



Inpatient Opioid Use After Pancreatectomy: Opportunities for Reducing Initial Opioid Exposure in Cancer Surgery Patients

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ABSTRACT

Background. Despite advances in enhanced surgical recovery programs, strategies limiting postoperative inpatient opioid exposure have not been optimized for pancreatic surgery. The primary aims of this study were to analyze the magnitude and variations in post-pancreatectomy opioid administration and to characterize predictors of low and high inpatient use.

Methods. Clinical characteristics and inpatient oral morphine equivalents (OMEs) were downloaded from electronic records for consecutive pancreatectomy patients at a high-volume institution between March 2016 and August 2017. Regression analyses identified predictors of total OMEs as well as highest and lowest quartiles.

Results. Pancreatectomy was performed for 158 patients (73% pancreaticoduodenectomy). Transversus abdominus plane (TAP) block was performed for 80% ($n = 127$) of these patients, almost always paired with intravenous patient-controlled analgesia (IV-PCA), whereas 15% received epidural alone. All the patients received scheduled non-opioid analgesics (median, 2). The median total OME administered was 423 mg (range 0–4362 mg). Higher total

OME was associated with preoperative opioid prescriptions ($p < 0.001$), longer hospital length of stay (LOS; $p < 0.001$), and no epidural ($p = 0.006$). The lowest and best quartile cutoff was 180 mg of OME or less, whereas the highest and worst quartile cutoff began at 892.5 mg. After adjustment for inpatient team, only epidural use [odds ratio (OR) 0.3; $p = 0.04$] predicted lowest-quartile OME. Preoperative opioid prescriptions (OR 8.1; $p < 0.001$), longer operative time (OR 3.4; $p = 0.05$), and longer LOS (OR 1.1; $p = 0.007$) predicted highest-quartile OME.

Conclusions. Preoperative opioid prescriptions and longer LOS were associated with increased inpatient OME, whereas epidural use reduced inpatient OME. Understanding the predictors of inpatient opioid use and the variables predicting the lowest and highest quartiles can inform decision-making regarding preoperative counseling, regional anesthetic block choice, and novel inpatient opioid weaning strategies to reduce initial postoperative opioid exposure.

Opioid abuse is a US public health crisis, with opioid overdose currently the leading cause of injury-related mortality.¹ A rapid increase in opioid prescriptions has contributed to this crisis by increasing chronic use and diversion.^{2–4} Surgeons are in part responsible because approximately 6–15% of opioid-naïve surgical patients will become persistent opioid users.^{5–7} Cancer surgery patients are at particularly high risk because 10–15% of opioid-naïve cancer survivors continue using opioids after curative-intent surgery of the abdomen and thorax.^{8,9}

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Increasing data implicate preoperative factors, operative variables, inpatient opioid use, provider variation, and bias as potential predictors of discharge opioid prescriptions.^{10,11} In this era of enhanced surgical recovery, understanding inpatient opioid use can lead to evidence-based strategies aimed at reducing initial opioid exposure. This will, in turn, mitigate the risks of persistent opioid use among cancer surgery survivors and diversion to their families and communities.

Published data on inpatient postoperative opioid use are scarce because most data on this topic are cross-sectional and from cohort studies of outpatient prescriptions. Furthermore, data on opioid use in hepatopancreatobiliary cancer surgery are nonexistent. A better understanding about the magnitude and variation of opioid use can inform prospective studies of inpatient and discharge opioid reduction strategies. Moreover, this can lead to more effective preoperative patient education for those at risk for high opioid use. Therefore, to identify actionable areas for opioid reduction, our primary aim in this study was to characterize patient and perioperative factors associated with inpatient opioid use after pancreatectomy.

PATIENTS AND METHODS

Patients

This was a single-institution retrospective cohort study. A new electronic health record (EHR) initiated in March 2016 allowed for the comprehensive collection of opioid data. Data from consecutive patients at least 18 years old who underwent pancreatectomy for tumors with curative intent at the University of Texas MD Anderson Cancer Center from March 2016 to August 2017 were collected from a prospectively maintained surgical database.¹² Two inpatient rounding teams, each with multiple attending surgeons, one advanced practice provider, and a surgical oncology or hepatopancreatobiliary surgery fellow provided care. The inpatient team was noted for each patient. Patients were excluded if pancreatectomy was performed as part of a multivisceral procedure or in combination with another operation. The local institutional review board approved this study (PA17-0726).

