



Opioid use following shoulder stabilization surgery: risk factors for prolonged use



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Hypothesis: The purpose of this study was to determine the rate of opioid use before and after shoulder stabilization surgery for instability due to recurrent dislocation and assess patient factors associated with prolonged opioid use postoperatively.

Methods: Patients undergoing primary shoulder stabilization procedures for shoulder instability due to recurrent dislocation were accessed from the Humana administrative claims database. Patients were categorized as those who filled 1 or more opioid prescriptions within 1 month, those who filled opioid prescriptions between 1 and 3 months, and those who never filled opioid prescriptions before surgery. Rates of opioid use were evaluated preoperatively and longitudinally tracked for each group. Multiple binomial logistic regression analysis was used to identify factors associated with opioid use at 3 months and 1 year after surgery.

Results: Overall, 4802 patients (45.9% opioid naive) underwent shoulder stabilization surgery for shoulder instability during the study period. Rates of opioid use significantly declined after the first postoperative month; however, at 1 year, the rate of opioid use was significantly greater in patients who filled opioid prescriptions preoperatively (13.4% vs. 1.9%, $P < .0001$). Filling opioid prescriptions 1 to 3 months prior to surgery was the strongest risk factor for opioid use at 1 year after surgery.

Conclusions: Patients who were prescribed opioids 1 to 3 months before surgery had the highest risk of prolonged opioid use following surgery. Obesity, tobacco use, and a preoperative diagnosis of fibromyalgia were independently associated with prolonged opioid use following surgery.

Level of evidence: Level II; Retrospective Design; Prognosis Study

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Excessive use of prescription opioid medication within the United States has been well documented, with the United States consuming 99% of the global hydrocodone supply

Institutional review board approval was not required for this retrospective study.

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according to the World Health Organization.²⁹ Despite the effectiveness of opioids for pain control, increased prescription opioid utilization has led to an increase in opioid dependence and abuse. In fact, an estimated 16 per 10,000 emergency department visits from July 2016 to September 2017 were due to opioid overdoses.²⁸ In addition, nontherapeutic use of opioid medication has become a national concern with a significant increase in addiction and

unintentional overdose.¹⁷ Therefore, prescribing opioid medication can have a profoundly negative impact on patients and society as a whole.

Orthopedic surgeons are the third most common prescribers of opioid medications and have an important role in curtailing the current opioid epidemic.²⁹ In addition, inappropriate use of opioid medications has been associated with poor clinical outcomes and increased perioperative complications in various orthopedic populations.^{9,19,23,27,33} However, the natural history of postoperative opioid use in patients undergoing shoulder stabilization surgery is not known. Moreover, risk factors associated with prolonged use of opioid medications after shoulder stabilization are not known. Previous studies have demonstrated the association between preoperative opioid use and prolonged opioid use in other orthopedic populations.^{4,8,13}

The purpose of this study was to determine the rate of preoperative opioid utilization and risk factors associated with prolonged postoperative opioid utilization in patients undergoing shoulder stabilization surgery for shoulder instability or dislocation. We hypothesized that filling opioid prescriptions preoperatively would be associated with a prolonged course of filling opioid prescriptions after surgery.

Methods

Database

The PearlDiver research tool (PearlDiver Technologies, Colorado Springs, CO, USA) was used to identify patients in the Humana administrative claims database (Humana, Louisville, KY, USA) undergoing shoulder stabilization surgery. PearlDiver is a research tool that can access deidentified information of over 20 million patients within the database who are insured privately or through Medicare. Patient information, including demographic characteristics, comorbidities, complications, and prescription medications, can be retrieved using *International Classification of Diseases (ICD), Ninth Revision and Tenth Revision* codes; Current Procedural Terminology codes; and National Drug Codes. The database affords access to a large population of patients across various settings while allowing for longitudinal tracking of patients, including evaluation of monthly opioid prescriptions filled before and after surgery.

