

Original Article

Opioid Use After Knee Arthroscopy

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Purpose: To quantify the use of 5 mg oxycodone by patients who have undergone knee arthroscopy. **Methods:** Patients who underwent knee arthroscopy at 2 institutions between May 2018 and May 2019 were identified retrospectively. Patients were called and queried about the following metrics: total postoperative opioid consumption, preoperative opioid consumption (defined as within 3 months of surgery), smoking status, and history of depression. The total number of opioids prescribed and number of refills were determined according to each patient's chart. State databases were reviewed for additional opioid prescriptions. **Results:** A total of 100 patients were included in this study. Patients were prescribed a median of 5 pills (range, 5 to 40). Median postoperative opioid consumption was 0 pills, with a mean of 1.9 pills (14.3 oral morphine equivalents) and a range of 0 to 25 pills of oxycodone 5 mg. Of the patients, 97% did not obtain refills, and 58% of the patients did not consume any opioids. Overall, 90% of all patients consumed ≤ 5 pills. **Conclusions:** Of the patients, 90% consumed 5 or fewer opioid pills (oxycodone 5 mg) following knee arthroscopy, with more than half of the patients consuming 0 pills. As a result, we recommend that 5 oxycodone 5 mg pills serve as an objective guideline for opioid prescription following knee arthroscopy. **Level of Evidence:** Level IV, retrospective case series.

Postoperative pain management is a critical component of arthroscopic knee surgery. Adequate pain control is closely correlated with patient satisfaction and reimbursement metrics.^{1,2} Opioids have held a place in orthopaedic surgery because patients require adequate pain control to comply with rehabilitation programs, so orthopaedic surgeons are the third highest prescribers of opioids.³ Unfortunately, surgeons are forced to make educated guesses regarding opioid prescriptions due to the scarcity of objective data.⁴

Analysis of opioid-prescribing patterns reveal that orthopaedic surgeons prescribe between 12 and 60 opioid pills after knee arthroscopy.⁴⁻⁶ In 2019, Stepan et al. recommended 30 opioid pills after knee arthroscopy, based on expert consensus.⁷ Although expert panel guidelines are beneficial, they are not grounded in evidence and can contribute to overprescription of opioids.^{4,7}

The current opioid-prescription patterns described above appear to be excessive. Published research states that the number of pills prescribed postoperatively correlates directly with consumption of these same pills.⁸ The purpose of this study was to quantify the use of 5 mg oxycodone by patients who have undergone knee arthroscopy. We hypothesize that patients consume fewer opioids than prescribed.

Methods

Upon receiving approval from the institutional review board (#2019007), we examined patients who underwent surgery performed by multiple surgeons at 2 geographically distinct institutions between May 2018 and May 2019. To be included in the study, patients had to meet the following inclusion criteria: be at least 18 years of age; having undergone meniscectomy, meniscal repair, chondroplasty, or synovectomy; be willing to answer questions regarding postoperative pain management; and have the ability to comprehend

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Table 1. Multiple Site Multimodal Analgesic Protocol and Postoperative Medication for Knee Arthroscopy

Perioperative Analgesic Protocol	
Preoperative	Acetaminophen 1000 mg PO (in holding area)
Intra-articular Injection	10 mL of 0.5% bupivacaine with epinephrine Ketorolac 15 mg
Postoperative pain-management protocol	
OTC medication	Acetaminophen 1000 mg PO Q8 for 5 days Ibuprofen 800 mg PO Q6 for 5 days
Prescription medications	Oxycodone 5 mg PO Q4 PRN

NOTE. Physicians followed this multimodal analgesic protocol for simple knee arthroscopies. Patients were advised to consume acetaminophen and ibuprofen on an alternating schedule every 4 hours to maximize pain relief. Opioids were prescribed on an as-needed basis. OTC, over-the-counter; PO, oral; PRN, as needed; Q4, every 4 hours; Q6, every 6 hours; Q8, every 8 hours.

and answer questions in English. Patients were excluded from the study if they met any of the following criteria: inability to recall the exact number of consumed opioid pills, revision arthroscopies and ligament reconstructions requiring open components during surgery, such as anterior cruciate ligament reconstruction or medial patellofemoral ligament reconstruction. Patients' sex, age, opioid prescriptions, and concomitant procedures were recorded. Patients' eligibility assessments and recruitment were performed by the principal investigator or a trained, authorized site delegate. All patients received education regarding proper opioid use.

