Decreased Prescribing of Postoperative Opioids in Pediatric ACL Reconstruction

Treatment Trends at a Single Center

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Background: Anterior cruciate ligament (ACL) injury is common in the pediatric population. Pain control after ACL reconstruction (ACLR) presents a unique challenge due to age and early rehabilitation needs. Pain management practices are believed to have evolved in recent years to limit unnecessary exposure to risks associated with opioid use in this vulnerable population.

Purpose: To describe trends in postoperative opioid prescribing and assess factors including obtaining consent for opioid prescribing for minors that may have mitigated excessive prescription of opioids.

Study Design: Cohort study; Level of evidence, 3.

Methods: This is a retrospective review of a consecutive series of pediatric patients (<18 years) undergoing primary ACLR within an urban academic hospital system over a 5-year period (2014-2018). The study period included the gradual introduction of preoperative consenting for opioid use in minors as mandated by state law in 2016. Patient characteristics, surgical details, presence of a signed consent form to prescribe opioid medications, prescribed postoperative medications, prescriber, and indicators of inadequate pain control were collected. Univariate and multivariate analyses were performed to determine factors associated with reduced postoperative opioid prescribing.

Results: This study included 687 patients with a mean age of 15.1 ± 1.9 years, with less than one-third of patients having preoperative consent forms to prescribe opioid medications. Postoperative prescribing trends demonstrated a decline in the number of opioid doses provided and increased utilization of nonopioid medications. Patients who received preoperative opioid counseling and signed a consent form were prescribed fewer opioids and had a smaller number of unscheduled contacts for poorly controlled pain. Univariate analyses identified multiple predictors of the number of opioid doses prescribed postoperatively. Obtaining preoperative consent to prescribe opioids and ambulatory surgery center location were found to be independent predictors of prescribed doses in the multivariate analysis.

Conclusion: The quantity of opioid medication prescribed for pain management after pediatric ACLR at our institution has declined in recent years. This appears to be, in part, related to state-mandated preoperative counseling about opioid use, signing of a consent form by the parent(s) or guardian(s) to prescribe opioids to minors, and encouragement toward the use of nonopioid medications when possible. Preoperative opioid use discussions in the pediatric population may be useful in reducing opioid overprescription and utilization in this population.

Keywords: opioid; anterior cruciate ligament reconstruction; consent of minors; multimodal pain management

Anterior cruciate ligament (ACL) rupture is one of the most common sports-related injuries within the pediatric population. Rates of injury have increased in frequency recently due in part to earlier and greater youth sports participation.[4,24] In order to prevent the long-term sequelae of an ACL-deficient knee, surgical intervention is common.[26] Perioperative pain management presents a unique challenge in this patient population given the young age and early rehabilitation needs.[7,15,20]

The long-term effects of early opioid exposure have been elucidated in the pediatric population.[18] Unused and leftover opioids often serve as a gateway to misuse, particularly in the adolescent population.[3,17] Reducing unnecessary opioid prescription, therefore, is of pressing importance in this patient cohort given their risk for recurrent exposure due to subsequent repeat or contralateral injury.[8] Orthopaedic surgeons and anesthesiologists are increasing the use of perioperative multimodal analgesic modalities including

non-steroidal anti-inflammatory medications and peripheral nerve blocks[1] to help control pain and facilitate reduced opioid needs. Legal and societal pressures may also play a role in reducing unnecessary prescriptions, as seen with Act 125 of 2016 in Pennsylvania, mandating written consent for prescribing opioid medications to minors.[21] However, no standard currently exists for provider prescribing in pediatric sports medicine, leaving surgeons, trainees, and advanced practice providers with little direction about what constitutes a safe but sufficient amount of these controlled substances.

The purpose of this study was to describe the postoperative pain management prescribing practices at a single center for pediatric ACL reconstruction (ACLR) and related procedures. Specifically, we aimed to detail trends in opioid and nonopioid pain medication prescribing at our institution while examining the emergence of preoperative consent for prescribing opioids for minors and its relationship to these prescribing practices. We hypothesized that opioid prescribing would decline over the study period without significant change in the ability to control pain.

