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## The impact of state-mandated opioid prescribing restrictions on prescribing patterns surrounding reverse total shoulder arthroplasty



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**Background:** Orthopedic surgeons are the third-highest prescribers of opioid medications, and the recent opioid crisis has placed more scrutiny on physicians and their prescribing habits. House Bill 21, a new law limiting the prescription of opioid medications, was signed in Florida on July 1, 2018 and similar laws have been passed in a number of other states as well. The purpose of this study was to understand the effect of new legal mandates on opioid prescribing patterns and dependence rates for patients undergoing reverse shoulder arthroplasty.

**Methods:** A retrospective review of 143 patients who underwent primary reverse shoulder arthroplasty from 2017 to 2019 was performed. There were 87 patients in the pre-legislation group (group 1), compared to 56 in the post-legislation group (group 2). Demographics data and opioid prescriptions provided 90 days before and after surgery were obtained using the physician drug monitoring database. Descriptive statistics and Student's t-tests were used to examine differences.

**Results:** Preoperatively, both groups received similar numbers of pills and total morphine equivalents (TMEs; group 1: 47.3 pills and 59.9 TMEs, group 2: 30.9 pills and 24.8 TMEs) ( $P = .292$ ,  $P = .081$ ). Group 1 had 88.5% of patients fill an opioid prescription postoperatively, compared to 50.9% of group 2 ( $P < .001$ ). Postoperatively, initial opioid prescriptions were higher in average pills for group 1 (26 pills with an average of 375.6 TMEs) compared to group 2 (18 pills with an average of 199.6 TMEs) ( $P < .001$ ,  $P = .122$ ). For the entire postoperative course, patients in group 1 filled prescriptions for an average of 1740.7 TMEs and 84 pills, compared to 461.9 TMEs and 32 pills in group 2 ( $P = .035$ ,  $P < .001$ ). In the cohort, 17.8% of group 2 had multiple recorded opioid prescriptions, compared to 70.1% of group 1. There were also significant differences observed in postoperative dependence rates, with 23.0% in group 1 compared to 12.5% in group 2 ( $P = .043$ ).

**Conclusions:** State-mandated opioid prescribing restrictions have been successful in decreasing opioid prescribing and dependence rates for orthopedic shoulder patients. Further efforts are required to reduce preoperative prescriptions involving chronic shoulder pathology as current legislature has not had an impact on this. Legislative changes may be an effective way to help reduce abuse and opioid dependence in shoulder arthroplasty patients; however, further research is needed.

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The opioid crisis in the United States slowly increased over the past several decades, reaching a peak in the late 2017 when the United States Department of Health and Human Services declared it a public health emergency.<sup>29</sup> As per the National Survey on Drug Use and Health in 2017, approximately 2.1 million Americans over the

age of 12 had an opiate use disorder and 130 Americans died each day from opiate overdoses.<sup>29</sup> One factor commonly recognized as contributing to the opioid epidemic was overprescription of opiate analgesics by physicians. In 2016, more than 236 million opioid prescriptions were written in the United States allowing each adult American to have a prescription for opioids.<sup>29</sup> Although opioids are a considerable option for relieving pain, their prescriptions also carry a high potential for abuse; in 2017, misuse of opiate pain analgesics was seen in 11.1 million Americans over the age of 12.

Amongst physicians, orthopedic surgeons are the third-highest prescribers of opioid medications, behind family medicine and

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internal medicine physicians.<sup>30</sup> Prior research has shown that overprescription of opiates for postoperative pain management is a common occurrence in the field of orthopedic surgery.<sup>6,7,26</sup> From 2002 to 2011, a 152% increase in preoperative opioid dependence among patients undergoing orthopedic surgery was observed.<sup>16</sup> In patients undergoing orthopedic shoulder surgery, many suffer from chronic pain, requiring preoperative opioids as well.<sup>3,17,31</sup> One study found that 40% of patients undergoing shoulder arthroplasty received narcotics within 3 months preceding their surgery.<sup>21</sup>

As of 2018, 21 states have established and implemented legislation that limits the prescribing of opioids.<sup>1</sup> Fifteen states (Alaska, Hawaii, Colorado, Utah, Oklahoma, Louisiana, Missouri, Indiana, West Virginia, South Carolina, Pennsylvania, New York, Maine, Connecticut, and Massachusetts) have placed a 7-day supply limit for the initial prescription of opioids to any opioid naive patient for the treatment of acute pain.<sup>4</sup> Three states have further limited this initial prescription to 5 days.<sup>4</sup> States have also begun to target the prescribing of opioids in the setting of postoperative pain.<sup>4</sup> While certain states have focused on limiting the duration of opioid prescriptions, a few states have also placed limits on the daily dose, standardized to morphine milligram equivalents (MMEs): Rhode Island (50 MMEs), Tennessee (60 MMEs if 3-day supply, otherwise 50 MMEs), Arizona (90 MMEs), Nevada (90 MMEs), Maine (100 MMEs).<sup>4</sup> Additionally, many public health initiatives such as implementing education programs for patients and providers, setting opioid prescribing guidelines, combating opioid overdoses, and facilitating regulation of pain clinics continue to increase in frequency throughout the United States.<sup>15,33</sup>

