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Outcomes

Opioid prescriptions for acute pain after outpatient surgery at a large public university-affiliated hospital: Impact of state legislation in Florida

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ABSTRACT

Background: In response to the growing opioid crisis, Florida recently implemented a law restricting the duration of opioid prescriptions for acute pain. Little is known about the impact of such legislation on opioid prescription practices at the time of discharge after surgery. The objective of this study was to determine whether Florida's new legislation changed opioid prescription practices for analgesia after surgery.

Methods: Adults 18 years of age and older undergoing cholecystectomy, appendectomy, hernia repair, hysterectomy, mastectomy, or lymph node dissection were included in this retrospective cohort study at a large public university–affiliated hospital. We analyzed opioid prescriptions on discharge after these common outpatient surgical procedures between June 1, 2017, and December 31, 2018. Florida House Bill 21 was passed on March 2, 2018, and subsequent implementation of this law took place on July 1, 2018. The law restricts the duration of opioid prescriptions for acute pain to 3 days, which can be extended up to a maximum of 7 days with additional documentation. The outcomes studied included the following: the proportion of patients receiving opioid prescriptions on discharge, total opioid dose prescribed, daily opioid dose prescribed, and the proportion of patients receiving more than a 3-day supply of opioids. We colledted data on emergency department cumulative visits within 7 and 30 days after discharge. Drug doses were converted to morphine milligram equivalents and calculated for each selected procedure.

Results: A total of 1,467 surgical encounters were included. The cohort was predominantly female (963 [65.6%]) with a mean (SD) age of 49.6 (14.4) years. At 6 months after implementation of HB 21, the proportion of patients receiving opioid prescriptions decreased by 21% (95% CI 16.8% to 25.3%, $P < .001$), mean total opioid dose prescribed decreased by 64.2 morphine milligram equivalents (95% CI 54.7 to 73.7, $P < .001$) from a baseline mean (SD) of 172.5 (78.9) morphine milligram equivalents. The mean daily opioid dose prescribed increased by 3.5 morphine milligram equivalents (95% CI 1.8 to 5.1, $P < .001$) from a baseline mean (SD) of 30.5 (9.4) morphine milligram equivalents. The proportion of patients receiving opioid prescriptions for longer than a 3-day supply decreased by 68% (95% CI 63.4% to 72.7%, $P < .001$). We observed no change in the number of postoperative emergency department visits before and after implementation of the law.

Conclusion: Opioid prescriptions for patients undergoing common outpatient surgical procedures at a large public university–affiliated hospital in Florida were substantially reduced within 6 months after implementation of state legislation limiting the duration of opioid prescriptions. This reduction was not associated with an increase in the number of postoperative emergency department visits. The legislation should significantly decrease the amount of unused opioid pills potentially available for diversion and abuse. Secondary effects from the enactment of this law remain to be evaluated.

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Introduction

Postoperative pain is one of the most common concerns for patients undergoing surgery.[1,2] Opioids remain the cornerstone for postoperative analgesia and have been liberally prescribed to surgical patients upon hospital discharge.[3] However, the majority of unused opioid medications are not disposed of correctly and are frequently misused or diverted.[4–6] The ubiquitous availability of opioid pills has been identified as a driver of the opioid crisis in the United States.[7] Liberal postoperative opioid prescribing has been shown to significantly contribute to long-term drug abuse to such a degree that undergoing surgery has been identified as an independent risk factor for chronic opioid use.[8,9]

Strategies to decrease the overprescription of opioids for postsurgical pain, through prescriber education and individualized feedback, have been successful at the institutional[10–12] and county levels.[13] Nevertheless, these strategies are not being universally adopted by prescribers. Therefore, to address the evolving opioid epidemic, several states have enacted controlled-substance prescribing laws that limit the duration and dosage of opioid prescriptions for acute pain.[14]

Since the year 2000, Florida has experienced a 200% increase in the rate of overdose deaths involving opioids.[15] In response to this population health crisis, on July 1, 2018, Florida implemented House Bill 21 (HB 21), a law aimed at restricting opioid prescriptions for acute pain.[16] This law requires prescribers to complete a 2-h course on the safe and effective prescribing of controlled substances before license renewal and consult the State of Florida's online prescription drug monitoring program (PDMP) for each patient before prescribing controlled substances.[17] In addition, the law generally limits opioid prescriptions for acute pain to a 3-day supply but contains a provision that allows up to a 7-day supply if deemed medically necessary by the provider. Exceeding a 3-day supply requires specific documentation on the prescription and in the patient's medical record. The law defines acute pain as "the normal, predicted, physiological, and time-limited response to an adverse chemical, thermal, or mechanical stimulus associated with surgery, trauma, or acute illness." It specifically excludes pain related to cancer, terminal conditions, palliative care, or serious traumatic injury with an Injury Severity Score of 9 or greater. This score is an anatomically based injury severity grading system ranging from 1 to 75, with a score of 15 being the cutoff value for major trauma.[18]

