Original Article

Declining Postoperative 90-Day Opioid Prescriptions From 2010 to 2021 Following Hip Arthroscopy for Femoroacetabular Impingement Syndrome

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Purpose: To analyze postoperative opioid prescriptions after hip arthroscopy for femoroacetabular impingement syndrome (FAIS) in a large, opioid-naive population and to evaluate factors associated with receiving more opioids. **Methods:** Opioid-naive adult patients who underwent hip arthroscopy for FAIS were queried in the 2010 to 2022 PearlDiver Mariner 161 national administrative database. Exclusion criteria included patients with a history of chronic pain and patients who received opioid prescriptions more than 30 days before surgery. Patient variables were extracted: age, sex, and Elixhauser Comorbidity Index. Ninety-day postoperative opioid prescriptions (by total morphine milligram equivalents [MMEs]) were assessed with multivariate linear regression. Ninety-day postoperative opioid prescriptions from 2011 to 2021 were assessed. **Results:** Of 27,079 patients with postoperative opioid prescriptions identified, a mean ± standard deviation of 347.6 ± 729.2 MMEs (40 tablets of 5 mg oxycodone) were prescribed per patient, with a mean of 1.6 prescriptions filled per patient within 90 days following surgery. Seventy-five percent of patients filled fewer than 600 MMEs, but a small subset filled more than 2,000 MMEs. Multivariate analysis revealed that, compared to patients in the age 30- to 39-year group, those aged 20 to 29 years received fewer MMEs ($\Delta = -72.5$, $P < .017$). Compared to those with an Elixhauser Comorbidity Index of 2 or under, those >2 were prescribed more MMEs ($\Delta = 52.5$, $P < .017$). Sex did not correlate with the postoperative MMEs prescribed. From 2011 to 2021, a 58.2% decrease in the 90-day mean MMEs prescribed was noted per patient ($P < .017$). **Conclusions:** Fewer postoperative MMEs were filled following FAIS hip arthroscopy for patients in their 20s relative to those in their 30s, as well as for those with lower comorbidity burden. Patient sex was not associated with differences in postoperative MMEs prescribed. The amount of mean MMEs prescribed per patient decreased from 2011 to 2021. **Clinical Relevance:** This study provides information about the typical amount of narcotics required after surgery. This is increasingly useful information, as surgeons/clinicians continue to try to minimize the role of narcotics in postoperative recovery.

Hip arthroscopy is a common orthopaedic procedure[1] that is utilized for both diagnostic and therapeutic purposes in a wide range of hip pathologies.[2] One such indication is femoroacetabular impingement syndrome (FAIS) when refractory to conservative management, for which surgical treatment has been growing in incidence over the years.[3] Diagnoses of FAIS have also increased in incidence over the years, with younger, athletic, and female populations being predisposed.[4]

While there has been growing attention on multimodal pain management after common arthroscopic procedures,[5,6] opioids remain a standard component of acute postoperative pain management.[7] Ukert et al.[8] used a private commercial insurance database to determine state-level variations in opioid prescription amounts following knee arthroscopy in opioid-naive patients. Day et al.[9] used the PearlDiver database to study postoperative opioid prescriptions in patients who underwent arthroscopic rotator cuff repair. Kunze et al.[10] developed a machine learning algorithm to predict prolonged postoperative opioid use following hip arthroscopy in the opioid-naive patient population.

Prior studies have also investigated the associations of excess opioid use following hip arthroscopy for FAIS.

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Bourgeault-Gagnon et al.,[11] in a cohort study of 231 patients who underwent hip arthroscopy for FAIS, found that preoperative opioid use was associated with a 10 times greater odds of prolonged postoperative opioid use at 6 weeks. Nazzal et al.,[12] in a database study of 22,124 patients, similarly found that preoperative opioid use was associated with prolonged postoperative opioid use, in addition to increased health care costs and early revision surgery. However, there are few studies investigating postoperative opioid prescriptions specifically among the opioid-naive population undergoing hip arthroscopy for FAIS.