Despite the abundance of legislation restricting opioid prescriptions, the efficacy of these programs remains unknown. A 2018 nationwide survey of members of the American Shoulder and Elbow Surgeons revealed that, following total shoulder arthroplasty, 93.6% of orthopedic surgeons still prescribe opioids postoperatively with the average patient receiving a total of 432.5 MMEs.<sup>31</sup> This study intends to determine the efficacy of the legislation restricting opioid prescriptions. House Bill (HB) 21, designed to regulate the prescription of controlled substances in Florida, was signed into law on July 1, 2018. Additionally, the law defines standards of practice for the management of acute pain (postoperative included) such that prescribers may only provide, at the maximum, a 3-day supply of Schedule II opiates. Although it may appear somewhat restrictive, the law does allow for the prescription of a maximum 7-day supply of opiates if the prescriber indicates an acute pain exception. Recently, a study has reported that 8 months following the implementation of HB 21 in Florida there was decreased opioid use and changes in initial prescribing decisions for acute pain in general.<sup>14</sup> The purpose of this study was to understand the effect of the new legal mandates on opioid prescribing patterns and dependence rates for patients undergoing reverse shoulder arthroplasty (RSA).

## Methods

A retrospective review of 143 patients who underwent RSA by 2 fellowship-trained shoulder surgeons was performed within a single healthcare system between 2017 and 2019. Patients who underwent a primary RSA were identified by the use of Current Procedural Terminology code 23472 and 23474, respectively. The cohort consisted of 87 patients in the pre-legislation group (group 1) and 56 in the post-legislation group (group 2). Patients who underwent RSA before July 1, 2018 when HB 21 became law were included in group 1 while those who underwent RSA after July 1, 2018 were included in group 2. Demographic information was collected on age, gender, race/ethnicity, body mass index (BMI), American Society of Anesthesiologists (ASA) grade, and smoking

**Table 1**  
Demographic characteristics of patients.

	Group 1	Group 2	P value
Age	73.7	72.1	.204
Gender	40 Males 47 Females	23 Males 33 Females	.061
Race/ethnicity	White: 68 Hispanic: 15 African American: 4	White: 43 Hispanic: 11 African American: 2	.178
ASA class	ASA 1: 2 ASA 2: 42 ASA 3: 43 ASA 4: 0	ASA 1: 1 ASA 2: 27 ASA 3: 27 ASA 4: 1	.248
Smoking status	Never: 58 Former: 26 Current: 3	Never: 33 Former: 20 Current: 3	.148
BMI	29.67	31.18	.175

ASA, American Society of Anesthesiologists; BMI, body mass index.

status. Primary surgery was defined as a primary RSA in a patient who had no prior arthroplasty surgery in the affected joint. Exclusion criteria included revision surgery, fractures, and patients with no available data in the Electronic-Florida Online Reporting of Controlled Substance Evaluation (E-FORCSE) database. Patient's opioid prescription data included both preoperative and postoperative opioid use within 90 days of surgery. This was obtained using E-FORCSE. Prescription type, number of pills, length of prescription, number of refills, daily MMEs, and total morphine equivalents (TMEs) were recorded and entered in the database. Refills were counted as separate prescriptions on the date of dispensation. Postoperative opioid dependence was defined as 3 or more months of continuous opioid usage through continuous prescriptions.

Statistical analyses, including descriptive statistics, were used to compare the demographic information between groups. Chi-square analysis was performed between the groups to identify variance in gender, race/ethnicity, smoking status, and ASA class. Student's t-test was used to identify the variance between groups in age and BMI, and to compare MMEs, TMEs, number of pills, and dependence between groups preoperatively and postoperatively.