Patient selection

A retrospective investigation of patients undergoing primary shoulder stabilization surgery between 2007 and 2017 in the Humana database (HOrtho) was conducted using the following Current Procedural Terminology codes: 23455 (open Bankart), 23460 (alternative bone block), 23462 (Latarjet coracoid transfer), 23466 (open capsular shift), or 29806 (arthroscopic stabilization). For this study, only patients with ICD codes for shoulder instability or dislocation (single episode or recurrent) at the time of surgery were included. The inclusion criteria were limited to patients who were active within the database for at least 3 months prior to and 12 months following shoulder stabilization surgery.

Patient records were subsequently queried for all doses of common oral and transdermal formulations of prescription

opioids, except for tramadol. This included hydromorphone, oxycodone, hydrocodone, fentanyl, methadone, OxyContin (Purdue Pharma, Stamford, CT, USA), propoxyphene, and morphine. Patients were categorized based on when the preoperative opioid prescription was filled. These categories were defined as filling at least 1 opioid prescription within 1 month and between 1 and 3 months prior to surgery. This delineation between filling opioid prescriptions within 1 month and between 1 and 3 months preoperatively was performed to separately analyze patients who may have filled opioid prescriptions during the month prior to surgery for postoperative use. Furthermore, patients who never filled opioid prescriptions prior to surgery were defined as opioid naive (N-OU). For the first postoperative year, in the entire cohort, opioid refills were tracked monthly after the index procedure. A postoperative period of 12 months was chosen for this study to minimize bias relating to opioid use secondary to other conditions or subsequent, unrelated surgical procedures.

Patient demographic characteristics and comorbidities were extracted and analyzed for all patients by use of relevant ICD codes. Demographic characteristics and medical comorbidities analyzed included age (<25 years vs. ≥25 years), sex, obesity (body mass index ≥ 30 kg/m²), psychiatric conditions including major depressive disorder and generalized anxiety disorder, fibromyalgia, and Ehlers-Danlos syndrome. The cutoff for age was chosen as less than 25 years because the recurrence of instability is relatively frequent in these patients.¹⁰

Factors associated with prolonged opioid use postoperatively

The primary outcome of the study was to determine the rate of preoperative and postoperative opioid use in patients undergoing shoulder stabilization surgery. In addition, risk factors associated with prolonged postoperative opioid use were evaluated. Prolonged postoperative opioid use was defined as filling opioid prescriptions 3 months or more after surgery. Risk factors evaluated included preoperative substance use or abuse disorders such as tobacco use, alcohol use or abuse, cannabis use or abuse, cocaine use or abuse, and amphetamine or stimulant use or abuse. Patient demographic characteristics and comorbidities including age, sex, obesity, depression or anxiety disorders, Ehlers-Danlos syndrome, fibromyalgia, and opioid use within 3 months prior to surgery were also evaluated.

Statistical analysis

Descriptive statistics were used to report patient demographic characteristics, medical comorbidities, and monthly postoperative opioid prescription refills. Pearson χ^2 tests and relative risk ratios along with 95% confidence intervals (CIs) were used to compare monthly postoperative opioid refill rates between the preoperative opioid and N-OU cohorts. Unadjusted univariate analysis for the impact of patient demographic characteristics and comorbidities on opioid refills at 1 year following surgery was also conducted. Multiple binomial logistic regression analyses were used to identify and control for independent risk factors for postoperative opioid refills at 3 and 12 months after surgery. To control for various patient characteristics, risk factors in the multiple binomial logistic regression included preoperative opioid use within 1 month, opioid use at 1 to 3 months preoperatively, age, sex, obesity, various medical comorbidities, and