Analgesic protocol included general anesthesia and a local injection at the site of the incision (10 mL of 0.5% bupivacaine with epinephrine and 15 mg of ketorolac) at the end of the procedure. Patients were prescribed a postoperative pain management protocol, including a multimodal approach of nonsteroidal anti-inflammatory drugs, acetaminophen and opioids. Patients were prescribed a 5-day course of oral acetaminophen 1000 mg and oral ibuprofen 800 mg. They were instructed to alternate between the 2 medications every 4 hours but not to exceed 3 doses of acetaminophen daily. For breakthrough pain, patients were prescribed opioid medication (Table 1). The protocol for the second site was identical.

Patients were contacted via telephone and asked a series of 5 questions regarding their postoperative pain management. First, patients were asked how many opioid pills they had consumed postoperatively. Prescribed and consumed opioids were converted to oral morphine equivalents (OMEs) to standardize each prescription for accurate data analysis. OMEs are standard values assigned to opioids to represent their relative potencies. For instance, 5 mg oxycodone equates to 7.5 OMEs. Next,

patients were asked what was done with the leftover opioid pills. If patients stated that they still retained leftover opioids, they were advised to dispose of them responsibly through local drug-disposal programs. The next 3 questions pertained to factors that may cause higher opioid consumption. Patients were asked whether they had consumed any opioids in the 3 months prior to their surgery. Next, patients were asked if they had a history of depression. Last, patients were asked about their smoking status. Smoking status was categorized into 5 groups: current regular, current occasional, former regular, former occasional, and never. Regular smokers were defined as those who smoke every day.

Results

A total of 191 patients met the criteria for this study; 81 patients were not able to be reached via telephone, 9 patients declined to participate in the study, and 1 patient was excluded due to reinjury during the postoperative recovery period. Of the patients, 100 (52.4% of the initial sample) were included in the final analysis (Fig 1). The patients in this study did not have open components during their procedures. Patients were prescribed a median of 5 oxycodone 5 mg pills (Table 2). Median postoperative opioid consumption

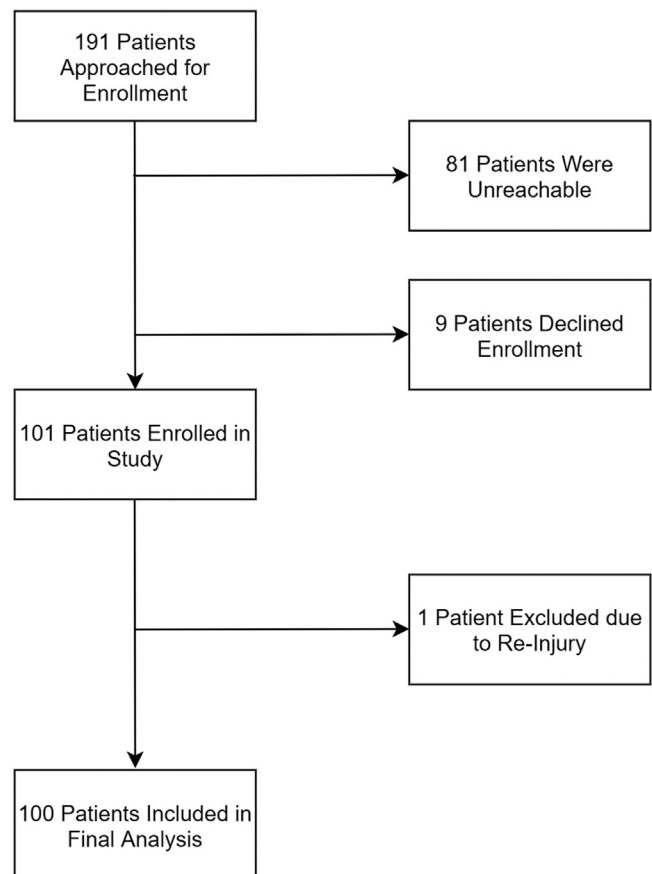
**Fig 1.** Flow Diagram of Study Enrollment

Table 2. Subjects' Demographics

Sex	
Male	56
Female	44
Age	
Mean	48
Range	18-72
Procedure	
Meniscal repair	10
Partial meniscectomy	76
Other arthroscopic surgery*	14
Smoking status	
Never	77
Current regular	3
Current occasional	2
Former regular	10
Former occasional	8
Depression	
Yes	6
No	94
Prior opioid use	
Yes	4
No	96
Opioid prescription (pills of oxycodone 5 mg)	
Median	5
Range	5-40

*Other arthroscopic surgery is defined as chondroplasty or synovectomy.

was 0 pills, with a mean of 1.9 pills (14.3 OMEs). Patients consumed between 0 and 187.5 OMEs (0-25 pills), and 97% of patients did not obtain refills; 58% of patients did not consume any opioids. Overall, 90% of all patients consumed ≤ 5 pills (Fig 2). Our data show that only 18% of prescribed opioids were consumed. (Fig 3).

