Wide Variation and Overprescription of Opioids After Elective Surgery

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Objective: We aimed to identify opioid prescribing practices across surgical specialties and institutions.

Background: In an effort to minimize the contribution of prescription narcotics to the nationwide opioid epidemic, reductions in postoperative opioid prescribing have been proposed. It has been suggested that a maximum of 7 days, or 200 mg oral morphine equivalents (OME), should be prescribed at discharge in opioid-naïve patients.

Methods: Adults undergoing 25 common elective procedures from 2013 to 2015 were identified from American College of Surgeons National Surgical Quality Improvement Program data from 3 academic centers in Minnesota, Arizona, and Florida. Opioids prescribed at discharge were abstracted from pharmacy data and converted into OME. Wilcoxon Rank-Sum and Kruskal-Wallis tests assessed variations.

Results: Of 7651 patients, 93.9% received opioid prescriptions at discharge. Of 7181 patients who received opioid prescriptions, a median of 375 OME (interquartile range 225–750) were prescribed. Median OME varied by sex (375 men vs 390 women, $P = 0.002$) and increased with age (375 age 18–39 to 425 age 80+, $P < 0.001$). Patients with obesity and patients with non-cancer diagnoses received more opioids (both $P < 0.001$). Subset analysis of the 5756 (75.2%) opioid-naïve patients showed the majority received >200 OME (80.9%). Significant variations in opioid prescribing practices were seen within each procedure and between the 3 medical centers.

Conclusions: The majority of patients were overprescribed opioids. Significant prescribing variation exists that was not explained by patient factors. These data will guide practices to optimize opioid prescribing after surgery.

Keywords: narcotic, opioid, postoperative pain, prescription, surgery

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At a press conference in 1992 the Health and Human Services secretary declared that patients who undergo surgery suffer unnecessary pain and that the notion that opioids used for postoperative pain are often addictive is a myth.[1] The data behind this statement arose from a short letter to the editor of *New England Journal of Medicine*.[2] The mentality that followed in the next 2 decades, and initiatives such as the "fifth vital sign," led to a dramatic rise in the use of opioid pain medications for the management of acute pain in the United States.[3]

Today we face an opioid epidemic: more than 5 million Americans abuse opioids,[4] opioid overdoses result in more than 33,000 deaths annually,[5] and opioid abuse resulted in an aggregate economic burden of $78.5 billion in 2013 alone.[6] Contrary to popular belief, high-volume prescribers are not predominantly responsible for the nation's opioid epidemic.[7] The majority (71%) of opioid abusers receive drugs through diversion of an appropriately obtained prescription for an inappropriate use, and in 55% of these cases, the drug is obtained from a family member or friend who has excess pills.[4,8] Holding onto unused opioids can place family members at risk of overdose, and poisoning attributed to prescription opioids is now one of the leading cause of injury-related mortality in the United States.[9,10] Opioid prescriptions written by surgeons to treat postsurgical pain directly contribute to this epidemic.[11]

Postdischarge opioid prescriptions are an important and necessary part of the recovery process after many surgical procedures. A survey of patients before surgery found that 59% reported concerns regarding pain control after surgery, whereas only 51% were concerned whether or not the surgery would improve their condition.[12] However, it is suspected that more than 70% of opioids prescribed at discharge after surgery go unused,[13] and 1 out of every 3 postsurgical opioid prescriptions is abused.[14] In addition, the risk of chronic opioid dependence after receiving opioids for surgery has been well documented.[11,15] Surgeons are second only to pain medicine physicians in the rate of opioid prescribing and surgeons write 10% of all opioids prescriptions annually[16]; therefore, it is imperative that surgeons do their part to combat the opioid epidemic.

Current postdischarge opioid prescribing practices after surgery are not evidence based and typically involve prescribing arbitrary round numbers of pills at the discretion of the surgeon. Although clinical standards for inpatient prescribing have been developed,[17] there are limited resources to guide outpatient prescribing practices after surgery. The Centers for Disease Control (CDC) suggest that the treatment of acute pain should be limited to less than 7 days,[18] and the state of Massachusetts has gone as far as to restrict opioid prescriptions for acute pain to a 7-day supply.[19] A proposed Minnesota state guideline aimed at reducing opioid dependency and substance use recommends no more than 7 days, or 200 oral morphine equivalents (OME in milligrams) be prescribed after a surgical procedure.[20] These guidelines are supported by data recently published by the CDC which identified a sharp increase in the risk of long-term opioid use for patients prescribed more than 5 days of opioids.[21] It is unknown to what extent postdischarge prescribing practices align with a 7-day, or 200 OME, maximum, approximately 26 five-milligram tablets of oxycodone (1 tablet every 6 hours for 7 days).