Adverse Events

We perform prospective surveillance to grade and document all adverse events (AEs) within 90 days after pancreatectomy.^{13–15} Postoperative pancreatic fistulas (POPFs) were graded per international criteria.^{16–18} This surveillance included a telephone call to patients 90 days after surgery to ensure accurate data collection.

Multimodal Pain Management Strategy and Opioid Data Collection

In collaboration with the Division of Pharmacy, inpatient encounters were queried for all inpatient opioids.¹⁹ Pharmacy data allowed for electronic abstraction of each opioid dose charted in the medication record. All routes of opioids were summarized, including intermittent intravenous, oral, and intravenous patient-controlled analgesia (IV-PCA) totals. Epidural catheter-infused opioids were excluded because we did not consider them as systemic opioids.²⁰

The patients routinely received either a transversus abdominus plane (TAP) block or an epidural as their initial intraoperative regional anesthetic block and were classified by their first regional anesthetic if they received a rescue block later. A mixture of up to 266 mg liposomal bupivacaine and 150 mg bupivacaine was used in all TAP blocks.

Opioid Dose Conversion

After collection of individual patient opioid doses, amounts were converted to oral morphine equivalents (OMEs) using accepted conversion ratios shown in a validated online calculator.^{21–25} For example, 5 mg of OME was equivalent to each of the following doses of common opioid analgesics: 0.4 mg of intravenous hydromorphone, 5 mg of oxycodone, 5 mg of hydrocodone, or 50 mg of tramadol. Tramadol was classified as an opioid as it is by the US Drug Enforcement Agency and Food and Drug Administration.²⁶

Statistical Analysis

Patient characteristics were summarized using descriptive statistics. Linear and logistic regression models were used to assess the association between patient characteristics with total inpatient OME and binary outcomes, respectively. Covariates with *p* values lower than 0.10 in the univariate analyses were included in the multivariate models. Backward selection was implemented until all remaining predictors had a *p* value lower than 0.05. Statistical analyses were performed using SAS 9.3 (The SAS Institute, Cary, NC, USA).

RESULTS

Patient Clinical and Perioperative Characteristics

Figure 1 details the schema for patient selection. From March 2016 to August 2017, 178 patients underwent

pancreatectomy. The study excluded 20 of these patients because of multivisceral resection. During this time, the median total inpatient OME administered was 423 mg.

The patients were classified into quartiles based on their total inpatient OME (Fig. 2). A total of 40 patients were in the lowest quartile of OME use (cutoff, < 180 mg OME), and 39 were in the highest quartile (starting with > 892.5 mg OME; Table 1).

Summary characteristics can be found in Table 1. The median age of the patients was 65 years (range 25–88 years), and 46% ($n = 73$) were female. The majority of the patients underwent a pancreaticoduodenectomy (PD; 73%). Almost half of the patients (48.1%) received a pancreatic adenocarcinoma. An open approach was used for 94% ($n = 148$), with a median operative time of 419 min (range 149–913 min) and a median estimated blood loss (EBL) of 300 mL (range 25–2500 mL). Approximately 11% of the patients ($n = 18$) received an intraoperative transfusion. Postoperatively, 20% ($n = 31$) manifested grade B/C POPF, and 11% ($n = 16$) had other anastomotic leaks. The median LOS was 7 days (range 3–51 days).

Highest and Lowest Quartiles of OME

The patients were stratified into quartiles based on their individual total inpatient OME use postoperatively (Fig. 2). Analyses were then performed using total inpatient OME to identify characteristics of the lowest and highest quartiles. The lowest (best)-quartile patients used 180 mg or less, whereas the highest-quartile patients required more than 892.5 mg. The patients who used more than 180 mg but 892.5 mg or less represented the middle two quartiles. The characteristics of the patients within these quartiles can be found in Table 1.