Table I Patient demographic characteristics, comorbidities, and other factors

Patient factor	Overall (n = 4802), n (%)	Preoperative opioid use (n = 1812), n (%)	Opioid naive (n = 2204), n (%)	P value
Age < 25 yr	2045 (42.6)	508 (28.04)	1199 (54.40)	<.0001*
Sex				<.0001*
Male	3418 (71.18)	1222 (67.44)	1644 (74.59)	
Female	1384 (28.82)	590 (32.56)	560 (25.40)	
Obesity (BMI ≥ 30 kg/m ²)	346 (7.21)	210 (11.59)	61 (2.77)	<.0001*
History of psychiatric diagnosis	266 (5.54)	139 (7.67)	61 (2.77)	<.0001*
Fibromyalgia	339 (7.06)	178 (9.82)	77 (3.49)	<.0001*
Ehlers-Danlos syndrome	15 (0.31)	<11	<11	—
Preoperative substance use diagnosis				
Tobacco use	133 (2.77)	85 (4.69)	18 (0.82)	<.0001*
Alcohol use or abuse	113 (2.35)	67 (3.70)	23 (1.04)	<.0001*
Cocaine use or abuse	12 (0.25)	<11	<11	—
Cannabis use or abuse	46 (0.96)	22 (1.21)	<11	—
Breakdown by procedure (CPT code)				
Arthroscopic stabilization procedure (29806)	4268 (88.88)	1568 (86.53)	1996 (90.56)	<.001*
Open Bankart procedure (23455)	298 (6.21)	138 (7.62)	119 (5.40)	.0043*
Latarjet procedure (23462)	114 (2.37)	53 (2.92)	44 (1.99)	.0565
Other open procedures (23460, 23466)	122 (2.54)	53	45	.0711
Breakdown by region				
Midwest	1258 (26.20)	368	671	<.0001*
Northeast	21 (0.44)	<11	<11	—
South	2971 (61.87)	1217	1292	<.0001*
West	552 (11.50)	219	233	.1308

BMI, body mass index; CPT, Current Procedural Terminology.

For groups with fewer than 11 patients, specific data were unavailable.

* Statistically significant finding ($P < .05$).

type of shoulder stabilization procedure performed. All statistical analyses were performed using the open-source R software (R Foundation for Statistical Computing, Vienna, Austria) housed within the PearlDiver research tool, with statistical significance set at $P < .05$.

Results

Patient characteristics

Overall, 4802 patients were identified in the database during the study period. Of these patients, 4268 (88.9%) underwent arthroscopic stabilization; 298 (6.2%), open Bankart procedures; 114 (2.4%), Latarjet procedures; and 122 (2.5%), other open procedures. Most patients were male patients ($n = 3418$, 71.2%), and 42.6% ($n = 2045$) were younger than 25 years. In addition, 7.2% ($n = 346$) were obese, 5.5% ($n = 266$) had a diagnosis of depression or anxiety, 7.1% ($n = 339$) had a diagnosis of fibromyalgia, and 0.3% ($n = 15$) had a diagnosis of Ehlers-Danlos syndrome (Table I). Overall, 45.9% ($n = 2204$) were N-OU, 37.73% ($n = 1812$) filled opioid prescriptions preoperatively, 18.3% ($n = 878$) filled opioid prescriptions 1 to 3 months prior to surgery, and

19.5% ($n = 934$) filled opioid prescriptions within 1 month prior to surgery.

Monthly postoperative opioid use

Overall, 3592 patients (74.8%) filled opioid prescriptions during the first postoperative month. In the following months, the rate of opioid prescription filling decreased to 12.4% ($n = 593$) at 3 months, 8.1% ($n = 390$) at 6 months, 7.31% ($n = 351$) at 9 months, and 6.5% ($n = 312$) at 12 months after surgery (Fig. 1). After the first postoperative month, patients in the preoperative opioid group had a significantly higher opioid prescription fill rate than patients in the N-OU group ($P < .0001$, Table II). At 1 year after surgery, the opioid prescription fill rate was significantly higher in the preoperative opioid group than in the N-OU group, with an estimated relative risk of 3.84 (95% CI, 2.91-5.06; $P < .0001$; Fig. 2).