Although several states have implemented laws of similar scope and intention as Florida's HB 21,[19] there is a paucity of data examining their impact on opioid prescriptions for acute pain, particularly in postoperative surgical patients. In this retrospective study, we sought to characterize the initial impact of Florida's new controlled-substances law on opioid prescription patterns for acute pain after surgery.

Methods

Data sources and patient cohort

An institutional review board exemption regarding informed consent from the University of Miami (IRB20190089) was granted to review opioid prescriptions for patients discharged after surgery during the 18-month period from July 1, 2017, to December 31, 2018. We included all patients 18 years of age or older who underwent one of the following common outpatient (ie, discharge planned for the same day of surgery or after up to 23 h of observation) surgical procedures: cholecystectomy, appendectomy, hernia repair, hysterectomy, mastectomy, and lymph node dissection. The appropriate duration of opioid prescribing for these procedures have been defined in a large national sample.[20] For each surgical encounter, we queried the electronic medical record database (Cerner Millenium, Kansas City, MO, USA) and obtained case data including age, sex, surgical procedure, surgery duration, and opioid prescriptions at discharge. Patient identifiers were removed before analysis. To normalize the various opioid medications, we calculated the total morphine milligram equivalents (MME) prescribed and the MME prescribed per day for each opioid prescription, using published conversion factors.[21] The data from discharged patients were binned into 3 periods: period 1 (July 1, 2017, to February 28, 2018), period 2 (March 1, 2018, to June 1, 2018), and period 3 (July 1, 2018, to December 31, 2018). Period 1 served as the baseline group. During period 2, HB 21 was signed into law but was not yet implemented. The enacted law then went into effect at the beginning of period 3. The percentage of patients with an opioid prescription on discharge and the total prescribed MME were calculated for each surgical procedure during every period of the study. Cumulative emergency department (ED) visits data within 7 and 30 days after discharge were collected.

Outcomes

Our primary outcomes were as follows: the proportion of patients receiving opioid prescriptions on discharge, total opioid dose prescribed, daily opioid dose prescribed, and the proportion of patients receiving longer than a 3-day supply of opioids. Secondary outcomes were whether a patient returned for an ED visit within 7 and 30 days after discharge.

Statistical analysis

Descriptive statistics were calculated for age, gender, surgery duration, and opioid prescription dosages. Pairwise χ^2 tests were used for categorical variables. Means for continuous variables were compared with the control group (period 1) values using one-way analysis of variance with Dunnett's test. Median values were compared using the Mann-Whitney *U* test. Significant *P* values were adjusted using Bonferroni's correction to account for multiple comparisons, where applicable. All analyses were performed using Minitab, v 17.1 (Minitab, Inc., State College, PA, USA) and R Studio software, v 1.1.463 (RStudio, Inc, Boston, MA, USA). *P* values less than .05 were considered statistically significant.

Results

We analyzed a total of 1,467 surgical encounters, of which 22 were not performed in unique patients (ie, 11 patients had 2 surgeries during the study period). We observed no differences among the 3 groups with respect to age, gender, and average surgical duration (Table I). The surgical procedure types performed were mostly similar, with minor, clinically insignificant differences in the number of breast biopsies and total abdominal hysterectomies (Supplemental Table I). In period 1, the baseline period, 511 (93.6%) patients received a prescription for opioid medications, of which 403 (78.9%) were for longer than a 3-day supply. The mean (SD) total opioid dose prescribed was 172.5 (78.9) MME. The median (interquartile range [IQR]) total opioid dose prescribed was 180 (97.5) MME (Figure). The mean (SD) daily opioid dose prescribed was 30.5 (9.4) MME and the median (IQR) was 30 (6.4) MME.