The purposes of this study were to analyze postoperative opioid prescriptions after hip arthroscopy for FAIS in a large, opioid-naive population and to evaluate factors associated with receiving more opioids. The hypothesis was that the opioid-naive hip arthroscopy patient would have received fewer opioid dosages following their surgery and that clinical factors such as age, sex, and comorbidities would independently influence these dosages.

Methods

Study cohort

Data for the current study were derived from 2010 to 2022 PearlDiver Mariner 161 Patient Claims Database (PearlDiver Technologies). This database has been well established for orthopaedic-related studies.[9,13-15] As data from this database are returned in a deidentified and aggregated form, our institutional review board found studies exclusively utilizing this database exempt from review.

Patients undergoing first-time hip arthroscopy for FAIS were identified by the Current Procedural Terminology codes 29914 to 29916 (typically directed specifically for FAIS[16]). Adult patients with records of opioid prescriptions within 90 days after undergoing hip arthroscopy were identified using National Drug Codes for opioids. Exclusion criteria included patients younger than 18 years, those with a history of chronic pain based on International Classification of Diseases coding, and patients who had records of receiving opioid prescriptions more than 30 days before surgery. This cutoff of not excluding based on opioid prescriptions within 30 days of surgery was selected because these prescriptions were presumed to have been prescribed related to the pathology being addressed,[17] and this interval has been previously used to define opioid-naive status.[18,19]

Patient Characteristics

Patient demographic variables were abstracted, including age, sex (defined by SAGER guidelines[20] as "a set of biological attributes associated with physical and physiological features including chromosomes, gene expression, hormone function, and reproductive/sexual anatomy, usually categorized as female or male"), and Elixhauser Comorbidity Index (ECI, a quantitative measure of patient comorbidity burden commonly used with administrative data sets[21]).

In addition, measures of 90-day postoperative opioid prescription data, including both the distribution of morphine milligram equivalents (MMEs) being prescribed to the study population and the number of prescriptions filled, were extracted.

Data Analysis

Univariate linear regression was used to derive the mean, standard deviation, and median 90-day total postoperative MMEs for patients in each age, sex, and ECI category. Single-factor analysis of variance was performed to assess for differences in MMEs prescribed per patient within each variable of interest.

The differences in mean 90-day postoperative MMEs prescribed per patient were compared on patient age group (20 to 29, 30-39 [reference group], 40-49, 50-59, 60+), sex, and ECI (2 or under, over 2) on multivariate linear regression. The age groups were chosen to allow for direct comparison between distinct decades of age. The 30 to 39 age group was chosen as the reference group for age comparisons in a post hoc manner as this age group contains the greatest number of patients and the mean age of the study cohort, thus reducing the likelihood of false negatives. The ECI cutoff was determined in a post hoc manner that utilizes the mean ECI within the study group. This was quantified by resulting in the excess 90-day postoperative MMEs prescribed per patient compared to the reference group for each variable. Patients younger than 20 years were excluded from the multivariate analysis due to comparatively minimal patient volume. Based on Bonferroni correction for multiple comparisons with a 95% confidence interval, statistical significance was established at $P < .017$.

Finally, the mean 90-day postoperative MMEs prescribed per patient from 2011 to 2021 were assessed. A trendline was fitted with univariate linear regression, and the r^2 value was derived to assess the fit.

Results

Patient Cohort and Narcotics Prescribed

In total, 27,079 adult patients undergoing hip arthroscopy for FAIS with postoperative opioid prescriptions were identified. The patient population had a mean age of 35.6 ± 14.0 years and a mean ECI of 1.6 ± 1.8, and 68.1% were female (Table 1).

