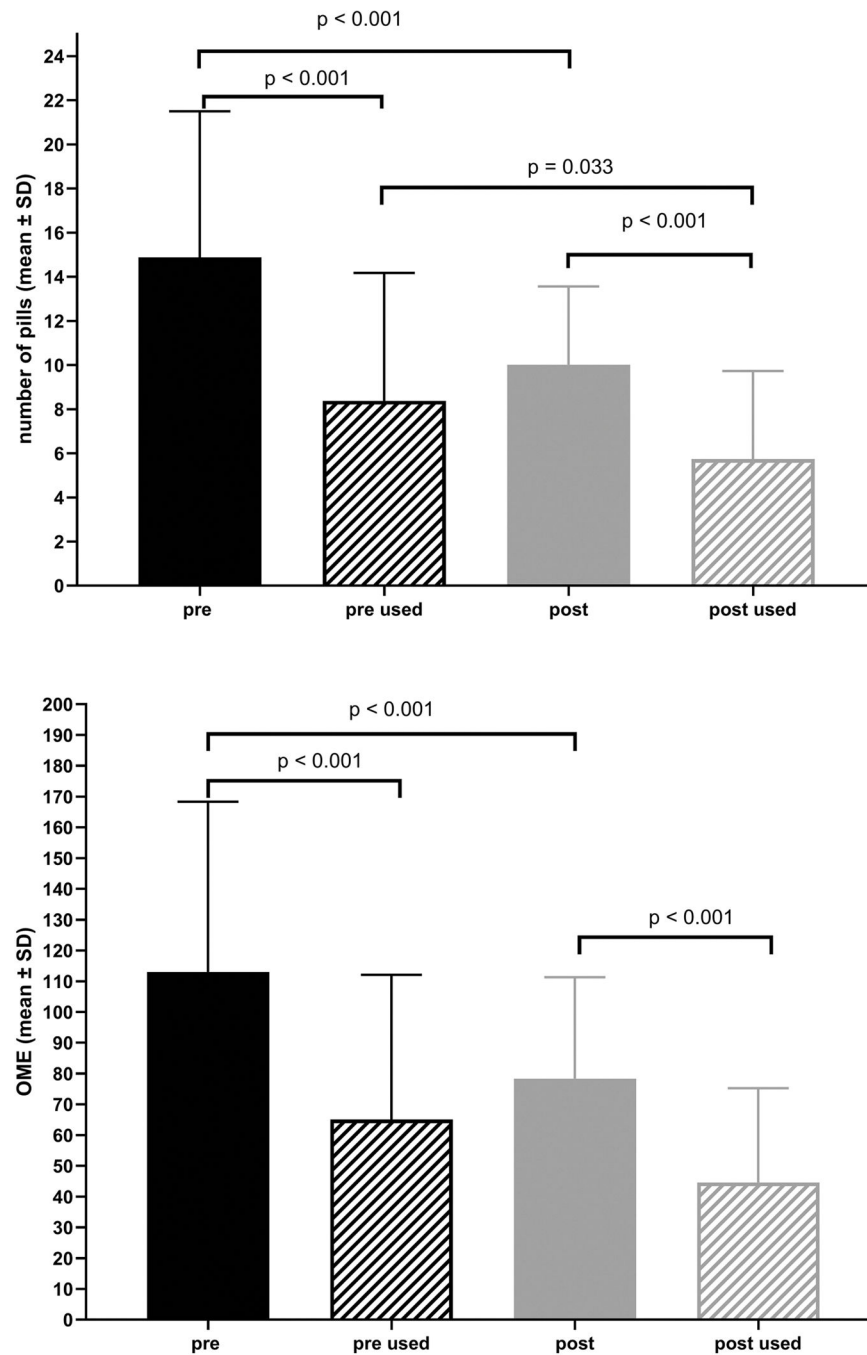


Fig. 2. Change in opioid prescription. (a) Average number of pills prescribed pre- and post- decrease and average number of opioid pills used as reported by patients during their follow up visit. (b) Average oral morphine equivalent (OME) pre- and post-decrease and average OME used as reported by patients during their follow up visit.

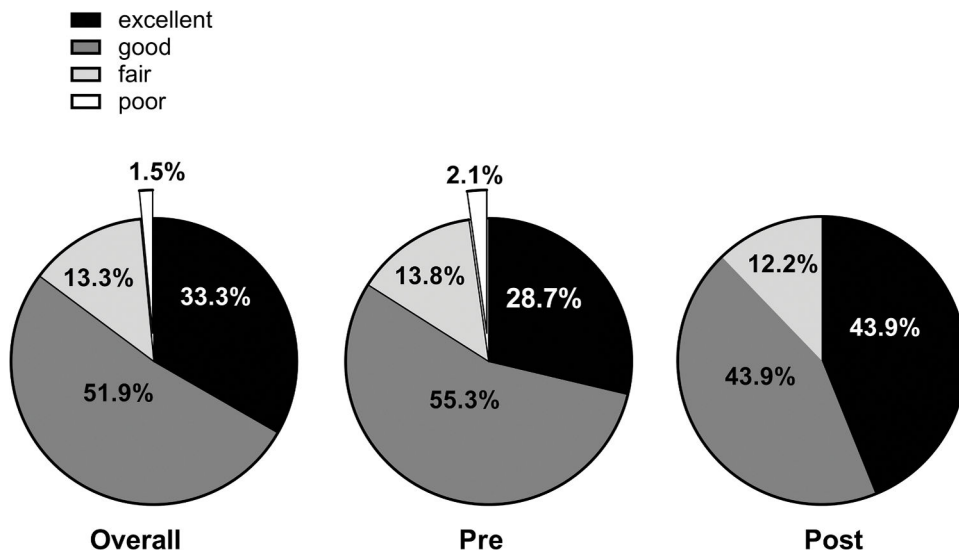


Fig. 3.
Patient satisfaction ratings regarding pain management.