At the beginning of period 2, HB 21 was enacted, but the restrictions on opioid prescriptions for acute pain were not yet in effect. During this period, as compared with the baseline, the percentage of patients receiving an opioid prescription did not change (93.3% versus 93.6%; difference 0.3%, 95% CI −3% to 3.6%; $P = .88$), but there was a decrease in the proportion of patients with a

Table I
Comparison of patient demographics, surgical duration, and opioid prescriptions before (period 1), after passage (period 2), and after implementation (period 3) of HB 21

	Period 1 (baseline) $N = 546$	Period 2 (law enacted) $N = 360$	Period 3 (law in effect) $N = 561$	Comparisons			
				Period 2–Period 1		Period 3–Period 1	
				Difference (95% CI)	*P* value	Difference (95% CI)	*P* value
Age, mean (SD), y	49.7 (14.6)	49.9 (14.4)	49.3 (14.2)	0.1 (−2.0 to 2.3)	.99	−0.4 (−2.3 to 1.5)	.84
Number (%) of females	341 (62.5)	238 (66.1)	384 (68.4)	3.7% (−2.7% to 10.0%)	.26	6.0% (0.4% to 11.6%)	.07
Surgery duration, mean (SD), min	101.3 (65.8)	101.0 (68.2)	105.4 (71.6)	−0.3 (−10.7 to 10.0)	.99	4.1 (−5.0 to 13.3)	.51
Number (%) with opioid prescription	511 (93.6)	336 (93.3)	407 (72.6)	−0.3% (−3.6% to 3.0%)	.88	−21% (−25.3% to −6.8%)	< .001
Number (%) of prescriptions > 3 days	403 (78.9)	227 (67.6)	44 (10.8)	−11.3% (−17.4% to −5.2%)	.002	−68% (−72.7% to −63.4%)	< .001
Total opioid prescribed, mean (SD), MME	172.5 (78.9)	136.7 (60.5)	108.3 (45.2)	−35.9 (−46.0. to −25.8)	<.001	−64.2 (−73.7 to −54.7)	< .001
Total opioid prescribed, median (IQR), MME	180 (97.5)	112.5 (90)	90 (45)	−30 (−45.0 to −22.5)	<.001	−60 (−60.0 to −60.0)	< .001
Daily opioid prescribed, mean (SD), MME	30.5 (9.4)	27.9 (10.1)	33.9 (13.8)	−2.6 (−4.3 to −0.8)	.004	3.5 (1.8 to 5.1)	< .001
Daily opioid prescribed, median (IQR), MME	30.0 (6.4)	30.0 (7.5)	30.0 (0.0)	0.0 (0.0 to 2.1)	<.001	0.0 (0.0 to 0.0)	.46

IQR, interquartile range; *SD*, standard deviation.

prescription duration of more than 3 days (67.8% versus 78.7%; difference 11.3%, 95% CI 5.2% to 17.4%; $P = .002$). The mean total opioid dose prescribed decreased by 35.9 MME (95% CI 25.8 to 46, $P < .001$). The mean daily dose decreased by 2.6 MME (95% CI 0.8 to 4.3, $P = .004$). The median (IQR) daily dose was 30 MME (7.5).

After implementation of the law

At the beginning of period 3, the new State of Florida law restricting opioid prescription duration for acute pain went into effect. When compared with the baseline (period 1), significantly fewer patients received opioid prescriptions on discharge (72.6% vs 93.6%; difference 21%, 95% CI 16.8% to 25.3%; $P < .001$). Patients who had undergone an appendectomy had more than a 2-fold decrease in the incidence of opioids being prescribed on discharge, and the remaining had reductions ranging from 5.4% to 25%. Among those receiving prescriptions, significantly fewer patients received prescriptions for longer than 3 days (10.8% vs 78.9%; difference 68%, 95% CI 63.4% to 72.7%; $P < .001$). The mean total opioid dose prescribed decreased by 64.2 MME (95% CI 54.7 to 73.7; $P < .001$) after the law was implemented. However, the mean daily prescribed opioid dose increased slightly, by 3.5 MME (95% CI 1.8 to 5.1). The median (IQR) daily dose of 30 (7.5) MME was not significantly different from period 1 (Table I; $P = .46$). We observed no difference in ED visits postdischarge within 7 days (3.3% vs 2.3%; difference of −1%, 95% CI −2.9% to 1.0%; $P = .32$) or within 30 days (7.9% versus 7.1%; difference of −0.7%; CI −3.8% to 2.4%; $P = .64$) before and after implementation of the law (Table II).