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Overprescription of opioid pain medication after surgery has the potential to place patients, their families, and the community at risk. The paucity of data on postdischarge opioid prescribing practices and lack of evidence-based guidelines continues to drive subjective prescribing practices in surgical patients. Herein we report the opioid prescribing practices across specialties and institutions with the aim that these data will guide practices to optimize opioid prescribing after surgery.

METHODS

Cohort

Institutional data from the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) were used to identify 25 of the most commonly performed procedures across the spectrum of surgical subspecialties at 3 affiliated academic medical centers in Minnesota, Arizona, and Florida through primary Current Procedural Terminology codes (Appendix, http://links.lww.com/SLA/B269). Patients who underwent one of these procedures and were discharged between January 1, 2013 and December 31, 2015 were identified.

Patients younger than 18 years, those who had urgent or emergent operations, and those with an in-hospital death or transfer to another inpatient acute care hospital were excluded. Patients with unrelated concurrent procedures or bilateral procedures were excluded when applicable (Appendix, http://links.lww.com/SLA/B269). Procedures commonly performed within the scope of an operation were not considered concurrent procedures and thus included [eg, ureteral stents, lymphadenectomy (except axillary lymph node dissection), and cholangiography]. Lastly, Minnesota patients refusing research authorization were excluded.

Patient and Procedural Data

Demographic data, diagnosis codes, procedure codes, and in-hospital and 30-day outcomes were sourced from institutional ACS-NSQIP data. Primary postoperative diagnosis, recorded using *International Classification of Diseases, Ninth Revision* and *Tenth Revision* codes, was manually grouped into cancer versus noncancer diagnosis. Patient characteristics were categorized for analysis. Admissions were classified by inpatient versus outpatient per ACS-NSQIP criteria. Any in-hospital complication included any surgical site infection, wound disruption, pneumonia, reintubation, pulmonary embolism, ventilator for more than 24 hours, renal insufficiency, acute renal failure, stroke/cerebrovascular accident, cardiac arrest, myocardial infarction, deep vein thrombosis, systemic sepsis or septic shock, return to the operating room, or urinary tract infection. In-hospital return to the operating room and readmissions within 30 days after surgery were also evaluated. Prolonged postoperative length of stay (LOS) was defined as the top quartile for each procedure.

Opioid Data

Medications in the pharmaceutical subclass of ‘‘opioid agonist,’’ ‘‘opioid partial agonist,’’ and ‘‘opioid combinations’’ with a Drug Enforcement Administration schedule of II or III were considered prescription opioid pain medications. Both liquid and tablet medications were included. Topical fentanyl patches (n = 11), methadone (n = 3), and opium tincture (n = 1) were excluded.

Medical records were abstracted for all prescriptions written in the 90 days before the surgery and up to 30 days after discharge. Documented medications as indicated by the patient on intake were also identified during the preoperative time period; patients either prescribed or with a history of opioid use in the 90 days before surgery (up to 7 days before surgery) were considered preoperative opioid users, whereas those with no documented history of opioid use and who did not get any prescriptions for opioids in this time period were considered opioid naïve.[15,22] Prescriptions written in the 7 days before surgery, during the admission, and on the day of discharge were considered discharge prescriptions—this range was necessary because some services proactively provide patients with their postdischarge opioid prescription before surgery. Medical records were reviewed to confirm the integrity of the cohort. Refills were defined as any opioid prescribed from 1 to 30 days after discharge regardless of where in the health system the refill originated, and thus including those written by surgeons, emergency room providers, or primary care providers.

Opioid prescriptions were converted into OME in milligrams (Appendix, http://links.lww.com/SLA/B269).[23] Within opioid-naïve patients, OME was categorized into quartiles prescribed within each procedure group to address potential confounding due to the variation in prescribing practices by procedure. Additional comparisons were made between patients whose prescription for opioids at discharge fell within the top quartile (Q4) of OME prescribed within their procedure group (considered to have a ‘‘top-quartile prescription’’) compared to patients in the lower 3 quartiles (Q1-Q3).