## Results

Of the 143 patients in this cohort, the average age was 73.1 years ( $\pm 7.40$ ), with 80 females and 63 males. Overall, the average ASA class was 2.50, 4.8% of the cohort were smokers, and the average BMI was 29.7. There were no significant differences in the distribution of gender (40 males and 47 females for group 1, 23 males and 33 females for group 2), race, ASA class, smoking status, or BMI (29.67 for group 1 and 31.18 for group 2) between the cohorts (Table 1). Preoperatively, there was no significant difference in the number of pills prescribed or TMEs, with patients in group 1 receiving an average of 47 pills and 59.9 TMEs compared to an average of 31 pills and 24.8 TMEs for group 2 ( $P = .292$  and  $P = .082$ , respectively) (Table II) (Fig. 1 and Fig. 2). No significant differences were observed between the groups in daily TMEs per script, with group 1 receiving 59.9 daily TMEs, and patients in group 2 receiving 24.8 daily TMEs ( $P = .082$ ).

There was a significant difference in opioid prescriptions filled postoperatively; group 1 had 88.5% of patients fill an opioid prescription postoperatively, compared to 50.9% of patients in group 2 ( $P < .001$ ). Postoperatively, there were significant differences in the average initial pills prescribed (group 1: 26 pills with an average of 375.6 TMEs; group 2: 18 pills with an average of 199.6 TMEs [ $P = .031$ ,  $P = .122$ ]) (Fig. 1 and Fig. 2). For the entire postoperative course, patients in group 1 filled prescriptions for an average of 1740.7 TMEs and 84 pills, compared to 461.9 TMEs and 32 pills in

**Table II**  
Opioid prescription data.

	Group 1	Group 2	P value
Number of pills prescribed preoperatively	47	31	.292
Number of initial postoperative pills	26	18	<b>.031</b>
Number of total postoperative pills prescribed	84	32	<b>&lt;.001</b>
Preoperative TMEs	59.9	24.8	.144
Postoperative initial TMEs prescribed	375.6	199.6	<b>.001</b>
Postoperative total TMEs	1740.7	461.9	<b>.035</b>
Postoperative prescriptions filled	88.5%	50.9%	<b>&lt;.001</b>
Patients with multiple opioid prescriptions	70.1%	17.8%	<b>&lt;.001</b>
Postoperative opioid dependence	23.0%	12.5%	<b>.043</b>

TMEs, total morphine equivalents.  
Values in bold are statistically significant.

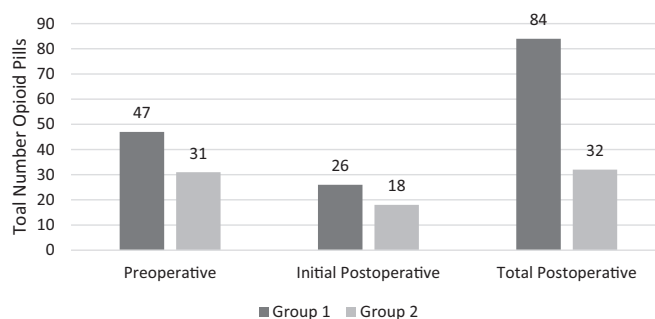
group 2 ( $P = .035$ ,  $P < .001$ ) (Fig. 1 and Fig. 2). In the cohort, 17.8% of group 2 had multiple recorded opioid prescriptions, compared to 70.1% of group 1. Group 1 had significantly higher dependence rates at 23.0% compared to group 2 at 12.5% ( $P = .043$ ) (Table II).

### Discussion

Prior to the passing of the new opioid curtailment legislation (HB 21), there were limited prescribing regulations in place. As of 2009, all pharmacists and medical practitioners dispensing opioids were required to report the prescriptions to the Florida Prescription Drug Monitoring Program (PDMP), E-FORCSE.<sup>13</sup> While this regulation allowed us to track more specific prescribing patterns and may have curtailed some of the opioid prescribing, especially amongst high-risk providers, it was unable to control the deadly problem, which may be attributed to suboptimal use by physicians and pharmacists.<sup>5,8,19,25</sup> The new regulations require prescribers and pharmacists to review the Florida PDMP before prescribing or dispensing a Schedule II opioid to patients who are 16 years or older which improves provider knowledge of opioid abuse, prevents overlapping opioid prescriptions, and coordinates patient-specific opioid pain management.<sup>13</sup> In addition, the new state-mandated restrictions curtail prescribing amounts all together by introducing a 3-day limit in the prescribing of Schedule II opioids for acute pain with a 7-day “acute pain exception.” In addition, the prescribers are required to document both the acute medical condition, patient education on alternatives, and the need for a higher than 3-day supply in the electronic medical record.<sup>13</sup> All of these provisions were aimed at decreasing the opioids prescribed in general and more specifically perhaps after surgical interventions. This study evaluated the effect of these new regulations on postoperative opioid prescribing patterns in patients undergoing RSA.