In the State of Florida, the implementation of a law limiting opioid prescriptions for acute pain, HB 21, was followed by an immediate and significant decrease in the fraction of patients receiving an opioid prescription (−21.1%) and in the total opioid dose prescribed (−36.1%) after most common surgical procedures at the studied institution. Thus, implementation of the law was associated with a substantive modification of the opioid prescribing behavior of providers after common surgical procedures. Similar to

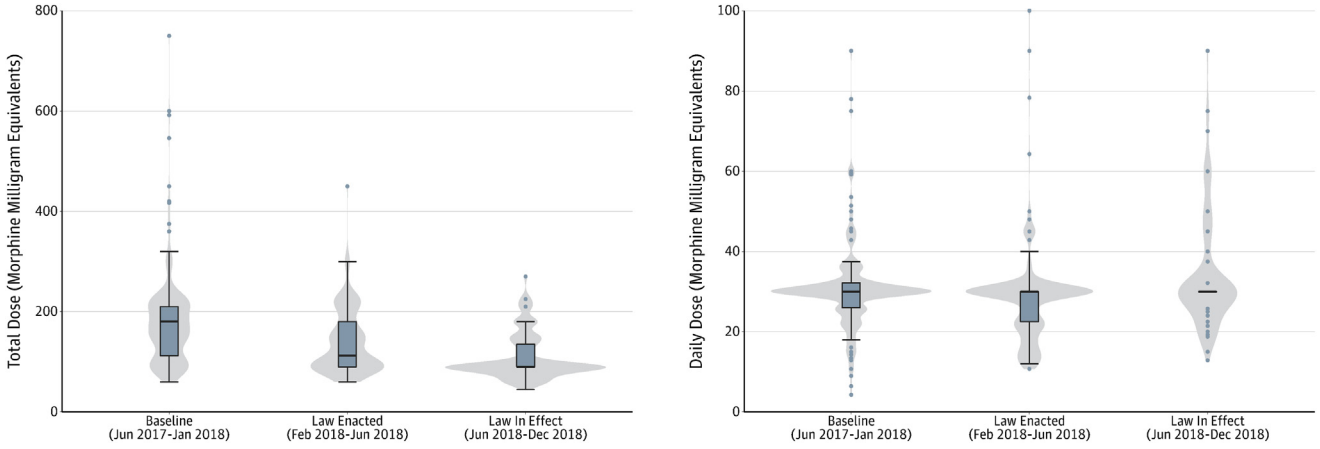

Figure. Opioid dose prescribed by period. Violin plots of the average total opioid dose and daily opioid dose prescribed as morphine milligram equivalents (MME) related to the enactment and implementation of Florida House Bill 21. The first group is the baseline period before enactment of the law on March 1, 2018 (the second group). The law went into effect on July 1, 2018 (the third group). The thick horizontal line in each *blue box* represents the median of the total doses (*left panel*) or the daily doses (*right panel*). The top and bottom borders of each box indicate the 75th and 25th percentiles, respectively. The whiskers represent the range of the data within 1.5 × interquartile range (IQR) of the median. The points beyond the whiskers indicate outliers. The shaded gray areas present the probability density of the data. After the law went into effect, the total dose decreased significantly compared with the baseline ($P < .001$). We observed no change in the median daily dose prescribed related to the implementation of the law ($P = .46$). Note in the right panel that the IQR range after the law went into effect was 0 morphine milligram equivalents, indicating a reduction of variability in opioid prescribing practices.

Table II
Comparision of emergency department visits after discharge

	Period 1 (baseline) $N = 546$	Period 2 (law enacted) $N = 360$	Period 3 (law in effect) $N = 561$	Comparisons			
				Period 2−Period 1		Period 3−Period 1	
				Difference (95% CI)	*P* value	Difference (95% CI)	*P* value
Number (%) of ED wisits within 7 d after discharge	18 (3.3)	11 (3.1)	13 (2.3)	−0.2% (−2.6% to 2.1%)	.84	−1% (−2.9% to 1%)	.32
Number (%) of ED visits within 30 d after discharge	43 (7.9)	23 (6.4)	40 (7.1)	−1.5% (−4.9% to 1.9%)	.39	−0.7% (−3.8% to 2.4%)	.64

Florida, several other states have implemented legislation aimed at decreasing the abuse of opioids by limiting the duration of opioid prescriptions for acute pain rather than the dosage.[19] This approach is based on data indicating that the *duration* of postsurgical opioid prescriptions, rather than the *dosage*, appears to be more strongly associated with the development of persistent opioid use.[22,23] In addition, because much of the excessively prescribed opioids go unused,[4] the amount of drug potentially available for diversion to the general population should be decreased as a result.