Statistical Analysis

Univariate comparisons of demographics, surgical factors, in-hospital complications, 30-day readmission, discharge prescriptions, and opioid refills used Wilcoxon Rank-Sum and Kruskal-Wallis tests for continuous variables and χ^2 and Fisher exact tests for categorical variables. Variation in discharge opioid prescribing practices in opioid-naïve patients was stratified across the 25 surgical procedures. Within opioid-naïve patients, further univariate comparisons by top-quartile prescriptions and refill status were conducted. Multivariable logistic regression was performed with outcomes of top-quartile prescriptions and refill in opioid-naïve patients and adjusted for age group, sex, diagnosis, prolonged LOS, medical center, and any complication. Refill status analysis also adjusted for quartile prescriptions (OME) to account for procedural variations. Missing data were handled as a separate category unless missing in fewer than n = 10 patients. Statistical analysis was performed using SAS version 9.4 (SAS Institute Inc, Cary, NC). All P values were considered statistically significant at $P < 0.05$.

RESULTS

To evaluate postdischarge prescribing practices we identified 7651 patients who underwent 1 of 25 elective procedures across 3 centers (2013–2015). The majority of cases were from Hospital A (60.8%) with 20.8% from Hospital B and 18.4% from Hospital C. Median age was 64 [interquartile range (IQR) 55, 72] years with 51.6% being women. The majority of operations were inpatient (67.6%) and required general anesthesia (83.4%) with a median LOS of 1 (IQR 1, 2) day. Almost all patients (93.9%) received opioid prescriptions at discharge. Over a quarter of patients (26.2%) received a tramadol prescription, which was nearly always (92.9% of the time) prescribed in addition to another opioid. A median of 375 OME (IQR 225–750) were prescribed at discharge with 4 out of 5 patients (81.2%) receiving more than the recommended maximum amount of opioids (>200 OME).

Unadjusted analysis, not controlling for procedure type, demonstrated that the median OME varied by sex (375 male vs 390 female, $P = 0.002$) and increased with age (375 age 18–39, 338 age 40–59, 425 60–79, and 425 age 80+ years, $P < 0.001$). Patients who were obese [body mass index (BMI $\geq$ 30)] tended to receive more opioids at discharge than normal BMI patients (median OME 450 vs 338) as did patients with a noncancer diagnosis (median OME 600 vs 225, both $P < 0.001$). The median OME prescribed did not vary over time (median 375 in 2013, 390 in 2014, and 375 in 2015, $P = 0.11$). Nearly one fifth of all patients (19.1%) received a refill within 30 days (range 49.8% total knee to 1.9% parathyroidectomy).

Opioid-naïve Patients Versus Preoperative Opioid Users

Across all procedures a quarter of patients (n = 1895, 24.8%) were preoperative opioid users before surgery. Comparison of preoperative opioid users to opioid-naïve patients revealed significant variations in demographics and operative factors (Table 1). Preoperative opioid users received nearly double the OME at discharge (median 600 vs 375, $P < 0.001$) and had nearly double the rate of refills (29.2% vs 15.7%, $P < 0.001$) compared to opioid-naïve patients (Table 1). LOS (median 2 vs 1 day, $P < 0.001$) and readmission rate (4.6% vs 3.3%, $P = 0.007$) were greater in preoperative opioid users compared to opioid naïve.

TABLE 1. Comparison of Opioid-naïve Patients to Preoperative Opioid Users Across All 25 Procedures