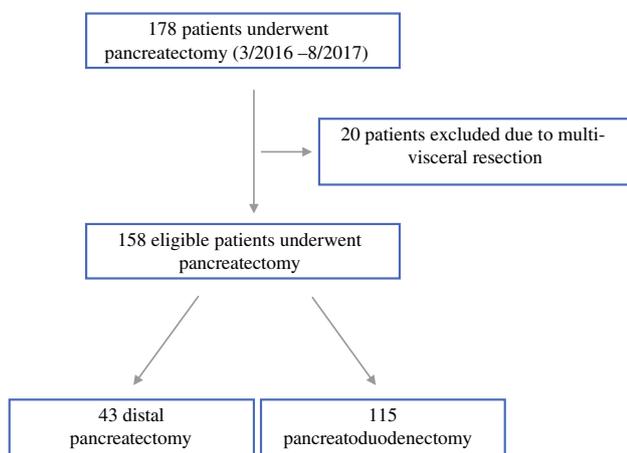


FIG. 1 Flowchart of patients included in the study

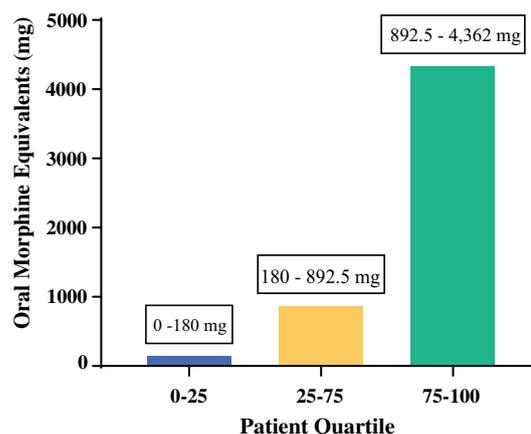


FIG. 2 Quartiles of patient total inpatient oral morphine equivalent (OME) use after pancreatectomy. The bounds of patient quartiles are denoted above each bar. Total inpatient OME of the lowest (best) quartile (0–25th percentile) ≤ 180 mg, middle quartiles (25–50th percentile) 180–892.5 mg, and highest quartile (75–100th percentile) 892.5–4362 mg)

Significant differences between the OME quartiles included preexisting outpatient opioid prescription ($p = 0.003$), operative time ($p = 0.05$), delayed gastric emptying (DGE; $p = 0.014$), and LOS ($p = 0.005$; Table 1). No differences were seen among the groups regarding history of prior abdominal surgery ($p = 0.72$), PD versus distal pancreatectomy (DP; $p = 0.16$), or grade B/C POPF ($p = 0.73$).

Perioperative Analgesia

Due to our recent enhanced recovery trend away from pain management methods requiring an indwelling catheter, most patients had an intraoperative TAP block placed by the anesthesia attending surgeon or the acute pain team (80.4%; Table 1), whereas a minority underwent an epidural (14.6%). Together with the TAP block, 118 patients (74.6%) also had concomitant IV-PCA. The highest-quartile OME was associated with TAP block ($p = 0.02$), IV-PCA ($p < 0.001$), or TAP + IV-PCA ($p < 0.001$) (Table 1).

Total Inpatient OME Linear Regression

The factors associated with total inpatient OME are presented in Table 2. In the univariate analysis, older patient age ($p = 0.02$), undergoing DP rather than PD ($p = 0.02$), and having an epidural ($p = 0.02$) were associated with a lower total inpatient OME. Having a preoperative opioid prescription ($p = 0.01$) and a longer LOS ($p < 0.001$) were associated with a higher inpatient OME. Prior abdominal surgery, body mass index, histology, and POPF were not significantly associated with total

