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Opioids Prescribed After Low-Risk Surgical Procedures in the United States, 2004–2012

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Abstract

Adverse events related to opioid analgesics are common.[1,2] Although opioids represent a component of pain treatment regimens following low-risk surgery,[3,4] few data exist regarding patterns of postoperative opioid prescribing over time. We assessed trends in the amount of hydrocodone/acetaminophen and oxycodone/acetaminophen prescribed, 2 opioids commonly used for postoperative pain management.

Methods

The University of Pennsylvania determined this research was exempt from review. We identified patients from the Clinformatics Data Mart Database (OptumInsight),[5] including health care encounters of approximately 14 million primarily commercially insured patients. Adults in the database tend to be younger and from the South compared with the US population. The database includes pharmacy and medical claims with data on services and procedures.

The sample included opioid-naive adults (age, 18–64y) who underwent 1 or more of 4 low-risk surgical procedures in 2004, 2008, or 2012: carpal tunnel release, laparoscopic

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Study concept and design: Wunsch, Wijeysundera, Neuman.
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Drafting of the manuscript: Wunsch, Neuman.
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cholecystectomy, inguinal hernia repair, or knee arthroscopy. Patients who filled any opioid prescription in the 6 months before surgery were excluded. We assessed the proportion of patients who filled any opioid prescription (and specifically hydrocodone/ acetaminophen or oxycodone/acetaminophen) in the 7 days after hospital discharge (inpatients) or after the procedure date (outpatients).

For patients who filled a prescription for hydrocodone/ acetaminophen or oxycodone/ acetaminophen, we calculated morphine equivalents dispensed using a standard conversion table.[6] We calculated the mean duration of prescriptions, daily morphine equivalent dose, and total morphine equivalents across the procedures and over time. We assessed trends using linear regression, adjusting for age, sex, inpatient/outpatient procedure, and region. Two-sided *P* values less than .05 were considered statistically significant; SAS (SAS Institute), version 9.3, was used.

Results

Characteristics of opioid-naive patients who underwent a low-risk surgical procedure (N = 155 297) changed over time, becoming more likely to be older and male and less likely to have inpatient surgery. Within 7 days, 80.0% filled a prescription for any opioid, and 86.4%of these prescriptions were for hydrocodone/acetaminophen or oxycodone/ acetaminophen (Table 1). The proportion filling a prescription for hydrocodone/ acetaminophen or oxycodone/acetaminophen varied across surgical procedures from 59.7% (carpal tunnel release) to 75.5% (inguinal hernia repair). The proportions of patients filling prescriptions for any opioid and for hydrocodone/ acetaminophen and oxycodone/ acetaminophen increased over time for all surgical procedures (Table 1).

Among patients filling a prescription for hydrocodone/ acetaminophen or oxycodone/ acetaminophen, the mean morphine equivalents dispensed ranged from 203.0(95%CI, 202.1–204.0) for laparoscopic cholecystectomy to 268.8 (95% CI, 267.6–270.0) for knee arthroscopy (Table 2). The mean morphine equivalents dispensed increased over time for all procedures: adjusted increase from 2004 through 2012,29.71 (95% CI, 28.08–31.35; $P < .001$). The adjusted increase was highest for knee arthroscopy: 45.16 morphine equivalents (95% CI, 42.26–48.07; $P < .001$). This increase was driven by an increase in the mean daily dose prescribed, with little change in the duration of prescriptions (Table 2).

Discussion

In this cohort, 70%of opioid-naive patients who underwent low-risk surgical procedures filled a prescription for hydrocodone/acetaminophen or oxycodone/acetaminophen within 7 days after discharge or the procedure date. The mean morphine equivalent dose increased over time for all procedures examined, with an increase of 18%(potency equivalent to an additional 45mg of morphine) for patients undergoing knee arthroscopy, driven by a change in the mean daily dose. Because the cohort was restricted to opioid-naive individuals, these changes are unlikely to represent an appropriate response by prescribing physicians to increasing rates of opioid tolerance over time within the population. Possible explanations

include an increased focus on pain treatment or an increasing reliance on opioids for postoperative pain relief vs alternative therapies.

Limitations include restriction to 4 surgical procedures; lack of data after 2012, as further changes in prescribing practices could have occurred; use of data that may not be generalizable; and an inability to determine which patients received a prescription that they did not fill. Details regarding source data for the database were provided to us by the vendor in working documents; there may be uncertainty regarding the validity, completeness, and accuracy of the data. Further research should assess the contribution of postoperative opioid prescribing practices to the epidemic of prescription opioid-related abuse.