METHODS

Patient Selection

Approval for this study was obtained from our hospital institutional review board. Records of all patients aged 18 years or younger who underwent ACLR at a single urban academic center between 2014 and 2018 were collected and assessed for inclusion in the study. Pediatric patients undergoing primary ACLR with or without concurrent procedures (eg, meniscal repair) were included. We excluded patients who underwent revision ACLR and those who were aged 18 years or older at the time of surgery.

Patients, Surgery, and Prescribing Characteristics

Demographic information (age, sex, and race/ethnicity), anthropomorphic data (height, weight, and body mass index [BMI]), surgical details (graft type, concurrent procedures, and surgery location), and postoperative pain medication prescribing details (prescriber and medications prescribed) were collected for each patient. Patients with uncontrolled pain prompting a telephone call, unplanned clinic return, or emergency department visit were identified as patients requiring an opioid refill for any reason within 30 days of surgery.

With Act 125 of 2016, the state of Pennsylvania established the requirements for prescribing opioids for minors. The caregiver must discuss the risks associated with the opioid medication with the minor patient and the parent(s) or guardian(s), and the patient or representative and the caregiver must sign a standard consent form before the medication can be prescribed.[21] The consent process began in early 2017, and by April 1, 2017, all minor patients undergoing ACLR in the current study had the required consent form in their record.

Outcomes of Interest

Our primary outcome of interest was the number of doses of opioid medication prescribed to patients on the day of surgery. No guidelines existed to direct postoperative pain medication prescribing at our institution over the study period; thus, dosage and amount were at the discretion of the prescribing provider. We standardized the number of opioid doses dispensed by dividing the total amount of opioids prescribed by the dose prescribed (or smallest dose if a range was given). Standardized conversions were used to calculated the total morphine milligram equivalent for all opioids prescribed.[5] Although liquid opiate prescription data were gathered and reported in descriptive analyses, patients receiving liquid medication comprised less than 10% (60 of 687) of the studied cohort and demonstrated dosing discrepancies from comparable patients prescribed tablet medication limiting dose calculations. To maintain consistency, we elected to exclude patients who received liquid doses from our advanced analyses.

Statistical Analysis

Descriptive statistics were used to analyze patient characteristics, procedural details, and prescribing practice trends over the study period. Differences in these variables were examined among the consenting cohorts using t tests, Mann-Whitney U tests, or Fisher exact tests as appropriate. Factors associated with an increasing number of prescribed opioid doses were determined using univariate and multivariate negative binomial regression analysis and reported as incidence rate ratios (IRRs) and 95% CIs based on data characteristics. Only those variables achieving $P < .1$ in univariate analysis and baseline patient characteristics (ie, age and sex) were entered into multivariate regressions. Assuming $\alpha = .05$, $\beta = 0.2$, and an SD of 15, post hoc power analysis identified that a sample size of 79 patients in each consenting group was sufficient to detect a change in prescribing of more than 6 doses

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TABLE 1
Patient, Procedural, and Prescribing Characteristics Overall and Classified by Preoperative Consent
to Prescribe Opioid Medication[a]