Of the patients who obtained refills, 2 of the 3 identified as smokers (current or former). Refills ranged from 5 to 20 pills. Only 5% of patients identified as current smokers ($n = 5$). Patients who identified as current smokers consumed a mean of

23.5 OMEs postoperatively, which is approximately 3.1 pills of oxycodone 5 mg, and 6% of patients reported histories of depression; however, this group consumed a mean of 0.5 pills of oxycodone 5 mg. Four patients stated that they had consumed opioids in the 3 months prior to their surgery; however, none of these patients consumed more than 5 opioid pills over the course of their recoveries. None of these parameters (smoking, depression and prior opioid use) had a bearing on postoperative opioid consumption; 27% of patients reported that they still possessed unused opioids.³

Discussion

The principal finding of this study is that 90% of patients undergoing knee arthroscopy consume 5 or fewer oxycodone 5 mg pills after the surgical event. Furthermore, 58% of patients consumed 0 opioid pills. This amount of opioid consumption is far lower than the recommendations by currently published expert panel guidelines. Despite being prescribed only 5 opioid pills, 97% of patients did not require refills during their postoperative recoveries. This suggests, in conjunction with a multimodal approach, that fewer prescribed opioids do not lead to more refills. Based on our findings, we recommend that 5 oxycodone 5 mg pills should be used as a guideline following knee arthroscopy.

There is limited literature concerning opioid-prescribing protocols following orthopaedic procedures. Furthermore, published opioid-prescribing recommendations fall into either clinical observational recommendations or expert panel guidelines.

Gardner et al. performed a prospective study observing opioid use following simple arthroscopic meniscectomy. They prescribed between 15 and 60 pills (hydrocodone, oxycodone or codeine) with a mean of

Distribution of Number of Opioids Consumed

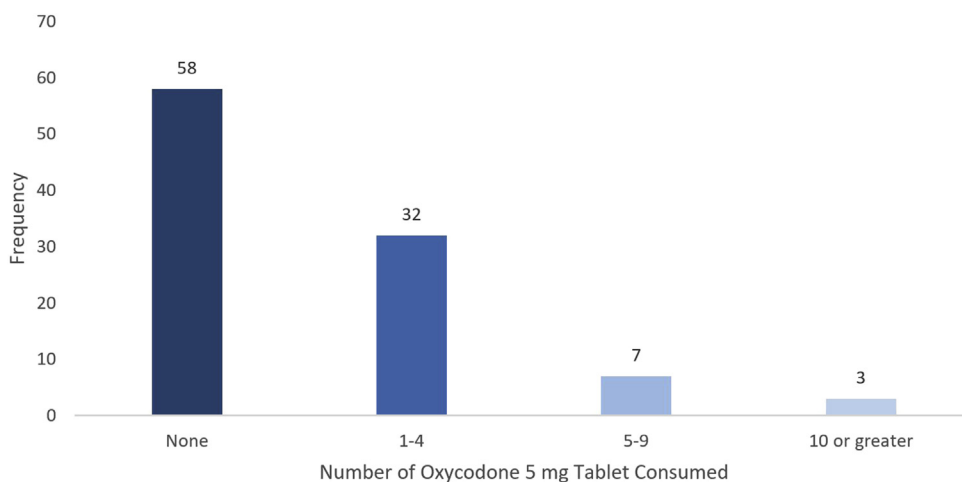


Fig 2. Distribution of post-operative opioid consumption following simple knee arthroscopy. Patients in this retrospective study were queried about their opioid consumption following recent knee arthroscopy. Of all patients, 90% consumed 5 or fewer opioids.