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Table 1

Characteristics of Opioid-Naive Patients Who Underwent Carpal Tunnel Release, Laparoscopic Cholecystectomy, Inguinal Hernia Repair, or Knee Arthroscopy Surgical Procedures, 2004–2012

		Carpal Tunnel Release			Laparoscopic Cholecystectomy			Inguinal Hernia Repair			Knee Arthroscopy		
Patient Characteristics	**Total Cohort**	**2004**	**2008**	**2012**	**2004**	**2008**	**2012**	**2004**	**2008**	**2012**	**2004**	**2008**	**2012**
Total patients, No.	155 297	7459	7123	6567	14 615	17 165	15 409	8719	8311	6266	20 867	22 945	19 851
Filling a prescription within 7 d, No. (%)													
Any opioid	124 207 (80.0)	5402 (72.4)	5369 (75.4)	5000 (76.1)	10 995 (75.2)	13 621 (79.4)	12 464 (80.9)	7223 (82.8)	7098 (85.4)	5375 (85.8)	16 504 (79.1)	18 882 (82.3)	16 274 (82.0)
Hydrocodone/ acetaminophen or oxycodone/acetaminophen	107 348 (69.1)	4030 (54.0)	4249 (59.7)	4340 (66.1)	8586 (58.8)	11 538 (67.2)	11 469 (74.4)	6197 (71.1)	6378 (76.7)	5019 (80.1)	14 172 (67.9)	16 620 (72.4)	14 750 (74.3)
Age, mean (SD), y	45.3 (11.9)	48.4 (9.7)	49.7 (9.3)	50.2 (9.7)	42.6 (11.5)	43.0 (11.8)	43.2 (11.9)	45.1 (12.0)	46.4 (11.9)	47.5 (12.0)	44.3 (11.9)	45.7 (12.1)	46.4 (12.3)
Men, No. (%)	76 912 (49.5)	2210 (29.6)	2254 (31.6)	2333 (35.5)	3342 (22.9)	4201 (24.5)	4075 (26.5)	7919 (90.8)	7593 (91.4)	5755 (91.8)	12 309 (59.0)	13 437 (58.6)	11 484 (57.9)
Inpatient procedure, No. (%)	6367 (4.1)	53 (0.7)	56 (0.8)	35 (0.5)	2014 (13.8)	1910 (11.1)	1439 (9.3)	203 (2.3)	164 (2.0)	116 (1.9)	168 (0.8)	130 (0.6)	79 (0.4)
Region, No, (%)													
Northeast	14 454 (9.3)	669 (9.0)	640 (9.0)	542 (8.3)	1120 (7.7)	1228 (7.2)	1100 (7.1)	999 (11.5)	864 (10.4)	666 (10.6)	2130 (10.2)	2336 (10.2)	2160 (10.9)
South	68 060 (43.8)	2888 (38.7)	3152 (44.3)	2848 (43.4)	6827 (46.7)	9030 (52.6)	7943 (51.6)	3504 (40.2)	3777 (45.5)	2728 (43.5)	7728 (37.0)	9817 (42.8)	7818 (39.4)
Midwest	51 859 (33.4)	3252 (43.6)	2529 (35.5)	2352 (35.8)	5047 (34.5)	4737 (27.6)	4311 (28.0)	3131 (35.9)	2551 (30.7)	1886 (30.1)	7981 (38.3)	7323 (31.9)	6759 (34.1)
West	20 853 (13.4)	647 (8.7)	799 (11.2)	823 (12.5)	1611 (11.0)	2168 (12.6)	2047 (13.3)	1078 (12.4)	1114 (13.4)	982 (15.7)	3011 (14.4)	3467 (15.1)	3106 (15.7)
Unknown	71 (0.1)	<10	<10	<10	10 (0.1)	<10	<10	<10	<10	<10	17 (0.1)	<10	<10

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Table 2

Total Opioids Prescribed, Mean Daily Dose, and Duration of Prescription for Opioid-Naive Patients Who Filled an Opioid Prescription for Hydrocodone/Acetaminophen or Oxycodone/Acetaminophen Within 7 Days After Surgery (Outpatients) or Hospital Discharge (Inpatients), 2004–2012