Variable	Total (N = 687)	No Consent (n = 468)	Consent (n = 219)	P Value
Age, y	15.1 ± 1.9	15.0 ± 1.9	15.2 ± 1.8	.159
Weight, kg	65.3 ± 17.2	65.2 ± 17.6	65.5 ± 16.3	.715
BMI	23.3 ± 5.0	23.2 ± 5.0	23.4 ± 4.9	.498
Sex				.229
Male	366 (53.3)	242 (51.7)	124 (56.6)	
Female	321 (46.7)	226 (48.3)	95 (43.4)	
Race/ethnicity				**.041**
White/Caucasian	438 (63.8)	303 (64.7)	135 (61.6)	
Black/African American	142 (20.7)	102 (21.8)	40 (18.3)	
Hispanic	20 (2.9)	15 (3.2)	5 (2.3)	
Other	87 (12.7)	48 (10.3)	39 (17.8)	
Graft type				**<.001**
Allograft tendon	14 (2.0)	14 (3.0)	0 (0)	
Bone–patellar tendon—bone	7 (1.0)	2 (0.4)	5 (2.3)	
Hamstring tendon	632 (92.0)	444 (94.9)	188 (85.8)	
Quadriceps tendon	17 (2.5)	2 (0.4)	15 (6.8)	
Iliotibial band	16 (2.3)	6 (1.3)	10 (4.6)	
Surgery location				**.001**
Main hospital	377 (54.9)	277 (59.2)	100 (45.7)	
Ambulatory surgery center	310 (45.1)	191 (40.8)	119 (54.3)	
Discharge prescriber				**<.001**
Advanced practice provider[b]	262 (38.1)	133 (28.4)	129 (58.9)	
Resident	164 (23.8)	121 (25.9)	43 (19.6)	
Fellow	157 (22.8)	124 (26.5)	33 (15.1)	
Physician	96 (14.0)	83 (17.7)	13 (5.9)	
Outpatient medications prescribed				
NSAIDs	521 (75.7)	329 (70.3)	192 (87.7)	**<.001**
Acetaminophen	602 (87.5)	395 (84.4)	209 (94.5)	**<.001**
Opioids	673 (97.8)	456 (97.4)	217 (99.1)	.154
Opioids prescribed				
Liquid medication (total mL)	146.3 ± 98.3	160.6 ± 105.5	99.1 ± 46.9	**.012**
Tablet medication (total mg/dose mg)	31.4 ± 13.0	34.6 ± 13.5	25.0 ± 8.7	**<.001**
MME	235.0 ± 100.9	259.3 ± 105.1	184.1 ± 67.6	**<.001**
Opioid refill prescribed	28 (4.1)	24 (5.1)	4 (1.8)	.060
Uncontrolled pain prompting early contact	96 (14.0)	77 (16.5)	19 (8.7)	**.006**
Telephone call	83 (12.1)	66 (14.1)	17 (7.8)	**.018**
ED or early unplanned clinic visit	13 (1.9)	11 (2.4)	2 (0.9)	.244

[a]Data are reported as n (%) or mean ± SD. *P* values in bold indicate a statistically significant difference between the study groups (*P* ≤ .05). BMI, body mass index; ED, emergency department; MME, morphine milligram equivalent; NSAID, nonsteroidal anti-inflammatory drug.
[b]Nurse practitioner or physician assistant.

of opioid medication (equaling approximately 1 day of medication based on dosing every 4 hours). Data analyses were performed using SPSS Version 24 Statistics for Windows (IBM Corp). For all analyses, $P \leq .05$ denotes statistical significance.

RESULTS

Study inclusion criteria were met by 687 patients with a mean age of 15.1 ± 1.9 years and BMI of 23.3 ± 5.0 (Table 1). Most of our study population were male (53.3%) and White/Caucasian (63.8%), while most also underwent ACLR using hamstring autograft (92.0%) at our main hospital (54.9%) rather than at an ambulatory surgery center (45.1%). Postoperatively, discharge medication prescribing was performed most frequently by nurse practitioners and physician assistants (38.1%), followed by residents (23.8%) and fellows (22.8%). For most patients, a multimodal pain regimen was prescribed for pain control at home, with 97.8% of patients receiving opioid medication, 87.5% of patients receiving acetaminophen, and 75.7% of patients receiving nonsteroidal anti-inflammatory drugs (NSAIDs). A total of 96 patients (14.0%) sought care for uncontrolled pain before their first follow-up visit. Patients made contact either by a telephone call (12.1%) or an emergency department/early clinic visit (1.9%) before their first scheduled postoperative visit. Twenty-eight patients (4.1%) had their opioid prescription refilled. Furthermore, there was no difference in prescribed amounts of opioid between different-aged patients ($P = .737$) (Table 2).

TABLE 2
Breakdown of Mean Prescribed Tablet Opioid Dose by Age[a]

Age, y	Patients	Prescribed Opioid Dose, g
≤12	62	33.10 ± 18.02
13	75	31.59 ± 12.23
14	115	31.84 ± 14.28
15	124	30.08 ± 10.24
16	121	31.82 ± 12.93
17	99	30.90 ± 11.22

[a]Data are reported as n or mean ± SD. Only patients who were prescribed pills were included in this breakdown.