Risk factors associated with opioid use after surgery

The unadjusted univariate analysis identified obesity (odds ratio [OR], 4.59; 95% CI, 3.37-6.18; $P < .0001$),

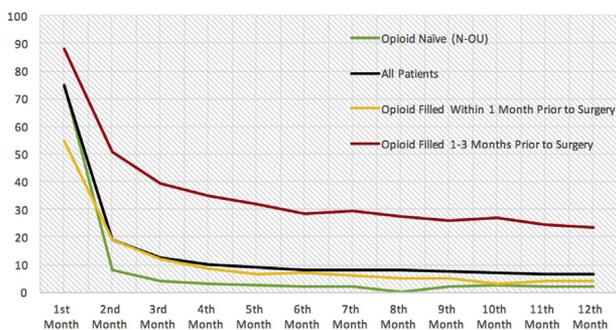


Figure 1 Opioid use after shoulder stabilization surgery (given as percentages). *N-OU*, opioid naive.

preoperative depression or anxiety (OR, 3.1; 95% CI, 3.13-4.45; $P < .0001$), a preoperative diagnosis of Ehlers-Danlos syndrome (OR, 3.67; 95% CI, 0.833-11.64; $P = .0448$), fibromyalgia (OR, 4.25; 95% CI, 3.12-5.78; $P < .0001$), tobacco use (OR, 5.15; 95% CI, 3.33-7.80; $P < .0001$), alcohol use or abuse (OR, 2.98; 95% CI, 1.77-5.01; $P < .0001$), an open Bankart procedure (OR, 1.61; 95% CI, 1.10-2.30; $P = .0107$), and patients who filled opioid prescriptions 1 to 3 months prior to surgery (OR, 11.01; 95% CI, 8.52-14.31; $P < .0001$) as having significantly higher odds of filling opioid prescriptions 1 year after surgery (Table III). In addition, arthroscopic stabilization (OR, 0.58; 95% CI, 0.42-0.81; $P = .001$), male sex (OR, 0.57; 95% CI, 0.44-0.73; $P < .0001$), age younger than 25 years (OR, 0.15; 95% CI, 0.10-0.22; $P < .0001$), and patients who filled opioid prescriptions within 1 month prior to surgery (OR, 0.56; 95% CI, 0.38-0.79; $P = .0016$) showed significantly lower odds of filling opioid prescriptions at 1 year after surgery (Table III).

However, following risk adjustment, the multiple binomial logistic regression identified that patients who filled

opioid prescriptions 1 to 3 months (OR, 9.18; 95% CI, 7.26-11.66; $P < .0001$) and within 1 month (OR, 2.57; 95% CI, 1.94-3.38; $P < .0001$) prior to surgery were independently associated with opioid use at 3 months after shoulder stabilization surgery. Similarly, filling opioid prescriptions 1 to 3 months (OR, 8.29; 95% CI, 6.09-11.42; $P < .0001$) and within 1 month (OR, 1.55; 95% CI, 1.01-2.37; $P = .0465$) prior to surgery, obesity (OR, 1.86; 95% CI, 1.29-2.64; $P = .0007$), tobacco use (OR, 1.88; 95% CI, 1.12-3.07; $P = .0134$), and a diagnosis of fibromyalgia (OR, 2.01; 95% CI, 1.39-2.89; $P = .0002$) were independently associated with opioid use at 12 months after shoulder stabilization surgery (Table IV). Patients younger than 25 years had a significantly decreased odds of filling opioid prescriptions at 3 months (OR, 0.27; 95% CI, 0.20-0.35; $P < .0001$) and 12 months (OR, 0.33; 95% CI, 0.22-0.49; $P < .0001$) after surgery.