	Total Morphine Equivalents Prescribed			Mean Daily Dose Prescribed, mg			Duration of Prescription, d		
Surgery Type	**Mean (95% CI)**	**Absolute Change (95% CI)**	***P* Value[a]**	**Mean (95% CI)**	**Absolute Change (95% CI)**	***P* Value[a]**	**Mean (95% CI)**	**Absolute Change (95% CI)**	***P* Value[a]**
All 4 surgical procedures[b]									
All years	235.1 (234.4 to 235.8)			51.6 (51.4 to 51.7)			5.0 (5.0 to 5.1)		
2004	219.2 (218.1 to 220.2)	Reference		48.7 (48.5 to 49.0)	Reference		5.1 (5.0 to 5.1)	Reference	
2008	237.4 (236.3 to 238.5)	17.83 (16.23 to 19.44)	<.001	51.0 (50.7 to 51.2)	2.19 (1.84 to 2.54)	<.001	5.1 (5.1 to 5.1)	0.03 (−0.01 to 0.07)	.10
2012	247.4 (246.1 to 248.8)	29.71 (28.08 to 31.35)	<.001	54.8 (54.6 to 55.1)	6.29 (5.93 to 6.65)	<.001	4.9 (4.9 to 5.0)	−0.12 (−0.17 to 0.08)	<.001
Carpal tunnel release[c]									
All years	213.1 (211.1 to 215.1)			47.0 (46.7 to 47.4)			5.0 (4.9 to 5.0)		
2004	201.6 (198.7 to 204.5)	Reference		44.4 (43.8 to 45.1)	Reference		5.1 (5.0 to 5.2)	Reference	
2008	216.4 (213.1 to 219.8)	13.21 (8.34 to 18.08)	<.001	46.6 (45.9 to 47.2)	2.03 (1.06 to 2.99)	<.001	5.1 (5.0 to 5.1)	−0.05 (−0.17 to 0.07)	.39
2012	220.5 (216.6 to 224.4)	17.58 (12.74 to 22.43)	<.001	50.0 (49.3 to 50.7)	5.38 (4.42 to 6.34)	<.001	4.8 (4.7 to 4.9)	−0.30 (−0.41 to −0.18)	<.001
Laparoscopic cholecystectomy[c]									
All years	203.0 (202.1 to 204.0)			49.2 (49.0 to 49.5)			4.6 (4.5 to 4.6)		
2004	190.1 (188.4 to 191.8)	Reference		47.0 (46.6 to 47.5)	Reference		4.6 (4.5 to 4.6)	Reference	
2008	203.8 (202.2 to 205.4)	12.47 (10.07 to 14.86)	<.001	48.9 (48.5 to 49.3)	1.75 (1.12 to 2.37)	<.001	4.6 (4.5 to 4.6)	−0.02 (−0.08 to 0.05)	.58

Surgery Type	Total Morphine Equivalents Prescribed			Mean Daily Dose Prescribed, mg			Duration of Prescription, d		
	Mean (95% CI)	Absolute Change (95% CI)	*P* Value[a]	Mean (95% CI)	Absolute Change (95% CI)	*P* Value[a]	Mean (95% CI)	Absolute Change (95% CI)	*P* Value[a]
2012	211.9 (210.2 to 213.5)	20.39 (17.99 to 22.79)	<.001	51.3 (50.9 to 51.7)	4.15 (3.52 to 4.78)	<.001	4.6 (4.5 to 4.6)	−0.05 (−0.12 to 0.01)	.13
Inguinal hernia repair[b]									
All years	221.5 (220.1 to 222.9)			51.9 (51.6 to 52.3)			4.7 (4.7 to 4.7)		
2004	212.1 (209.9 to 214.3)	Reference		50.4 (49.8 to 50.9)	Reference		4.7 (4.7 to 4.8)	Reference	
2008	224.6 (222.2 to 226.9)	11.84 (8.57 to 15.10)	<.001	51.7 (51.1 to 52.2)	1.29 (0.47 to 2.11)	.002	4.8 (4.7 to 4.8)	0.03 (−0.05 to 0.11)	.51
2012	229.3 (226.7 to 232.0)	16.57 (13.09 to 20.05)	<.001	54.2 (53.6 to 54.9)	3.82 (2.95 to 4.69)	<.001	4.6 (4.6 to 4.7)	−0.10 (−0.18 to −0.01)	.03
Knee arthroscopy[b]									
All years	268.8 (267.6 to 270.0)			54.3 (54.0 to 54.5)			5.5 (5.5 to 5.5)		
2004	244.8 (243.1 to 246.6)	Reference		50.3 (49.9 to 50.7)	Reference		5.5 (5.5 to 5.6)	Reference	
2008	271.1 (269.1 to 273.0)	25.30 (22.47 to 28.12)	<.001	53.3 (52.9 to 53.6)	2.90 (2.33 to 3.47)	<.001	5.6 (5.6 to 5.7)	0.10 (0.03 to 0.16)	.005
2012	289.2 (286.8 to 291.6)	45.16 (42.26 to 48.07)	<.001	59.2 (58.7 to 59.6)	9.11 (8.53 to 9.70)	<.001	5.4 (5.3 to 5.4)	−0.14 (−0.21 to −0.08)	<.001

[a]Linear regression adjusting for patient characteristics assessing trends over time.

[b]Adjusted for age, sex, inpatient/outpatient procedure, region, and surgical procedure.

[c]Adjusted for age, sex, inpatient/outpatient procedure, and region.