There was no preoperative consent to prescribe opioid medications obtained for 468 patients (68.1%), whereas consent was obtained for 219 patients (31.9%) (Table 1). The consenting cohorts differed by race/ethnicity (P = .041), graft type used for ACLR (P < .001), surgery location (P = .001), and discharge provider (P < .001). Concurrent prescribing of NSAIDs (P < .001) and acetaminophen (P < .001) was more common in the consented cohort. While there was no statistical difference in the likelihood of opioid prescribing between groups (P = .154), the consented cohort received significantly fewer doses of liquid (P = .012) and tablet (P < .001) opioid medication and lower total morphine milligram equivalent (P < .001). Despite decreased prescribed medication quantity, the opioid consent group had significantly lower rates of early contact for uncontrolled pain (P = .006), with particularly fewer telephone calls to their surgeon (P = .018).

A comparison of patients before Pennsylvania's Act 125[21] was passed on November 2, 2016, and after is shown in Table 3. While age, sex, weight, BMI, and race/ethnicity were similar between the 2 groups, surgeries were performed more commonly with hamstring autograft at a main hospital before Act 125. Our surgeons moved toward using a quadriceps tendon autograft at an ambulatory surgery center after this time. Most important, the post–Act 125 cohort had higher amounts of NSAIDs (88% vs 67.8%; P < .001) and acetaminophen (93.8% vs 83.5%; P < .001) prescribed with lower numbers of opioid doses (P < .001) and less early patient contact (P = .006). Interestingly, the amount of total outpatient opioids prescribed was similar between groups.

While there was no change in the rate of opioid use (>95% of patients) over the 5-year period, the mean doses dispensed steadily decreased annually from 38.6 doses in 2014 to 22.9 in 2018 (Figure 1). This was accompanied by an overall increase in the percentage of patients prescribed oral NSAIDs (65.2% to 89.3%) and acetaminophen (77.8% to 98.6%) during that time period. Univariate testing demonstrated that a resident (IRR, 1.561; 95% CI, 1.258-1.937; P < .001), fellow (IRR, 1.311; 95% CI, 1.058-1.625; P = .013), or attending physician (IRR, 1.316; 95% CI, 1.024-1.692; P = .032) discharge provider were significant predictors of prescribing more postoperative opioid doses as compared with advanced practitioners, a finding that was not significant in multivariate regression analysis (Table 4). Univariate testing simultaneously showed

TABLE 3
Comparison of Patient Characteristics and Opioid Prescription Before and After Pennsylvania's Act 125[21a]

Variable	Before Act 125[b] (n = 413)	After Act 125[b] (n = 274)	P Value
Age, y	15.0 ± 1.8	15.2 ± 1.9	.324
Sex			.117
Male	210 (50.8)	156 (56.9)	
Female	203 (49.2)	118 (43.1)	
Weight, kg	65.0 ± 17.2	65.8 ± 17.1	.439
BMI	23.0 ± 4.9	23.6 ± 5.1	.104
Race/ethnicity			.092
White/Caucasian	266 (64.4)	172 (62.8)	
Black/African American	89 (21.5)	53 (19.3)	
Hispanic	15 (3.6)	5 (1.8)	
Other	43 (10.4)	44 (16.1)	
Graft type			**<.001**
Allograft tendon	11 (2.7)	3 (1.1)	
Bone–patellar tendon—bone	2 (0.5)	5 (1.8)	
Hamstring tendon	397 (96.1)	235 (85.8)	
Quadriceps tendon	0 (0.0)	17 (6.2)	
Iliotibial band	3 (0.7)	13 (4.7)	
Surgery location			**<.001**
Main hospital	250 (60.5)	127 (46.4)	
Ambulatory surgery center	163 (39.5)	147 (53.6)	
Discharge prescriber			**<.001**
Advanced practice provider[c]	103 (25.4)	159 (58.2)	
Resident	111 (27.3)	53 (19.4)	
Fellow	109 (26.8)	48 (17.6)	
Physician	83 (20.4)	13 (4.8)	
Outpatient medications prescribed			
NSAIDs	280 (67.8)	241 (88.0)	**<.001**
Acetaminophen	345 (83.5)	257 (93.8)	**<.001**
Opioids	401 (97.1)	272 (99.3)	.055
Opioids prescribed			
Liquid medication (total mL)	175.2 ± 108.2	92.5 ± 39.6	**<.001**
Tablet medication doses (total mg/dose mg)	35.0 ± 13.8	26.1 ± 9.4	**<.001**
MME	264.0 ± 106.3	192.5 ± 74.3	**<.001**
Opioid refill prescribed	21 (5.1)	7 (2.6)	.101
Uncontrolled pain prompting early contact	70 (16.9)	26 (9.5)	**.006**
Telephone call	61 (14.8)	22 (8.0)	**.008**
ED or early unplanned clinic visit	9 (2.2)	4 (1.5)	.579