TABLE 1 Patient and perioperative characteristics

	Total (n = 158) n (%)	≤ 180 mg OME (n = 40) n (%)	180–892.5 mg OME (n = 79) n (%)	> 892.5 mg OME (n = 39) n (%)	p Value
Median age: years (range)	64.5 (25–88)	68 (43–88)	64 (27–81)	62 (25–81)	0.18
Female	73 (46.2)	18 (45)	40 (50.6)	15 (38.5)	0.45
BMI: kg/mm ² (range)	26.24 (17.82–43.94)	26.24 (19.15–43.66)	26.24 (17.82–43.94)	26.01 (18.57–43.73)	0.58
Prior abdominal surgery	91 (57.6)	24 (60)	43 (54.4)	24 (61.5)	0.72
Preoperative opioid prescription	15 (9.6)	1 (2.6)	5 (6.3)	9 (23.1)	0.003
PDAC	76 (48.1)	20 (50)	38 (48.1)	18 (46.2)	0.94
Primary site					
Pancreas	127 (80.4)	33 (82.5)	63 (79.7)	31 (79.5)	0.96
Ampulla	10 (6.3)	2 (5)	6 (7.6)	2 (5.1)	
Other	21 (13.3)	5 (12.5)	10 (12.7)	6 (15.4)	
Pancreatectomy					0.16
DP	43 (27.2)	13 (32.5)	24 (30.4)	6 (15.4)	
PD	115 (72.8)	27 (67.5)	55 (69.6)	33 (84.6)	
Operation					0.07
Open	148 (93.7)	35 (87.5)	74 (93.7)	39 (100)	
Laparoscopic	10 (6.3)	5 (12.5)	5 (6.3)	0 (0.0)	
Median operative time: min (range)	418.5 (149–913)	439.5 (194–871)	405 (149–724)	437 (188–913)	0.05
Median EBL: mL (range)	300 (25–2500)	340 (70–1800)	250 (25–2500)	350 (50–2000)	0.07
Intraoperative transfusion	18 (11.4)	5 (12.5)	6 (7.6)	7 (17.9)	0.24
POPF	31 (19.6)	8 (20)	17 (21.5)	6 (15.4)	0.73
DGE	26 (17.1)	1 (2.6)	15 (20)	10 (26.3)	0.01
Other anastomotic leak	16 (10.5)	1 (2.6)	11 (14.7)	4 (10.5)	0.14
Median LOS: days (range)	7 (3–51)	6 (3–23)	7 (3–22)	8 (5–51)	0.005
Epidural	23 (14.6)	11 (27.5)	9 (11.4)	3 (7.7)	0.02
TAP block	127 (80.4)	26 (65)	65 (82.3)	36 (92.3)	0.008
IV-PCA	132 (83.5)	21 (52.5)	73 (92.4)	38 (97.4)	< 0.001
TAP + IV-PCA	118 (74.7)	19 (47.5)	64 (81)	35 (89.7)	< 0.001
Median OME: mg (range)					
Total inpatient (range)	423.15 (0–4361.9)	81.5 (0–180)	427.5 (185–892.5)	1287.3 (905–4361.9)	< 0.001
Total IV-PCA	295 (0–2990)	0.35 (0–160)	310 (0–750)	1085 (0–2990)	< 0.001

OME oral morphine equivalent, BMI body mass index, PDAC pancreatic ductal adenocarcinoma, PD pancreaticoduodenectomy, DP distal pancreatectomy, EBL estimated blood loss, POPF postoperative pancreatic fistula, DGE delayed gastric emptying, LOS length of stay, TAP transversus abdominus plane, IV-PCA intravenous patient-controlled analgesia

inpatient OME (all $p > 0.05$). In the multivariate analysis, having a preoperative opioid prescription ($p < 0.001$) and longer LOS ($p < 0.001$) were independently associated with greater inpatient OME, whereas epidural use ($p = 0.006$) was associated with reduced inpatient OME.

Predictors of Lowest Quartile OME

When the lowest quartile was compared with the remaining cohort, older patient age ($p = 0.04$), inpatient team ($p = 0.02$), and having an epidural ($p = 0.01$) were

associated with the lowest quartile in the univariate analysis (Table 3). In the multivariate analysis, only epidural use was independently associated with the lowest-quartile OME ($p = 0.04$; Table 3).