Discussion

In this retrospective study, we found that more than one-third of patients undergoing primary shoulder stabilization surgery filled prescriptions for opioid medications within 3 months before surgery. Our study also highlighted that patients who filled opioid prescriptions within 3 months before surgery were nearly 4 times more likely to fill opioid prescriptions 1 year after shoulder stabilization surgery than patients in the N-OU cohort. Moreover, we found that filling opioid prescriptions 1 to 3 months prior to surgery was the strongest risk factor for prolonged postoperative opioid use. Given the current opioid epidemic in the United States, the findings of this study will help us understand baseline preoperative and postoperative opioid consumption and recognize risk

Table II Opioid prescriptions filled following shoulder stabilization surgery

Postoperative month	Preoperative opioid use (n = 1812)		Opioid naive (n = 2204)		RR	95% CI		P value
	Opioid prescriptions filled, n	%	Opioid prescriptions filled, n	%		Lower	Upper	
1	1280	70.64	1649	74.82	0.91	0.85	0.97	.003*
2	622	34.33	182	8.26	2.78	2.44	3.17	<.0001*
3	457	25.22	87	3.95	3.81	3.14	4.63	<.0001*
4	385	21.25	68	3.09	3.99	3.20	4.98	<.0001*
5	343	18.93	57	2.59	4.51	3.50	5.82	<.0001*
6	317	17.49	42	1.91	5.05	3.80	6.72	<.0001*
7	314	17.33	43	1.95	4.9	3.70	6.5	<.0001*
8	289	15.95	51	2.31	3.89	3.02	5.02	<.0001*
9	278	15.34	44	2.00	4.28	3.25	5.64	<.0001*
10	265	14.62	52	2.36	3.55	2.76	4.55	<.0001*
11	254	14.02	49	2.22	3.6	2.77	4.64	<.0001*
12	242	13.36	43	1.95	3.84	2.91	5.06	<.0001*

CI, confidence interval; RR, risk ratio.

* Statistically significant finding ($P < .05$).

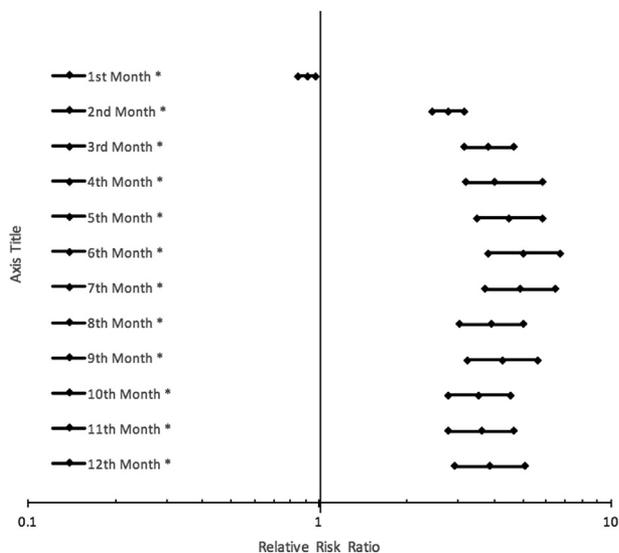


Figure 2 Relative risk of postoperative opioid fill rates between opioid-naïve (*N-OU*) and preoperative opioid cohorts. *Statistically significant finding ($P < .05$).

factors for prolonged postoperative opioid use in this population.

In the past few years, large databases have been used to identify trends and risk factors for postoperative opioid use for various orthopedic procedures including spinal surgery, total joint arthroplasty, and arthroscopic surgery.^{3,5,6,21} Recently, Berglund et al⁷ used the Humana database to investigate risk factors for postoperative opioid