	All n = 7651	Opioid Naïve n = 5756 (75.2%)	Preoperative Opioid User n = 1895 (24.8%)	*P*
Demographics				
Age, median (IQR)	64 (55, 72)	64 (55, 72)	63 (54, 72)	0.002
Age, category				0.08
18–39 Years	603	437 (7.6%)	166 (8.8%)	
40–59 Years	2148	1588 (27.6%)	560 (29.6%)	
60–79 Years	4263	3248 (56.4%)	1015 (53.6%)	
80+ Years	637	483 (8.4%)	154 (8.1%)	
Sex, female	3948	2903 (50.4%)	1045 (55.1%)	<0.001
Male	3703	2853 (49.6%)	850 (44.9%)	
Race/ethnicity				0.015
Non-Hispanic white	6812	5149 (89.5%)	1663 (87.8%)	
Other	278	189 (3.3%)	89 (4.7%)	
Unknown	561	418 (7.3%)	143 (7.5%)	
BMI, median (IQR)*	29.0 (25.4, 33.3)	28.7 (25.4, 33.0)	29.8 (25.6, 34.4)	<0.001
BMI, ≥30*	3283	3360 (58.7%)	971 (51.5%)	<0.001
<30	4331	2368 (41.3%)	915 (48.5%)	
Year of operation (row %)				0.62
2013	2402	1797 (74.8%)	605 (25.2%)	
2014	2505	1877 (74.9%)	628 (25.1%)	
2015	2744	2082 (75.9%)	662 (24.1%)	
Patient/operative factors				
Admission type				0.21
Inpatient	5171	3868 (67.2%)	1303 (68.8%)	
Outpatient	2480	1888 (32.8%)	592 (31.2%)	
Anesthesia type				0.31
General	6380	4814 (83.6%)	1566 (82.6%)	
Locoregional	1271	942 (16.4%)	329 (17.4%)	
Cancer diagnosis, yes	1958	1684 (29.3%)	274 ((14.5%)	<0.001
No	5693	4072 (70.7%)	1621 (85.5%)	
Current smoker, yes	601	391 (6.8%)	210 (11.1%)	<0.001
No	7050	5365 (93.2%)	1685 (88.9%)	
Outcomes				
LOS, median (IQR)	1 (1, 2)	1 (1, 2)	2 (1, 3)	<0.001
Return to OR†, yes	23	19 (0.3%)	4 (0.2%)	0.41
No	7628	5737 (99.7%)	1891 (99.8%)	
Any complication†, yes	69	50 (0.9%)	19 (1.0%)	0.59
No	7582	5706 (99.1%)	1876 (99.0%)	
Any SSI†, Yes	11	7 (0.1%)	4 (0.2%)	0.48
No	7640	5749 (99.9%)	1891 (99.8%)	
Readmission‡, yes	275	188 (3.3%)	87 (4.6%)	0.007
No	7365	5561 (96.7%)	1804 (95.4%)	
Discharge opioid prescriptions				
Discharge prescription				<0.001
Opioids	7181	5513 (95.8%)	1668 (88.0%)	
No opioids	470	243 (4.2%)	227 (12.0%)	
OME prescribed, median (IQR)	375 (225, 750)	375 (225, 750)	600 (225, 900)	<0.001
OME >200 prescribed at discharge, yes	6212	4646 (80.7%)	1552 (81.9%)	0.25
No	1439	1110 (19.3%)	343 (18.1%)	
Opioid refill§, yes	1460	906 (15.7%)	554 (29.2%)	<0.001
No	6191	4850 (84.3%)	1341 (70.8%)	

*Missing in n = 37 patients.
†In-hospital.
‡30 Days from index procedure, missing in n = 11 patients (n = 7 naïve, n = 4 tolerant).
§Within 30 days of discharge.
OR indicates operating room; SSI, surgical site infection.

Variations by Center

Significant variations were seen between the 3 centers with the rate of opioid tolerance ranging from 22.9% at Hospital A and 23.9% at Hospital B to 32.0% at Hospital C ($P < 0.001$). Within opioid-naïve patients, significant variations in median OME prescribed at discharge were observed (median 300 Hospital A, 375 Hospital B, 450 Hospital C, $P < 0.001$). Although all procedures were performed across the 3 centers, there was variation in the frequency of procedures at each location, confounding the overall measures of prescribed OME and refills. However, when identifying patients in the top quartile of prescribed OME *within each procedure*, variation across sites remained (17.7% of patients in Hospital A received a prescription in the top quartile for their procedure compared to 35.6% in Hospital B and 37.1% in Hospital C, $P < 0.001$).

Opioid-naïve Patients Controlling for Procedure Type

Analysis of the 5756 (75.2%) opioid-naïve patients showed that the majority (80.9%) of patients received greater than 200 OME at discharge [median of 375 (IQR 225, 750)]. The only procedures in which greater than 50% of the patients received less than 7 days of opioids or 200 OME at discharge were parathyroidectomy (58.0%), thyroid lobectomy (59.5%), and carotid endarterectomy (68.3%). Within all other procedures, more than half of patients received prescriptions greater than 200 OME. The amount of opioids prescribed at discharge varied significantly both across procedures and within each procedure type (Fig. 1).

Patients with age ranging from 40 to 59 years were most likely to receive a top-quartile prescription (28.0% vs 23.1% age 18–39, 24.9% age 60–79, and 14.1% age 80+, $P < 0.001$). Women were less likely to have a top-quartile prescription (23.5%) than men (26.0%, $P = 0.025$). No difference was seen in regards to BMI, admission type, cancer diagnosis, prolonged LOS, in-hospital complications, or readmission, whereas patients who received general anesthesia were more likely to receive a top-quartile prescription (25.7% vs 20.0%, $P < 0.001$). The proportion of patients with a top-quartile prescription significantly increased across the duration of the study: 22.0% 2013, 25.4% 2014, 26.5% 2015, $P = 0.005$. Additional comparisons are shown in Table 2.