Predictors of Highest Quartile OME

We then compared the highest quartile of total inpatient OME with the remaining cohort to determine factors associated with the highest total inpatient OME. In the multivariate analysis, preoperative opioid prescription

TABLE 2 Factors associated with total inpatient opioid administration

	Univariate estimate (95% CI)	<i>p</i> Value	Multivariate estimate (95% CI)	<i>p</i> Value
Age (years)	− 9.84 (− 18.39 to − 1.28)	0.02		
Sex (male vs. female)	59.41 (− 154.24 to 273.05)	0.58		
Prior abdominal surgery	11.48 (− 204.24 to 227.21)	0.92		
Preoperative opioid prescription	452.83 (95.47 to 810.19)	0.01	626.75 (337.42 to 916.09)	< 0.001
BMI at presentation (kg/m ²)	4.25 (− 17.14 to 25.64)	0.70		
Log (EBL, mL)	42.48 (− 84.95 to 169.92)	0.51		
Log (operative time, min)	161.22 (− 140.57 to 463.01)	0.29		
Inpatient team (1 vs. 2)	− 203.59 (− 493.98 to 86.79)	0.17		
PDAC	− 41.88 (− 255.17 to 171.40)	0.70		
DP versus PD	− 278 (− 513.55 to − 42.45)	0.02		
POPF	163.87 (− 103.37 to 431.11)	0.23		
LOS (days)	66.65 (49.83 to 83.47)	< 0.001	70.96 (55.21 to 86.72)	< 0.001
Epidural	− 360.51 (− 657.48 to − 63.54)	0.02	− 339.85 (− 582.63 to − 97.07)	0.006

CI confidence interval, BMI body mass index, EBL estimated blood loss, PDAC pancreatic ductal adenocarcinoma, DP distal pancreatectomy, PD pancreaticoduodenectomy, POPF postoperative pancreatic fistula, LOS length of stay

TABLE 3 Patient characteristics associated with lowest-quartile total oral morphine equivalent (OME) (> 180 vs. ≤ 180 mg)

	Univariate OR (95% CI)	<i>p</i> Value	Multivariate OR (95% CI)	<i>p</i> Value
Age: years (range)	0.97 (0.93–1.00)	0.04		
Sex (male vs. female)	0.94 (0.46–1.93)	0.86		
Prior abdominal surgery	0.88 (0.42–1.82)	0.72		
Preoperative opioid prescription	5.12 (0.65–40.23)	0.12		
BMI at presentation: kg/m ² (range)	0.98 (0.92–1.06)	0.67		
Log (EBL): mL (range)	0.75 (0.48–1.16)	0.20		
Log (operative time): min (range)	0.69 (0.25–1.93)	0.48		
Inpatient team (1 vs. 2)	0.35 (0.15–0.86)	0.02		
PDAC	0.90 (0.44–1.85)	0.78		
DP versus PD	0.71 (0.32–1.55)	0.39		
Clinically relevant POPF	0.97 (0.39–2.38)	0.94		
LOS: days (range)	1.10 (0.99–1.23)	0.07		
Epidural	0.30 (0.12–0.75)	0.01	0.36 (0.14–0.95)	0.04

OR odds ratio, CI confidence interval, BMI body mass index, EBL estimated blood loss, PDAC pancreatic ductal adenocarcinoma, DP distal pancreatectomy, PD pancreaticoduodenectomy, POPF postoperative pancreatic fistula, LOS length of stay

($p < 0.001$), longer operative time ($p = 0.05$), and longer LOS ($p = 0.007$) were independent predictors of the highest quartile of total inpatient OME (Table 4).

DISCUSSION

Despite advances in enhanced surgical recovery programs, strategies to limit initial inpatient opioid exposure have not been optimized to date. This study aimed to summarize the magnitude and variation in inpatient opioid use after pancreatectomy and to characterize patient, perioperative, and hospital factors associated with the spectrum

of total inpatient OME. We found that the median total inpatient OME from this contemporary study period was 423 mg. Almost all the patients had some form of regional anesthesia, typically TAP block with concomitant IV-PCA (75%). Preoperative opioid prescription and longer LOS were associated with increased inpatient OME, whereas epidural use reduced inpatient OME.