Table 1

Patient characteristics.

	Overall population	Pre-decrease	Post-decrease	<i>p</i> -value
	<i>n</i> = 178	<i>n</i> = 125	<i>n</i> = 53	
Age, median [IQR]	53 [35–65]	54 [35–66.5]	51 [35–59.5]	0.132
Male, n (%)	96 (53.9)	74 (59.2)	22 (41.5)	0.034
Race, n (%)				0.484
Caucasian	154 (86.6)	107 (85.6)	47 (88.7)	
African American	10 (5.6)	9 (7.2)	1 (1.9)	
Other/unknown	14 (7.8)	9 (7.2)	5 (9.4)	
Comorbidities, n (%)				
Chronic pain	39 (21.9)	30 (24)	9 (17)	0.330
Anxiety	32 (18)	19 (15.2)	13 (24.5)	0.142
Depression	51 (28.7)	36 (28.8)	15 (28.3)	>0.999
Other psychiatric conditions	17 (9.6)	9 (7.2)	8 (15.1)	0.160
Alcohol Abuse	6 (3.4)	4 (3.2)	2 (3.8)	>0.999
Drug Abuse	18 (10.1)	13 (10.4)	5 (9.4)	>0.999
Family history of alcohol abuse	30 (16.9)	20 (16)	10 (18.9)	0.665
Family history of drug abuse	4 (2.2)	2 (1.6)	2 (3.8)	0.583
Pre-admission medication history, n (%)				
opioid	18 (10.1)	15 (12)	3 (5.7)	0.279
benzodiazepine	20 (11.2)	11 (8.8)	9 (17)	0.125
insomnia medication	6 (3.4)	2 (1.6)	4 (7.5)	0.065
muscle relaxant	9 (5.1)	4 (3.2)	5 (9.4)	0.130
anti-depressant	45 (25.3)	30 (24)	15 (28.3)	0.574
other psychiatric medication	9 (5.1)	5 (4)	4 (7.5)	0.454
Surgery information				
Surgery type, n (%)				
unilateral laparoscopic inguinal hernia repair	16 (9)	15 (12)	1 (1.9)	0.042
bilateral laparoscopic inguinal hernia repair	2 (1.1)	1 (0.8)	1 (1.9)	0.508
unilateral open inguinal hernia repair	48 (27)	37 (29.6)	11 (20.8)	0.270
bilateral open inguinal hernia repair	3 (1.7)	2 (1.6)	1 (1.9)	>0.999
open umbilical hernia repair	15 (8.4)	14 (11.2)	1 (1.9)	0.042
laparoscopic cholecystectomy	54 (30.3)	28 (22.4)	26 (49.1)	0.001
exploratory laparotomy/ cyst /mass/skin excision	3 (1.7)	3 (2.4)	0	0.556
Wound exploration/closure	24 (13.5)	16 (12.8)	8 (15.1)	0.811
Colostomy	2 (1.1)	2 (1.6)	0	>0.999
Laparoscopic ventral hernia repair	2 (1.1)	2 (1.6)	0	>0.999
Open ventral hernia repair	2 (1.1)	2 (1.6)	0	>0.999
Open epigastric hernia repair	5 (2.8)	4 (3.2)	1 (1.9)	>0.999
Diagnostic laparoscopy	1 (0.6)	1 (0.8)	0	>0.999
Open epigastric hernia repair	1 (0.6)	1 (0.8)	0	>0.999
Open epigastric hernia repair	2 (1.1)	1 (0.8)	1 (1.9)	0.508

	Overall population	Pre-decrease	Post-decrease	
Excision of foreign body	1 (0.6)	1 (0.8)	0	>0.999
Takedown loop ileostomy	3 (1.7)	0	3 (5.7)	0.025
Neurectomy	2 (1.1)	0	2 (3.8)	0.087

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Table 2

In-hospital pain management and discharge information.

	Overall population n = 178	Pre-decrease n = 125	Post-decrease n = 53	p value
In-hospital pain management				
Day of surgery adjunct, n (%)	127 (71.3)	86 (68.8)	41 (77.4)	0.281
First adjunct, n (%)				
Acetaminophen	124 (97.6)	83 (96.5)	41 (100)	0.55
Gabapentin	3 (2.4)	3 (3.5)	0	
Second Adjunct, n (%)				
Celecoxib	4 (3.9)	4 (5.6)	0	0.317
Acetaminophen	1 (1)	1 (1.4)	0	
Gabapentin	97 (95.1)	66 (93)	31 (100)	
Regional anesthesia, n (%)				
block	29 (17.9)	21 (18.4)	8 (16.7)	0.496
local	130 (80.2)	90 (78.9)	40 (83.3)	
spinal	3 (1.9)	3 (2.6)	0	
Pre-discharge opioid, n (%)	19 (10.7)	15 (12)	4 (7.5)	0.44
Pre-discharge adjunct	20 (11.2)	14 (11.2)	6 (11.3)	>0.999
Discharge information				
Discharge opioid, n (%)	141 (79.2)	91 (72.8)	50 (94.3)	<0.001
OME, median [IQR]	75 [75–150]	80 [75–150]	75 [75–76.3]	<0.001
number of pills, mean [SD]	13.2 [6.2]	14.9 [6.6]	10 [3.5]	<0.001
Discharge Adjunct, n (%)	157 (88.2)	107 (85.6)	50 (94.3)	0.129

IQR = Interquartile; SD = standard deviation