[a]Data are reported as n (%) or mean ± SD. P values in bold indicate a statistically significant difference between the study groups (P ≤ .05). BMI, body mass index; ED, emergency department; MME, morphine milligram equivalent; NSAID, nonsteroidal anti-inflammatory drug.
[b]Act 125 enacted on November 2, 2016.
[c]Nurse practitioner or physician assistant.

that surgery at an ambulatory surgery center (IRR, 0.721; 95% CI, 0.611-0.850; P < .001) and presence of a
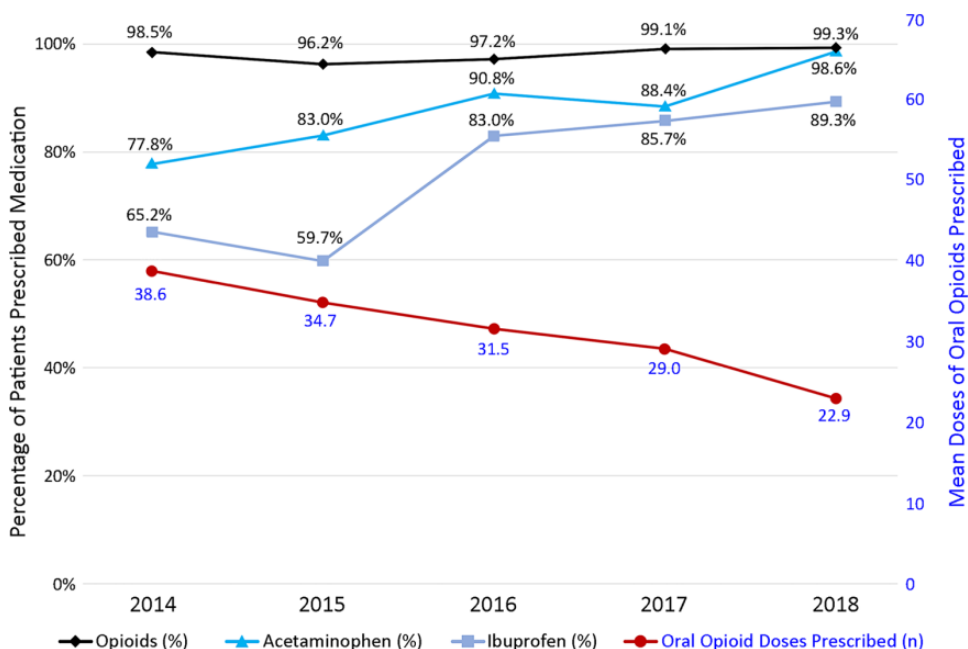
Figure 1. Postoperative pain medication prescribing trends for anterior cruciate ligament reconstruction.

TABLE 4
Regression Analysis of Factors Associated With Prescription of a Greater Number of Postoperative Doses of Opioid Medication[a]