Inadequate treatment of acute postoperative pain adversely impacts outcomes after major surgery, particularly after hepatopancreatobiliary surgery.^{27–29} However, the risk of persistent opioid use after cancer surgery is

TABLE 4 Patient characteristics associated with highest quartile of total inpatient oral morphine equivalent (OME) (> 892.5 vs. ≤ 892.5 mg)

	Univariate OR (95% CI)	<i>p</i> Value	Multivariate OR (95% CI)	<i>p</i> Value
Age (years)	0.99 (0.96–1.02)	0.48		
Sex (male vs. female)	1.52 (0.73–3.18)	0.27		
Prior abdominal surgery	1.24 (0.59–2.60)	0.57		
Preoperative opioid prescription	5.60 (1.85–16.97)	0.002	8.10 (2.48–26.51)	< 0.001
BMI (kg/m ²)	1.04 (0.97–1.12)	0.23		
Log (EBL, mL)	1.45 (0.93–2.26)	0.10		
Log (operative time, min)	3.32 (1.11–9.95)	0.03	3.36 (1.00–11.33)	0.05
Inpatient team (1 vs. 2)	0.53 (0.17–1.66)	0.28		
PDAC	0.90 (0.44–1.86)	0.78		
DP versus PD	0.40 (0.16–1.04)	0.06		
Clinically relevant POPF	0.68 (0.26–1.81)	0.44		
LOS: days	1.09 (1.01–1.18)	0.02	1.12 (1.03–1.21)	0.007
Epidural	0.41 (0.12–1.47)	0.17		

OR odds ratio, CI confidence interval, BMI body mass index, EBL estimated blood loss, PDAC pancreatic ductal adenocarcinoma, DP distal pancreatectomy, PD pancreaticoduodenectomy, POPF postoperative pancreatic fistula, LOS length of stay

reported to be as high as 15%, so providers must particularly recognize dangers of treating postoperative pain with over-prescription of opioids.⁸

To minimize surgeons' contributions to the national opioid crisis, we must focus on characterizing what drives postoperative opioid administration, then enact objectively driven strategies to minimize the patient, operative, and hospital factors that have an impact on opioid prescription. The relationship between initial postoperative opioid exposure and long-term opioid use is highlighted by the fact that persistent opioid use at 1 year is associated with initial opioid prescription.²⁶ Therefore, efforts should be made to decrease inpatient opioid dosing and hasten weaning efforts down to the last inpatient day. Aggressive multimodal non-opioid oral analgesic packages can be applied to all cancer surgery patients, particularly those undergoing potentially curative resection.³⁰

A common strategy to limit inpatient opioid use is through regional anesthesia, such as epidurals. Detractors of epidurals criticize the modest improvements in postoperative pain scores despite their resource-intensive nature requiring expertise for placement, active management of hypotension and fluid retention, daily rounding needs, and risks of catheter displacement.^{31–36} However, a contemporary randomized controlled trial by our group noted improved patient-reported pain scores and decreased opioid use for patients undergoing major hepatopancreatobiliary operations with epidurals versus IV-PCA alone.³⁷ In line with this previous trial, the current study showed epidural use to be the only independent predictor of lowest-quartile OME. This likely was because a TAP block is almost always paired with an IV-PCA,

which during this study period was not standardized, resulting in a tremendous contribution to the total inpatient OME.

Despite these findings favoring epidurals in terms of less total OME, the pragmatic move away from routine epidural use has already occurred in our hospital and others due to the aforementioned practical concerns of epidural management that run counter to enhanced surgical recovery principles. Therefore, instead of reverting to using more epidurals, the impetus should be on improving regional plane blocks such as TAP, quadratus lumborum, and erector spinae plane, as well as on reducing or eliminating IV-PCA use with these blocks.