use in patients undergoing anatomic or reverse total shoulder arthroplasty (TSA). They found that a preoperative diagnosis of opioid dependence or abuse was a significant risk factor for opioid use up to 12 months after surgery. Rao et al²² used a multi-institutional shoulder arthroplasty registry to conduct a similar investigation and found that patients with at least 5 opioid prescriptions filled preoperatively were nearly 10 times more likely to consume opioids for up to 1 year after shoulder arthroplasty. Similarly to Berglund et al, Westermann et al³⁰ used the Humana database to identify independent risk factors for continued postoperative opioid use in patients undergoing rotator cuff repair. They found that patients who filled opioid prescriptions 1 to 3 months prior to surgery had a 7.45 increased risk of filling opioid prescriptions at 3 months after surgery. Similar investigations have been conducted for other orthopedic procedures such as anterior cruciate ligament reconstruction and hip arthroscopy.^{1,3} However, such investigations have not been conducted for patients undergoing shoulder stabilization surgery. Our study is the only study to date that has used a large database to identify risk factors for prolonged postoperative opioid use. We found obesity, tobacco use, a preoperative diagnosis of fibromyalgia, opioid use within 1 month of surgery, and opioid use between 1 and 3 months before surgery to be independent risk factors for prolonged opioid consumption 1 year after surgery.

The results of our multivariate model revealed several modifiable risk factors that could be optimized preoperatively to potentially minimize prolonged opioid use postoperatively. Specifically, we found obesity and tobacco use

Table III Univariate analysis of risk factors associated with opioid use at 12 months after shoulder stabilization surgery

Risk factor	OR	95% CI		P value
		Lower	Upper	
Opioid prescriptions filled only within 1 mo before surgery	0.56	0.38	0.79	<.0001*
Opioid prescriptions filled from 1-3 mo before surgery	11.01	8.52	14.31	<.0001*
Age < 25 yr	0.15	0.10	0.22	<.0001*
Male sex	0.57	0.44	0.73	<.0001*
Obesity	4.59	3.37	6.18	<.0001*
History of psychiatric diagnosis	3.1	2.13	4.45	<.0001*
Fibromyalgia	4.25	3.12	5.78	<.0001*
Ehlers-Danlos syndrome	3.67	0.833	11.64	.0448*
Preoperative substance use diagnosis				
Tobacco use	5.15	3.33	7.8	<.0001*
Alcohol use or abuse	2.98	1.77	5.01	<.0001*
Amphetamine use or abuse	4.87	0.24	38.2	.171
Cannabis use or abuse	0.33	0.02	1.51	.273
Breakdown by procedure (CPT code)				
Arthroscopic stabilization procedure (29806)	0.58	0.42	0.81	.001*
Open Bankart procedure (23455)	1.61	1.1	2.3	.0107*
Latarjet procedure (23462)	1.15	0.62	2.15	.659
Other open procedures (23460, 23466)	1.12	0.34	3.66	.847

OR, odds ratio; CI, confidence interval; CPT, Current Procedural Terminology.

* Statistically significant finding ($P < .05$).

Table IV Multivariate analysis of risk factors associated with opioid use at 3 and 12 months after shoulder stabilization surgery

Risk factor	Opioid use 3 mo after surgery				Opioid use 12 mo after surgery			
	OR	95% CI		P value	OR	95% CI		P value
		Lower	Upper			Lower	Upper	
Opioid prescriptions filled only within 1 mo before surgery	2.57	1.94	3.38	<.0001*	1.55	1.01	2.37	.0465*
Opioid prescriptions filled from 1-3 mo before surgery	9.18	7.26	11.66	<.0001*	8.29	6.09	11.42	<.0001*
Age < 25 yr	0.27	0.2	0.35	<.0001*	0.33	0.22	0.49	<.0001*
Male sex	0.85	0.69	1.06	.1511	0.89	0.67	1.18	.402
Obesity	1.09	0.79	1.49	.5816	1.86	1.29	2.64	.0007*
History of psychiatric diagnosis	1.37	0.95	1.96	.0848	1.28	0.82	1.96	.257
Fibromyalgia	1.38	0.99	1.88	.0566	2.01	1.39	2.89	.0002*
Ehlers-Danlos syndrome	2.62	0.67	9.21	.1455	2.06	0.41	7.99	.3303
Preoperative substance use diagnosis								
Tobacco use	1.53	0.97	2.37	.0618	1.88	1.12	3.07	.0134*
Alcohol use or abuse	1.16	0.68	1.94	.5695	1.55	0.83	2.81	.1555
Amphetamine use or abuse	1.36	0.14	15.08	.7848	0.54	0.02	7.65	.6655
Cannabis use or abuse	1.19	0.44	2.93	.7113	0.23	0.01	1.17	.1592
Breakdown by procedure (CPT code)								
Arthroscopic stabilization procedure (29806)	0.75	0.44	2.92	.2767	0.73	0.33	1.47	.4016
Open Bankart procedure (23455)	1.2	0.74	1.92	.4451	1.16	0.57	2.19	.6611
Latarjet procedure (23462)	1.34	0.72	2.4	.3397	0.82	0.32	1.88	.6612
Other open procedures (23460, 23466)	1.82	0.79	4.07	.1516	0.68	0.27	1.57	.3876