Variable	Univariate Analysis		Multivariate Analysis	
	Incidence Rate Ratio (95% CI)	P Value	Incidence Rate Ratio (95% CI)	P Value
Age	0.982 (0.937-1.030)	.459	0.982 (0.936-1.030)	.462
Female sex	1.007 (0.854-1.187)	.936	0.995 (0.844-1.174	.956
Weight, kg	1.000 (0.995-1.005)	.97	Not entered	—
BMI	1.004 (0.988-1.020)	.655	Not entered	—
Underweight/normal weight	Reference	—	Not entered	
Overweight	1.015 (0.825-1.249)	.886	Not entered	
Obese	1.151 (0.850-1.558)	.363	Not entered	
Graft type				—
Allograft tendon	0.936 (0.523-1.674)	.824	Not entered	
Bone–patellar tendon—bone	0.841 (0.370-1.908)	.678	Not entered	
Hamstring tendon	Reference	—	Not entered	
Quadriceps tendon	1.005 (0.562-1.796)	.987	Not entered	
Iliotibial band	1.022 (0.541-1.928)	.947	Not entered	
Ambulatory surgery center location	0.721 (0.611-0.850)	**<.001**	0.712 (0.517-0.979)	**.037**
Preoperative consent to prescribe opioids obtained	0.724 (0.608-0.863)	**<.001**	0.764 (0.634-0.920)	**.005**
Acetaminophen prescribed postoperatively	0.845 (0.654-1.092)	.198	Not entered	—
Ibuprofen prescribed postoperatively	0.843 (0.694-1.022)	.083	1.014 (0.815-1.260)	.904
Discharge prescriber				
Advanced practice provider[b]	Reference	—	Reference	—
Resident	1.561 (1.258-1.937)	**<.001**	1.102 (0.770-1.574)	.599
Fellow	1.311 (1.058-1.625)	**.013**	0.934 (0.659-1.325)	.703
Physician	1.316 (1.024-1.692)	**.032**	1.186 (0.913-1.541)	.201

[a]P values in bold indicate statistically significant difference between the study groups ($P \leq .05$). BMI, body mass index; —, not applicable.
[b]Nurse practitioner or physician assistant.

signed consent form for prescribing opioids (IRR, 0.724; 95% CI, 0.608-0.863; $P < .001$) were significant predictors of fewer postoperative opioid doses. In multivariate regression analysis, surgery at an ambulatory surgery center (IRR, 0.712; 95% CI, 0.517-0.979; $P = .037$) and presence of a preoperative consent form for prescribing opioids (IRR, 0.764; 95% CI, 0.634-0.920; $P = .005$) were significant predictors of a lower number of opioid doses prescribed.

DISCUSSION

This study sought to detail trends in postoperative pain medication prescribing and its relationship to the emergence of preoperative consent to prescribe opioid medications for minors. Postoperative pain management continues to be a challenging and patient-specific endeavor that is perpetually evolving.[9,11,19] For pediatric patients undergoing ACLR, safe but adequate pain management is important due to their age and rehabilitation needs.[13] Tripp et al[27] found that controlling immediate postoperative pain in this group is more difficult than in adults due to higher subjective reports of pain, catastrophizing, and increased anxiety, forcing many prescribers to rely more heavily on opioid medications to decrease these symptoms. The recent emphasis on decreasing the use of opioid medication in order to reduce to their negative effects has led to an increase in the use of multimodal analgesia including perioperative peripheral blocks and postoperative NSAIDs.[6,12,14] Our study identified a decreasing volume of opioids dispensed postoperatively over the study period without evidence of worsening pain control. This coincided with growing utilization of formal prescriptions for multimodal pain management therapies including ibuprofen and acetaminophen. We found that an ambulatory surgery center location and a preoperative consent form for prescribing opioids were associated with lower total doses of prescribed opioids.

The overall trends in postoperative prescribing patterns at our center are very encouraging, especially across a diverse group of prescribers and without formal guidelines for prescribing in place. While we continue to rely on opioids as part of a pain management regimen in the vast majority of patients (>95%), the number of opioid doses steadily decreased between 2014 and 2018. This could be related to a number of factors including achieving adequate pain control using multimodal analgesia, obtaining preoperative consent to prescribe opioids, and providing better patient pre-education on pain management.[16] This not only leads to better patient outcomes and satisfaction, but some have found it can also lower health care costs and burden on the health care system.[2]

In 2016, Act 125 was enacted by Pennsylvania's legislation in an effort to help physicians constantly evaluate and reduce the amount of opioids being prescribed to minors. Among other mandates, physicians must discuss pain management and have the parent(s) or guardian(s) sign a consent form before prescribing these medications to a minor. While other studies have identified decreased prescribing

after state-legislated prescribing limits,[22] to our knowledge, this is the first work exploring the relationship between the preoperative consenting process and postoperative prescribing in pediatric sports medicine. We believe the discussion resulting from the consenting process likely affected opioid prescribing in a number of ways. Most importantly, it forced a preoperative discussion about postoperative pain management as well as the risks and benefits of utilizing opioid medications.[6] For providers, it required they acknowledge the importance of opioid stewardship with families and patients on a regular basis and placed greater focus on the amount and duration of medication prescribed. For patients and families, it forced a discussion that was not routinely carried out before mandated consenting, educating them about the risks and hazards of opioid misuse and overdose.