Perhaps the single largest preoperative risk factor for postoperative opioid use in our study was a preexisting opioid prescription, with an odds ratio of 8.1 for highest quartile use. These patients with significant preoperative opioid exposure are even at increased risk for opioid overdose during the postoperative period.³⁸ Many cancer patients fit this category due to neoplastic pain and discomfort during neoadjuvant therapy.

In our cohort, almost 10% of the patients had a preoperative opioid prescription, and only one of these patients ended up within the lowest quartile OME. Due to the small number of these patients, we did not perform any further post hoc analyses if this subgroup. Because most pancreatectomies are elective, there is ample opportunity to intervene and implement strategies to decrease opioid use as part of preoperative physiologic optimization programs. Identifying these patients at highest risk for large opioid requirements might drive the increasingly rare decision to choose an epidural.

Some potential limitations of this study warrant discussion, including the retrospective, single-institution cohort design. Retrospectively, we did not have the ability to discern patient-reported outcomes and pain scales that led to opioid prescription and administration, and thus the appropriateness of dosing and distribution could not be analyzed. Our sample size was one of convenience, chosen from the time of our new EHR implementation in March 2016. However, to limit selection bias, we analyzed consecutive patients. Because of the study's retrospective design, some between-group differences existed naturally among the lowest, middle 50%, and highest-quartile patients. We attempted to control for this using regression models. Furthermore, intraoperative opioid administration during general anesthesia was not reported. Finally, we had no institutional data on persistent opioid use beyond the postoperative period for our patient cohort because it is not part of our current workflow except when patients answer medicine reconciliation questions during clinic visits. Prospective evaluation of postoperative opioid reduction protocols is ongoing at our hospital, and an integral component of these will be patient-reported opioid use and functional outcomes at short- and long-term intervals after surgery.

Despite these limitations, a particular strength of this study was the retrieval from the EHR of comprehensive, granular data regarding exact opioid dosing. Efforts are in place to modify our institutional EHR to report opioid conversions to OME within the daily summary views available to providers.

This study represents the most in-depth analysis of postoperative inpatient opioid use in the field of hepatopancreatobiliary surgery, and we submit that the results have implications for the tens of thousands of cancer patients who undergo abdominal operations annually in the United States. This study may thus serve as a template for other institutions to evaluate a cohort of their own patients to analyze the magnitude and variation of inpatient opioid use and the local associated factors.

To make progress on limiting postoperative opioid exposure, we must implement specific strategies encompassing the entire perioperative period. We suggest four pillars leading to reduction of postoperative opioid exposure. First, we must start with effective preoperative education and counseling for all ranks of providers and patients regarding efforts to minimize opioid exposure and their rationale. This will reduce anxiety and help define realistic expectations.

Second, we must limit total inpatient OME exposure through effective use of regional anesthetic blocks, multimodal non-opioid medication packages, and reduction or elimination of IV-PCA use, especially in the first 24 h after

surgery. This early inpatient exposure is the factor on which all discharge opioid amounts, outpatient use, and potential persistent use all are built.

Third, an aggressive inpatient weaning process should target a goal of zero or nearly zero daily OME by discharge. This includes the continued use of multimodal non-opioid packages, with the addition of novel inpatient weaning strategies, and liberal use of regional anesthetic blocks including rescue blocks.³⁹ We believe this component often is neglected in current enhanced recovery protocols, which focus on ambulation, fluid management, and alimentary tract recovery.

Finally, after reduction of inpatient opioid exposure, provider variation in discharge opioid prescription amounts must be minimized, with discharge prescriptions tailored to the procedure, the patient's use, or both to minimize over-prescription.¹⁰⁻¹⁹

CONCLUSION

In this study, preoperative opioid prescription and longer LOS were associated with increased inpatient OME, whereas epidural use reduced inpatient OME. Understanding the predictors of inpatient opioid use, including the variables predicting the lowest- and highest-quartile patients, can inform local decisions regarding regional anesthetic block choice and novel inpatient opioid weaning strategies to reduce initial postoperative opioid exposure. Going forward, we suggest prospective studies based on the following four pillars: preoperative counseling, limiting initial inpatient opioid exposure, rapid inpatient weaning, and standardizing discharge prescription protocols.

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