The distribution of MMEs prescribed in the 90 days following surgery is shown in Figure 1. Notably, 75.0% of patients received fewer than 600 MMEs, but a small subset of patients received more than 2,000 MMEs (80

Table 1. Patients Prescribed Opioids Within 90 Days Following Hip Arthroscopy

Characteristic	Value
Number	27,079
Age, mean ± SD, y	35.6 ± 14.0
Sex, n (%)	
Male	8,646 (31.9)
Female	18,433 (68.1)
Elixhauser Comorbidity Index, mean ± SD	1.6 ± 1.8
Opioid prescriptions written per patient	
Mean	1.6
Median	1
MMEs prescribed per patient	
Mean ± SD	347.6 ± 729.2
Median	300

MME, morphine milligram equivalent.

and 267 tablets of 5 mg oxycodone, respectively). The mean ± standard deviation and median MMEs prescribed per patient within 90 days postoperatively were 347.6 ± 729.2 and 300, respectively. The mean was equivalent to 46 tablets of 5 mg oxycodone and the median equivalent to 40 tablets of 5 mg oxycodone (Appendix 1, available at www.arthroscopyjournal.org).

Patients filled a mean prescription count of 1.6. While 67.3% of patients received only 1 opioid prescription, 12.1% of patients received 3 or more prescriptions in this period (Fig 2).

Factors Associated With Excess Narcotics Prescribed

Multivariate logistic regression analysis revealed that compared to patients in the age 30 to 39 group, being between the ages of 20 and 29 independently predicted being prescribed fewer MMEs ($\Delta = -72.5$, $P < .017$). Older age groups did not differ significantly in the amount of MMEs prescribed. Compared to those with an ECI of 2 or under, patients with an ECI of more than 2 received more MMEs ($\Delta = 52.5$, $P < .017$). Sex was not a significant predictor of postoperative MMEs prescribed (Fig 3).

From 2011 to 2021, there was a 58.2% decrease in mean MMEs prescribed per patient within 90 days following hip arthroscopy and an average decrease of 46 MMEs per year ($P < .017$) (Fig 4). This represents a change from 90 tablets of 5 mg oxycodone prescribed per patient in 2011 to 38 tablets in 2021, or 6 fewer tablets prescribed per patient per year.

Discussion

The main finding of the current study is that, on average, opioid-naive patients who were prescribed opioids following hip arthroscopy for FAIS were prescribed the equivalent of 46 tablets of 5 mg oxycodone within 90 days following surgery. Young et al.,[22] in a national claims database study of over 5 million opioid-naive patients undergoing surgery, found that patients who received opioid prescriptions lasting >7 days or consisting of >400 MMEs had higher odds of progressing to chronic opioid use. Concerningly, 48.3% of patients in the current study were prescribed >400 MMEs. Given that chronic opioid use has been associated with increased complication rates following hip arthroscopy,[7] it is important to focus on allocating further research and resources for the patients identified in our study who are receiving high amounts of opioids following hip arthroscopy.

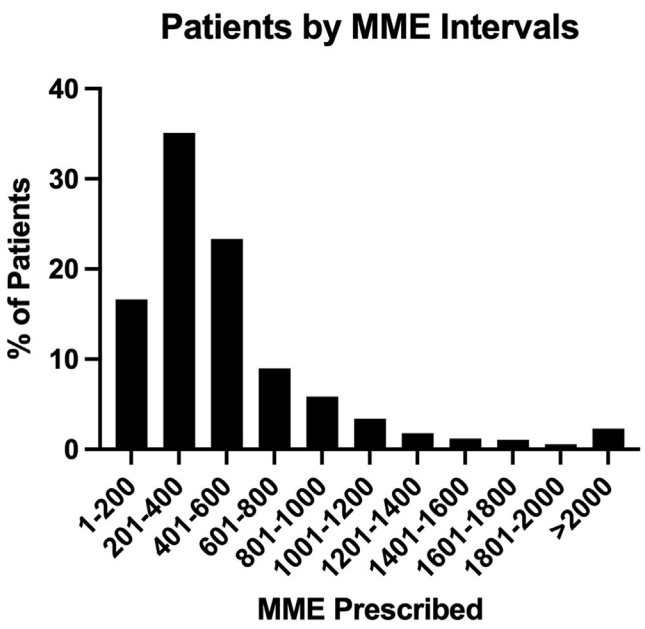

Fig 1. Breakdown of patients by the amount of morphine milligram equivalents prescribed in the 90 days following hip arthroscopy. MME, morphine milligram equivalents.