Our findings demonstrated a significant reduction in the number of doses prescribed to patients in the "opioid consenting" era without an apparent increase in early telephone calls, unplanned clinic visits, or returns to the emergency department. Aside from consent, prescribing of opioids appears closely tied to surgery location. Younger patients tended to receive opioids in liquid form for which doses appeared more liberally prescribed. This may be in part due to the electronic medical record, which has recommended dispensing volumes, possibly causing prescribers to round volumes up to larger numbers. In the consenting era, there appeared to be greater attention paid to this. Differences in prescribing volume based on location of surgery could be related to the reliance on the main hospital for cases believed to be longer or more complex, potentially resulting in greater analgesic requirements. These findings indicate that we might benefit from guidelines provided by an institutional education program similar to what has been provided successfully at other institutions.[25]

At our institution, advanced practitioners, rotating residents, orthopaedic pediatric fellows, and attending physicians all participate in the discharge of a patient, with advanced practitioners discharging a majority of our patients. Rotating orthopaedic residents (postgraduate years 2 through 4 at our institution) may have varying levels of familiarity with pain management practices in the pediatric population. Without institutional guidelines in place, residents likely rely on prescribing practices in other (ie, nonpediatric) areas of orthopaedics, where opioid utilization may be greater. Findings from this and related work from our institution are helping to establish best practice recommendations for pain management. These serve to standardize opioid-prescribing practices across our institution to better guide all providers toward safe and effective prescribing in this patient population. It should also be noted that, while graft type was not a risk factor for higher opioid prescription amounts, 92% of our cohort had hamstring autografts used in their ACLR. The relatively low number of all other graft types can skew this analysis and hide a true difference in pain levels between groups that could have higher opioid requirements.

Many providers have turned to multimodal analgesia to help manage patient-reported pain. This has been gaining popularity, both in the pediatric and adult

populations, as an effective method of decreasing opioid requirements postoperatively.[10,23] Our study noted a formal increase in the prescription of nonopioid medication at the same time that there was more careful management of opioids by the providers. While the use of acetaminophen and ibuprofen as alternatives to opioids is not new, written prescription of these medications is not routine in all practices. Some providers may rely on verbal instruction to patients and families because these medications can be obtained over the counter in different formulations. Our findings identified a significant shift toward formally prescribing these opioid alternatives over the study period, which we believe likely helped enable the shift in opioid prescribing without compromising pain control. We believe this represents an important consideration for providers aiming to refine their opioid-prescribing practices.

Most limitations of this study exist because of its single-center, retrospective design. Although pain management was provided by a large number of caregivers with diverse training, the methods described may not be generalizable to other treatment centers. While our patient cohort was diverse across the spectrum of pediatric ACL injury, as a tertiary referral center it may have included more patients with medically or surgically complex cases and unusual pain control needs. With regard to the assessment of the adequacy of prescribed medication, a retrospective collection of data about unplanned visits and the need for medication refills is limited. Finally, the study design is not ideally suited for evaluation of the actual medication utilization by patients. Future work using prospective, survey-based data capture will seek to identify the needs and actual consumption of opioids during the postoperative period.

CONCLUSION

The amount of prescribed postoperative opioids at our institution for pain management in pediatric ACLR has declined in recent years. This appears to be, in part, related to state-mandated preoperative opioid counseling, signing of a consent form by the parent(s) or guardian(s) for prescribing opioids, and encouragement toward the use of nonopioid medications when possible. Continued efforts should be made to optimize the use of these medications in order to mitigate the long-term issues related to misuse, overdose, and addiction.

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