Discussion

Although the law itself appears to be quite simple, it has had multifaceted consequences for opioid prescription patterns, as noted in our study. These findings are important for physicians, epidemiologists, and policymakers.

First, the law significantly increased the percentage of patients who received no opioid prescriptions on discharge after surgery (27.5% vs 6.4% at baseline). Recent literature suggests that many patients develop chronic opioid dependence after initial, acute exposure.[8] Retrospective studies have estimated that the incidence of chronic opioid use after surgery is approximately 6%, with no difference between minor and major surgical procedures.[9] Thus, in theory, the law should substantially reduce the number of patients who may develop new persistent opioid use.

A second important finding was that among patients who received postoperative opioid prescriptions, almost 90% got only a 3-day supply, even though providers could write for longer durations of treatment by adding “acute pain exception” to the prescription if medically indicated. This would entail documentation of the acute medical condition in the medical records and a lack of alternative treatment options, justifying a deviation from the 3-day supply limit. A large health insurance database analysis by Shah et al.[23] has identified taking opioids on the third postoperative day as a risk factor for developing chronic opioid addiction. It had been reported that one of the rationales for opioid overprescribing was the false perception among providers that some patients needed more opioids than others for the same procedure. This variation was shown to be as much as 3-fold and was a subjective estimate, rather than being based on an objective assessment of pain. This has been described as a “patient-centered variation.”[4] With the new law, the extent of such variation appears to be small (Figure). In addition, beginning in July 2018, the acute pain service provided incoming residents and fellows with a lecture on postsurgical pain management during their orientation that includes opioid prescribing recommendations based on the Michigan Opioid Prescribing Engagement.[24] In conjunction with the new law, these recommendations likely contributed to a decrease in patient-centered variation.

A third finding was that the median daily dose did not change significantly after the implementation of the law, but the variability decreased (Figure). Although the mean daily dose increased from 30.5 to 34.4 MME, the amount remained well below 50 MME, which is the maximum recommended prescribing dose in opioid-naïve patients.[25] Furthermore, this difference represents less than 1 tablet of hydrocodone/acetaminophen (5 mg/325 mg) per day, which is clinically inconsequential. The increase in the mean daily dose was likely a result of more patients during period 3 not being prescribed opioids. That is, patients with expected mild pain postsurgery who had been routinely being given small opioid prescriptions were no longer receiving such prescriptions.

A fourth finding was that there was no increase in the percentage of patients making an ED visit postoperatively, suggesting that lack of pain control resulting from the change in prescribing practices was not a major issue. Florida law does not allow providers to prescribe opioids via the telephone, and clinic wait times are long. Therefore, if postoperative pain had not been adequately addressed, a reasonable expectation was that the patients would have sought care in the ED of our hospital.

Our study has several limitations. First, the data were collected at a single large public university-affiliated hospital where prescriptions are usually written by a resident physician and then cosigned by an attending surgeon. This potentially limits the applicability of our findings to other institutions and healthcare settings. Second, our study was limited in duration to the first 6 months after implementation of the law. The results we found may change over time (ie, to either higher or lower doses or duration of treatment) as providers accumulate feedback from their patients regarding the adequacy of their pain control. Third, we do not know the extent to which patients may have been supplementing their opioid prescriptions with leftover opioids from other medical encounters. Thus, the impact of the law on the duration of opioid treatment might be overstated. However, the reduction in total opioid prescribed would still result in the reduction of the pool of unused opioid that is potentially available for misuse. Fourth, although provider compliance with checking the state PDMP before opioid prescribing was recorded as 100% attributable to the electronic attestation built into the electronic medical record, the actual impact of the information contained in the online report from the PDMP on prescribing behavior is unknown.

Further investigation of the Florida law’s long-term impact on opioid prescriptions and potential secondary consequences, such as inadequate postsurgical analgesia, need for refills, overdose deaths, and opioid use from other sources are clearly warranted.

In summary, opioid prescriptions for patients undergoing the common surgical procedures at a large public university−affiliated hospital in Florida were rapidly and substantially reduced after implementation of state legislation limiting the duration of opioid prescriptions. By limiting the duration of treatment, this legislation decreases the duration of opioid exposure and may attenuate the risk of developing opioid dependence after outpatient surgery. Secondary effects from the enactment of this law remain to be evaluated.

Conflict of interest

All authors report no conflict of interest.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at https://doi.org/10.1016/j.surg.2019.04.022.

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