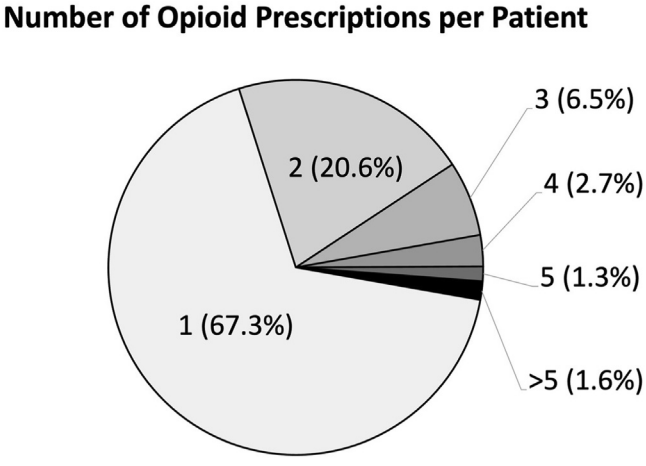

Fig 2. Breakdown of the number of opioid prescriptions patients are receiving within the 90 days after hip arthroscopy.

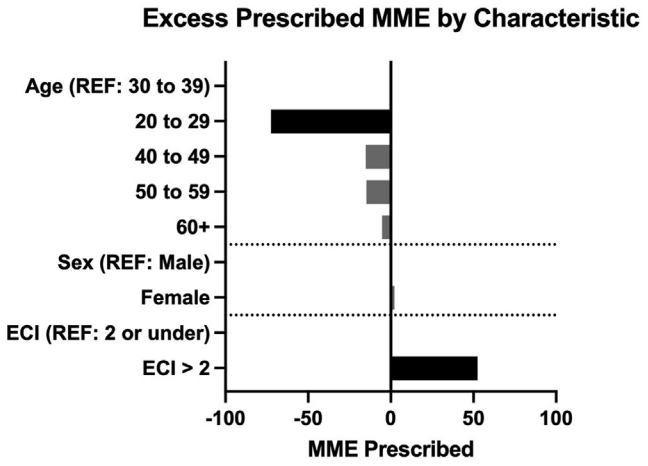

Fig 3. Forest plot showing results of multivariate linear regression analyzing patient age group, sex, and ECI as independent predictors of 90-day postoperative MMEs prescribed following hip arthroscopy. Bold = statistically significant at $P < .017$. MME, morphine milligram equivalents; REF, referent cohort.

The demographics of the large cohort of national patients identified for the current study were predominantly young and female-biased, as those found in other cohort studies exploring hip arthroscopy for FAIS,[23-25] supporting the applicability of the cohort investigated.

While most patients filled only 1 prescription, 32.7% refilled prescriptions at least once and 12.1% at least twice. In a cohort study of 775 patients, Beck et al.[26] found that those who underwent hip arthroscopy for FAIS who received an opioid prescription refill (i.e., 2 postoperative prescriptions) had worse functionality and pain scores compared to those who did not receive a refill (i.e., 1 postoperative prescription). However, this analysis did not control for preoperative opioid use. Regardless, there is room to improve in reducing prescription amounts and counts in this population, and these results may enhance provider awareness and assist in opioid prescription reduction.[27]

Achieving adequate pain management while minimizing opioid prescription amounts is a balancing act that is patient dependent. A 2021 study of 113 patients undergoing hip arthroscopy for FAIS at a single institution incorporating an opioid reduction policy revealed that reducing the mean postoperative MMEs prescribed from the equivalent of 33 to 15, the 5-mg oxycodone tablets did not change patient satisfaction scores.[28] This may be related to a notable finding in a 2024 case series of 176 younger patients who underwent various elective arthroscopic surgeries: 60% of their prescribed opioids went unused. This evidence may provide further comfort for physicians and institutions considering the implementation of opioid reduction strategies in this patient population, especially given the increasing focus on opioid-sparing multimodal pain management strategies and outcomes in recent literature, such as with oral medications (acetaminophen, gabapentin, nonsteroidal anti-inflammatory drugs, etc.), nerve blocks, intraoperative muscle relaxants, and postoperative local anesthetics.[29-31]