OR, odds ratio; CI, confidence interval; CPT, Current Procedural Terminology.

* Statistically significant finding ($P < .05$).

to be significant risk factors associated with opioid use 1 year after shoulder stabilization surgery. Tobacco use, smoking specifically, has been associated with higher analgesic use in patients undergoing total joint arthroplasty.²⁵ Furthermore, smoking tobacco has been shown to be an independent risk factor for poor patient-reported outcomes. Halawi et al¹¹ investigated the impact of smoking on the Western Ontario and McMaster Universities Osteoarthritis index and the Short Form 12 Physical Component Summary and Mental Component Summary in patients undergoing total joint arthroplasty. After adjusting for significant demographic characteristics and comorbidities, they found that smokers had significantly lower Western Ontario and McMaster Universities Osteoarthritis index and Short Form 12 Physical Component Summary scores than nonsmokers. Similarly, obesity has been shown to be a risk factor for prolonged opioid use.^{8,32} Using the Humana database, Cancienne et al⁸ found obesity to be a significant risk factor for opioid use up to 12 months after total knee arthroplasty. Therefore, preoperative weight-loss optimization and smoking cessation may help reduce prolonged postoperative opioid use. Moreover, prior investigations on the impact of preoperative opioid use on postoperative clinical outcomes have been conducted.^{16,18,24,31} In a recent study by Williams et al,³¹ among patients undergoing rotator cuff repair, preoperative opioid users were found to have significantly inferior preoperative and postoperative American Shoulder and Elbow Surgeons, visual analog scale, Constant, and Simple Shoulder Test scores. However, Williams et al noted that

the magnitude of postoperative improvement in outcome scores from baseline was not statistically significant between N-OU and preoperative opioid use groups. Similarly, the association of inferior clinical outcome scores has been investigated in the TSA population.^{16,18} Even though we were unable to assess clinical outcomes after shoulder stabilization between the N-OU and preoperative opioid groups, we suspect that similarly to the finding in the TSA and rotator cuff repair populations, patients who filled opioid prescriptions preoperatively would likely have poorer outcome scores than patients in the N-OU cohort.

In our study, filling opioid prescriptions 1 to 3 months preoperatively was the strongest risk factor for prolonged postoperative opioid use. The use of opioid medication for pain control is prevalent in the United States.²⁹ A population-based study on pain management in patients following hip and ankle fractures compared opioid prescriptions between the United States and the Netherlands.¹⁴ None of the Dutch population and an alarming 85% of the American population were treated with opioid medication after hip fractures. Instead of receiving opioid medications, the Dutch patients were treated with nonsteroidal anti-inflammatory drugs and acetaminophen. Similarly, only 6% of the Dutch population and about 82% of the American population were treated with opioid medication after ankle fractures. There is also concern that nontherapeutic opioid use is prevalent in the orthopedic population, which further contributes to the opioid epidemic.¹⁷ Therefore, knowledge of opioid use after shoulder stabilization is critical to understand the normal duration of opioid use. In