This retrospective study is among the first to assess the effectiveness of the new legislation regulating the prescribing of controlled opioid

Comparison of Total Prescribed Pills Pre and Post Legislation



**Figure 2** Preoperative, initial postoperative, and total postoperative opioid pills prescriptions amongst pre-legislative and post-legislative groups.

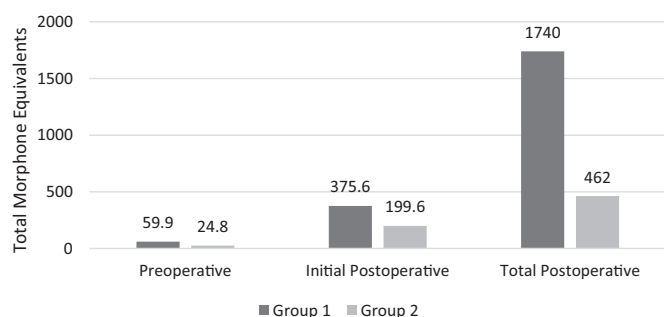
medications.<sup>28</sup> Using comparative cohorts, we were able to understand the implication of this HB 21 legislation and found a significant decrease in the number of opioid pills prescribed, including initial and total TMEs, and dependence rates postoperatively for patients undergoing RSA. This finding is supported by 2 studies that also evaluated the effect of HB 21, which found that the mean TMEs prescribed postoperatively decreased significantly following the implementation of the law.<sup>22,23</sup> One study found that the most significant decrease in postoperative TMEs was in an orthopedic surgery procedure, knee arthroplasty, highlighting considerable impact of the state legislation on opioid utilization following orthopedic surgeries.<sup>22</sup> In addition, we observed a decrease in both the number of pills and TMEs; therefore, we can conclude that the law did not result in physicians prescribing smaller quantities of higher dose opioids as suggested in other studies but instead led to an overall decrease in the amount of opioids postoperatively.<sup>23</sup>

Not only did we observe a decrease in opioid use between the 2 groups but we also observed a reduction in postoperative dependence rates. This decrease in the postoperative dependence rate was in-line with our hypothesis, particularly given that postoperative opioid use has been shown to lead to increased rates of opioid dependence in shoulder arthroplasty patients.<sup>2,3,17,31</sup> Furthermore the total number of pills and refills significantly decreased after the new state mandates came into force, an observation which may be different from that reported by other authors who found no significant decreases in the postoperative refill rate pre and post-implementation of HB21.<sup>24</sup> Following the introduction of the state-mandated legislation, the rate of opioid prescriptions filled postoperatively in shoulder arthroplasty patients decreased by 42.5%.

Although differences were seen in postoperative opioid prescribing patterns between the 2 groups, there was no significant difference in either the number of pills or TMEs prescribed preoperatively between the 2 groups. The lack of difference in preoperative opioid prescribing practices is likely because state mandates typically only restrict the prescribing of opioids to 3 days in the setting of acute pain, under which postoperative pain is included, but does not place similar limitations on prescribing for chronic pain such as in patients with chronic shoulder problems like osteoarthritis or rotator cuff arthropathy.<sup>3,17,18,31</sup>

Although this study provides valuable information regarding the impact of the legislation curtailing opioid prescribing, there are a number of potential limitations that may have impacted our results. First this study included the evaluation of only 1 surgical procedure, which may not be generalizable to other procedures, especially in specialties outside of orthopedic surgery.<sup>9,11,12,20,27,32</sup> Additionally, the prescribing practices of only 2 orthopedic surgeons were evaluated, which may not reflect the prescribing

Comparison of Opioid Usage Pre and Post Legislation



**Figure 1** Preoperative, initial postoperative, and total postoperative total morphine equivalents amongst pre-legislative and post-legislative groups.

practices of all orthopedic surgeons following the implementation of Florida HB 21.<sup>10</sup> Furthermore, using the PDMP allowed us to evaluate all prescriptions at the time of surgery and after multimodal pain management was used and part of the regimen prior to the new change in regulations. Additional prescriptions (ie, non-opioid medications) were strongly recommended—it became more typical for 3-day Toradol prescriptions to be initiated post-operatively. This increase was not directly coordinated to the new legislation but unequivocally emphasized and therefore included in the limitations.

## Conclusion

State-mandated opioid prescribing restrictions have been successful in decreasing opioid prescribing and dependence rates for orthopedic shoulder patients. Further efforts would be required to reduce preoperative prescriptions involving chronic shoulder pathology, as primary care providers provided the majority in these. Legislative changes may be an effective way to help reduce abuse and opioid dependence in shoulder arthroplasty patients; however, further research is needed.

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