The current study found that younger age (specifically patients in their 20s compared to those in their 30s) and less comorbidity burden were factors independently associated with being prescribed fewer MMEs in the postoperative 90-day window of hip arthroscopy for FAIS. These findings are consistent with recent data showing that younger patients tend to require fewer opioids postoperatively[32] and that comorbidities can cause pain, heighten pain perception, and act as contraindications for other pain management modalities in a multimodal strategy.[33]

Finally, the current study found that among opioid-naive adults who received postoperative opioids following hip arthroscopy for FAIS, the mean MMEs prescribed per patient within the 90 postoperative days decreased considerably from 2011 to 2021, with a noticeable downward inflection in 2016. Numerous factors may be contributing to this, but a notable one is highlighted by a large cross-sectional analysis of opioid-naive patients, which found that the Centers for Disease Control and Prevention guidelines for the prescription of opioids in chronic pain released in 2016 had an unintended but substantial impact of reducing postoperative opioid prescriptions.[34] Further, increases in hip arthroscopy surgical volume[35] combined with

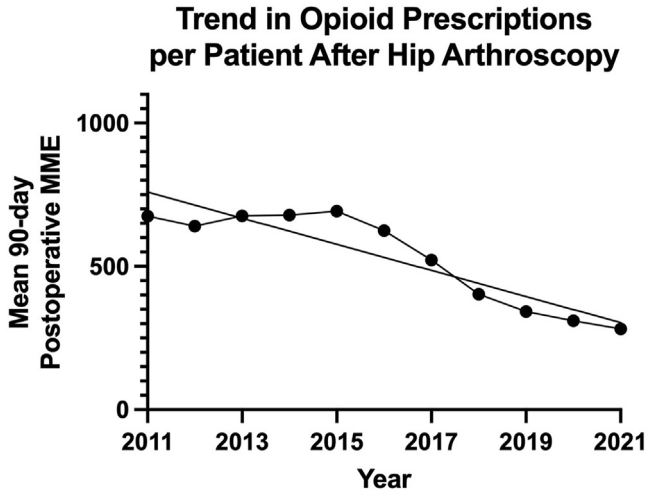

Fig 4. The trend of mean 90-day postoperative MMEs prescribed per patient following hip arthroscopy from 2011 to 2021. The decrease in MMEs from 2011 to 2021 is statistically significant ($P < .017$). The r^2 value of the trendline is 0.84. MME, morphine milligram equivalents.

advancing knowledge and techniques through the years (such as with post-less distraction[36]) may have contributed to reductions in the amount of opioids needed for adequate postoperative pain control.[37]

Limitations

The current study is to be interpreted in the context of limitations. First, due to the nature of database studies, it is limited by its retrospective study and by the accuracy of the administrative coding. Second, while opioid prescriptions filled were tracked, opioid usage, specific surgical indications, and patient outcomes were not studied. Third, the current study investigated a case series of patients who received opioid prescriptions following hip arthroscopy for FAIS but did not analyze the cohort that did not receive opioids. Fourth, the opioid prescriptions tracked were not able to be specifically linked to diagnoses related to postoperative pain, and thus some prescriptions may have been dispensed for reasons unrelated to the surgery. Finally, other pain control modalities that patients may have utilized were not accounted for.

Conclusions

Fewer postoperative MMEs were filled following FAIS hip arthroscopy for patients in their 20s relative to those in their 30s, as well as for those with a lower comorbidity burden. Patient sex was not associated with differences in postoperative MMEs prescribed. The amount of mean MMEs prescribed per patient decreased from 2011 to 2021.

Disclosures

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: A.E.J. is a consultant or advisor for Smith & Nephew, has received funding grants from Arthrex, and has received travel reimbursement from Arthrex and Smith & Nephew. J.N.G. is a board member of the *North American Spine Society Journal*. All other authors (W.D., S.H., S.S., B.K., J.Z.) declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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