addition, orthopedic surgeons should consider implementing measures to reduce opioid consumption in their patients. One such measure may be to formally educate patients on responsible opioid use before surgery. A randomized controlled trial by Syed et al²⁶ showed that regardless of preoperative opioid consumption, patients who received video-based education on responsible opioid use were less likely to use opioids after arthroscopic rotator cuff repair. Syed et al found that patients with a history of preoperative opioid use were 7 times more likely to discontinue opioid use at 3 months after surgery if they were randomized to the preoperative education cohort. Another measure to reduce opioid use may be to identify patients with contributing risk factors for prolonged opioid use and implementing a multimodal pain control protocol. In the TSA population, McLaughlin et al¹⁵ found that patients who were randomized to the multimodal analgesic cohort had significantly decreased opioid consumption postoperatively compared with the control cohort that received opioids and acetaminophen only. They also found that patients in the multimodal analgesic cohort had a shorter hospital stay with lower pain scores. In their study, the multimodal analgesic cohort received oxycodone, acetaminophen, a nonsteroidal anti-inflammatory drug (naproxen), and gabapentin. Further research is needed to identify effective modalities to help reduce opioid consumption after surgery.

In this study, an open Bankart procedure was significantly associated with opioid prescription refills at 12 months postoperatively in the unadjusted model. Although not significant in the adjusted multivariate model, this finding may be consistent with poorer outcome scores for patients undergoing open Bankart procedures compared with Latarjet procedures for shoulder stabilization.^{2,12} Hovelius et al¹² analyzed 185 shoulders that underwent open Bankart procedures ($n = 88$) or Bristow-Latarjet procedures ($n = 97$) for recurrent shoulder instability. They found that patients undergoing open Bankart procedures had significantly poorer Western Ontario Shoulder Index scores; Disabilities of the Arm, Shoulder and Hand scores; and Simple Shoulder Value scores. In addition, a meta-analysis by An et al² found that patients who underwent Latarjet procedures had a lower risk of redislocation and recurrence of instability than patients with open or arthroscopic Bankart procedures. They also reported higher Rowe scores and a lower loss of external rotation following the Latarjet procedure. However, data regarding opioid consumption following various procedures for shoulder instability are lacking, and this topic warrants further investigation.

Our study has inherent limitations owing to its retrospective nature and the use of an administrative claims-based database, which relies on accurate billing and coding; however, the inaccuracies due to coding are unlikely to significantly impact the results of this study.²⁰ In addition, detailed clinical or radiographic factors such as

chronicity of symptoms, indications for surgery, recurrence of shoulder subluxation vs. dislocation, presence of Hill-Sachs lesions, or degree of glenoid bone loss could not be assessed. Furthermore, operative factors such as operative time, patient positioning, and complexity of surgery could not be assessed with the database used. We were also unable to determine the specific indication for opioid use in this population. Moreover, we were not able to determine the exact number of opioids actually consumed by patients; therefore, it may be possible that our data may have overestimated the use of opioid medication. There is also the possibility that prescribed opioid medication may be used by persons for whom it was not prescribed. Furthermore, because of the lack of matching between the 2 cohorts, we were unable to control for other confounders that were not assessed in this study. In addition, perioperative opioid use is likely subject to physician prescribing practices; therefore, the high rate of perioperative opioid use may not be associated with patient factors. Lastly, patient-reported outcomes such as the American Shoulder and Elbow Surgeons score and the Western Ontario Shoulder Index are not recorded in the database used; therefore, comparison of these outcome measures between the preoperative opioid and N-OU cohorts was not possible. Despite these limitations, this is the largest retrospective analysis to identify trends in postoperative opioid use and determine independent risk factors associated with prolonged postoperative opioid use in patients undergoing shoulder stabilization procedures.

Conclusion

Patients who were prescribed opioids between 1 to 3 months before surgery had the highest risk of prolonged opioid use following surgery. Obesity, tobacco use, and a preoperative diagnosis of fibromyalgia were independently associated with prolonged opioid use following surgery.

Disclaimer

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