QUANTIFICATION OF UNUSED OPIOIDS

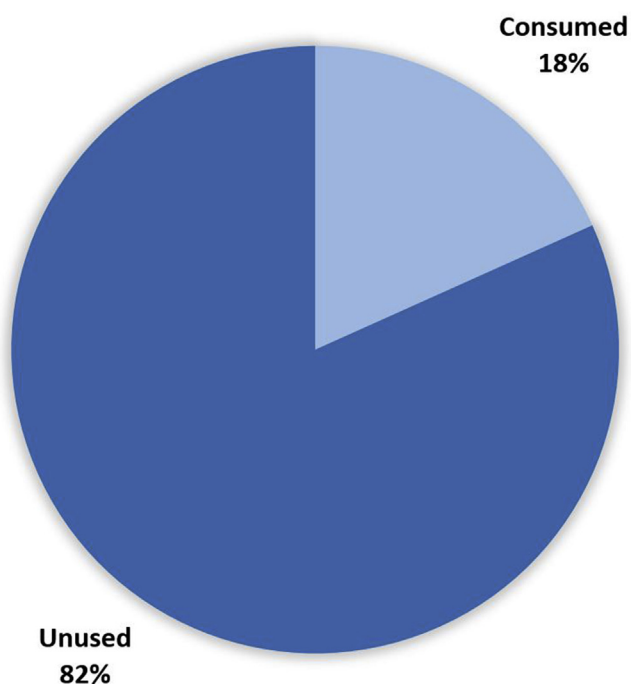


Fig 3. Quantification of unused opioids. The number of unused opioids was calculated as the difference between the total number of opioid pills prescribed and the total number of opioid pills consumed.

36.9 pills. They found that they overestimated opioid consumption, as only 18% of prescribed opioids were consumed.⁶ Tepolt et al. prescribed a similar range of opioid pills (12-60) and found that after knee arthroscopy, their patients consumed only 32% of prescribed opioids.⁵ Tepolt et al. also performed a multivariate analysis, which showed that increased weight, longer surgery time and increased diazepam use were associated with increased opioid consumption.⁵ Although Gardner and Tepolt recognize overprescription, they did not offer specific guidelines for opioid prescription after knee arthroscopy. Moreover, Wojahn et al. prospectively observed that patients consumed a median of 7 opioid pills (hydrocodone 5 mg) following knee arthroscopy. Only 5.9% of their patients obtained refills, which may indicate that patients are satisfied with lower opioid prescriptions.⁴ Via a multivariate analysis, Wojahn et al. found that meniscal repair, smoking and preoperative opioid usage were associated with higher postoperative opioid consumption.⁴ In an effort to elucidate the benefits of a multimodal approach to pain management, Pham et al. found no difference in pain control and pain satisfaction between an NSAID group and an opioid group after knee arthroscopy.¹

Current expert-panel recommendations for simple knee arthroscopy contrast the clinical observational

studies. Stepan et al. sought to reduce opioid consumption following orthopaedic surgery through prescriber education. Their expert panel suggested 30 opioid pills (hydromorphone 2 mg, oxycodone 5 mg or hydrocodone 5 mg) for knee arthroscopy.⁷ Similarly, Overton et al. also presented an expert panel guideline suggesting between 0 and 10 pills (oxycodone 5 mg) following partial meniscectomy.⁹

Expert panel guidelines should concur with evidence-driven guidelines to reduce substantially the opioid epidemic. This current study demonstrates that patients consume a mean of approximately 2 pills following simple knee arthroscopy. Prescribing opioids in accordance with expert panel guidelines (Overton and Stepan) would amount to nearly 3 to 9.5 million excess opioid pills prescribed during a 6-year period.^{7,9,10} If physicians abided by this current study's proposed guideline, the quantity of excess opioid pills would be reduced by 62% to 88%.

Farley et al. found that opioid consumption is associated with opioid prescription quantities following anterior cruciate ligament reconstruction.⁸ Therefore, overprescription can potentiate the still increasing opioid epidemic. The Centers for Disease Control and Prevention delineates a 5-day prescription window after which the risk of long-term opioid dependence at 1 year increases steeply.¹¹ Thus, large opioid prescriptions, such as 30 pills, have the possibility of persisting past the 5-day window. However, strategies to remedy the epidemic include proper patient education, a multimodal approach to pain management and fewer opioids for breakthrough pain.¹²

Limitations

The current study has several limitations. Patients were queried regarding postoperative pain management up to 12 months postoperatively, so recall bias may affect the accuracy of their reporting. Moreover, due to the retrospective nature of the study, we were not able to record the association of pain satisfaction and opioid consumption during recovery. Additionally, a larger sample size may be more effective in elucidating the effects of smoking status, depression and prior opioid use. Response bias is always a potential limitation in studies based on self-reporting. We did not assess other factors that may be associated with opioid consumption such as socioeconomic status.

Conclusions

We found that 90% of patients consume 5 or fewer opioid pills (oxycodone 5 mg) following knee arthroscopy, with over half of the patients consuming 0 pills. As a result, we recommend that 5 oxycodone 5 mg pills serve as the guideline for opioid prescription following knee arthroscopy.

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