Opioid-naïve Patients Requiring a Refill

The refill rate in opioid-naïve patients was 15.7% and varied significantly across procedure (Fig. 1). Refills were more likely among patients who were women (refill rate 18.3% vs 13.1% men, $P < 0.001$) or obese (20.3% vs 12.6%, $P < 0.001$), but less likely among patients with a cancer diagnosis (11.1% vs 32.6%, $P < 0.001$). Refills were more common in patients who received a top-quartile prescription (19.3% vs 14.1% Q1, 14.4% Q2, and 14.9 Q3, $P < 0.001$). Patients who needed a refill also had a significantly longer LOS, but no difference in refill rate by in-hospital complications was observed (Table 3). Of the readmitted patients, 43.6% required a refill compared to only 14.8% of those without a readmission ($P < 0.001$). The majority of the readmitted patients (74.4%) received the refill before readmission. Current prescribing practices

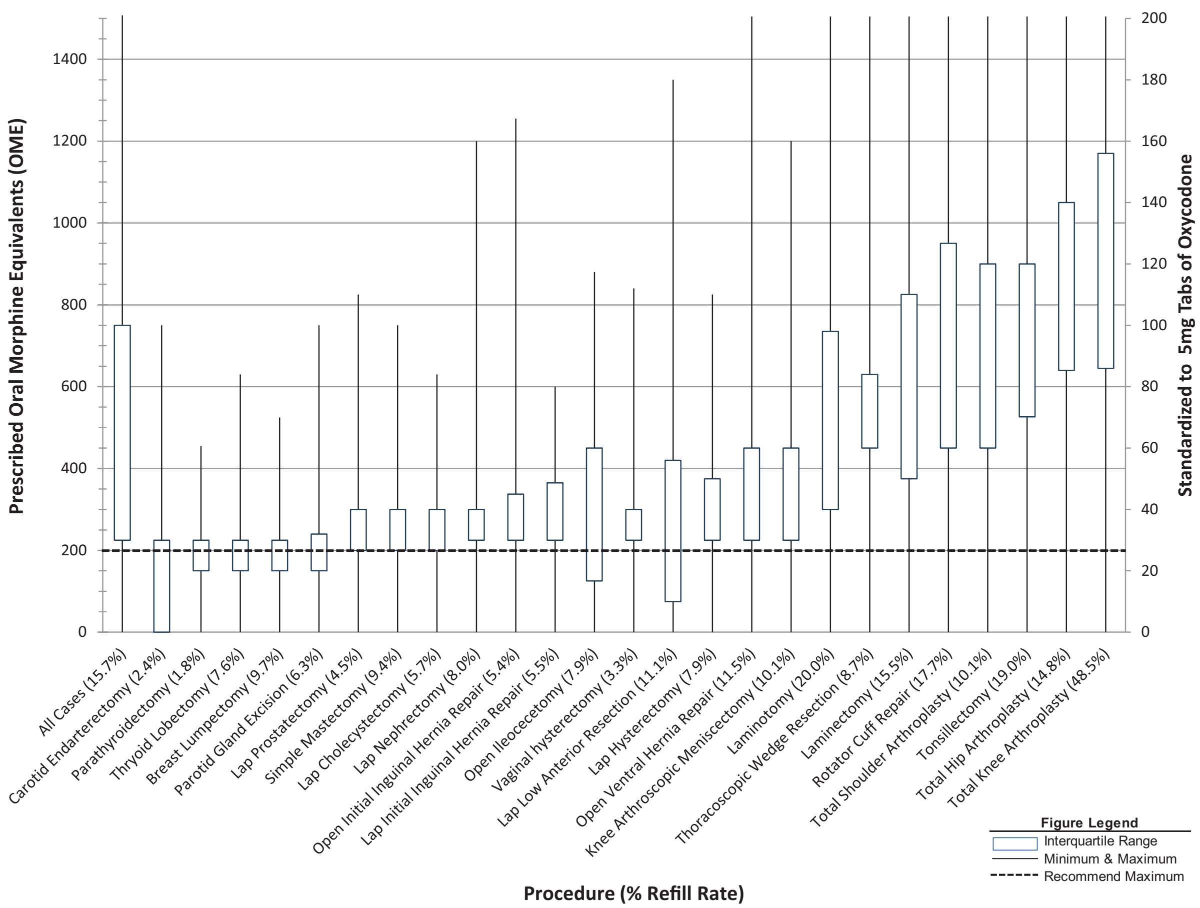

FIGURE 1. Discharge opioid prescribing practices in opioid-naïve patients across 25 common elective surgical procedures.