



Effect of a legislative mandate on opioid prescribing for back pain in the emergency department



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ABSTRACT

Objective: A change in Arizona State law in 2017 required prescribers to review data from a prescription drug monitoring program (PDMP) prior to opioid prescribing. The objective was to determine the effect of this change on opioid prescribing for patients who presented to the emergency department (ED) for back pain.

Methods: This was a retrospective cohort study conducted in a 50-bed community ED in the United States. Consecutive adult patients who presented to the ED with back pain were included. Patients were categorized based on when they presented to the ED in reference to the law mandating PDMP review: 1) pre-PDMP and 2) post-PDMP. The outcome measures included the proportion of patients who were prescribed opioids upon discharge and the total amount of opioids prescribed per patient in oral morphine milligram equivalents (MME). **Results:** A total of 268 patients were included (134 in pre-PDMP and 134 in post-PDMP). Opioid prescribing on discharge from the ED occurred in 46% (n = 62) of patients in the pre-PDMP group and 48% (n = 64) of patients in the post-PDMP group (difference 2%, 95% CI -11 to 13%). Of those who received opioid prescriptions, the median total prescribed MME was 75 mg (IQR 60–120 mg) in the pre-PDMP group and 75 mg (IQR 60–90) in the post-PDMP group (mean difference 8 mg, 95% CI -9 to 24 mg).

Conclusion: A legislative requirement for provider PDMP review did not change opioid prescribing for patients in the ED who presented with back pain.

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1. Introduction

It is well known that the opioid epidemic is a public health crisis in the United States [1]. In 2016 there were over 63,000 overdose deaths and 66% involved an opioid [2]. This is partly related to opioid overprescribing after acute or primary care encounters [3]. To address this issue, most States have implemented prescription drug monitoring programs (PDMPs) [4]. The primary function of the PDMP is to provide a central database of all prescriptions dispensed for controlled substances. This is meant to guide treatment decisions by providing detailed information about previous controlled substance use. National data have shown that implementation of State PDMPs have been associated with sustained reduction in opioid prescribing [5]. To improve utilization of this system, some States have taken an additional step by mandating that providers review PDMP data prior to opioid prescribing [6]. This man-

dated approach has also been shown to reduce Statewide opioid prescribing and related overdose deaths [7]. However, more evidence is needed to determine if this approach is beneficial across all settings, such as in the emergency department (ED).

Patients who are prescribed opioids in the ED are at increased risk for chronic opioid use up to one year after the initial encounter [8]. Hence it is an important setting for risk mitigation strategies to address the opioid epidemic. In one small study, ED providers who were shown PDMP data changed opioid prescribing decisions in 41% of cases [9]. Thus the potential utility for a mandated requirement to review PDMP data may apply to the ED. However, there is little evidence at this time that a legislative mandate would change opioid prescribing in this setting. Mandated review of PDMP also has logistical implications because of time constraints in the ED and may not be necessary in all patients. Thus, the effect of mandated PDMP review on opioid prescribing in the ED requires further investigation.

In 2017, a change in Arizona law mandated providers to review PDMP data prior to opioid prescribing [10]. The primary objective of this study was to determine the effect of this law on the proportion of patients with back pain who were prescribed opioids on discharge from the ED. The secondary objective was to compare the

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quantity of opioids prescribed for these patients before and after the legislative change.

2. Methods

2.1. Study design and setting

This was a retrospective cohort study conducted in a 50-bed community ED in the United States. The ED has approximately 78,000 annual patient visits. Effective October 16, 2017, Arizona law (Section 36-206 of the Arizona Revised Statutes) required prescribers to obtain a 12-month patient utilization report from the PDMP prior to prescribing an opioid analgesic or benzodiazepine [10]. The utilization report includes information about all controlled substances dispensed for a patient from community pharmacies in the State. Information includes the name of the medication, dose, quantity, and date dispensed. ED providers were informed about this change by hospital administration via medical staff meetings. There were no specific educational initiatives at a State level specifically addressing how PDMP data could be used for best practice decisions. The ED did not have any specific guidelines for opioid prescribing during the study period. Thus, prescribing was based on provider preference. The hospital's institutional review board approved the study prior to data collection. The Strengthening the Reporting of Observational studies in Epidemiology (STROBE) guidelines were followed for all aspects of the study [11].

2.2. Patient selection

In order to select a homogenous population and decrease the potential for confounding, the sample was restricted to patients with back pain. A list of patients who presented to the ED with back pain were generated using the following International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) codes: M533 (sacrococcygeal disorders), M545 (low back pain), M546 (pain in thoracic spine), M549 (dorsalgia), S39.012A (strain of muscle, fascia, or tendon of lower back), and S29.012A (strain of muscle and tendon of back wall of thorax). Lists were generated for patients who presented to the ED for two study periods: 1) pre-PDMP (July 1, 2017 to October 15, 2017) and 2) post-PDMP (October 16, 2017 to February 1, 2018). Consecutive adult patients (at least 18 years of age) were screened from each time period until the desired sample was reached. Consecutive screening was used to minimize selection bias. Patients were excluded if they were admitted to the hospital, had traumatic injury, back pain due surgical complications, osteomyelitis of spine, or epidural abscess.

2.3. Study variables and data collection

Data were collected from electronic medical records by one of the investigators and entered into a standardized form in Research Electronic Data Capture (REDCap), which is an online data capture system [12]. Data collected included demographics, pain score upon ED presentation (0 to 10 scale, 0 = no pain, 10 = worst possible pain), history of depression or anxiety, prior opioid use within 1 year of ED visit, insurance status, ED administered medications, all ED discharge prescriptions for low back pain (including quantity of opioids). Patients were defined opioid naïve if they did not have any opioid prescriptions filled in 12 months prior to the ED visit. Opioid doses were converted to oral morphine milligram equivalents (MME) using conversion factors defined by the Center for Disease Control [13].

2.4. Data analysis

Continuous data were reported as means with standard deviations if normally distributed. Data that were not normally dis-

tributed were reported as medians with interquartile ranges (IQRs). The distribution of data for each variable was evaluated visually via histograms. Mean differences were reported with 95% confidence intervals for continuous data. Categorical data were reported as percentages and compared between groups using the Fisher's exact test. Missing data were imputed using mean substitution. Based on a previous study we assumed baseline opioid prescribing in 62% of patients with back pain [8]. Assuming a reduction from 62% to 45% after PDMP legislative change, using a power of 80%, and an alpha of 0.05, a sample of 134 patients was required per group (Total 268). An a priori alpha of 0.05 was used for all analyses. All data analyses were conducted in Stata 15 (StataCorp LP, College Station, Texas).

3. Results

3.1. Characteristics of study subjects

A total of 314 patients were screened for inclusion. Of these, 46 patients were excluded, resulting in a final cohort of 268 patients (134 per group). The reasons for exclusion are detailed in Fig. 1. The overall cohort had a mean age of 47 ± 18 years, and 53% ($n = 142$) were female. There were 8% ($n = 20$) with a history of depression, 10% ($n = 27$) with a history of anxiety, and 61% ($n = 164$) were opioid naïve. Missing data was present in no more than 2 patients in some demographic variables such as age, sex, history of depression and anxiety. Previous opioid history was missing in 9 (3%) patients, which were imputed as opioid naïve. Hydrocodone/acetaminophen (22%, $n = 59$), oxycodone/acetaminophen (15%, $n = 40$), and tramadol (5%, $n = 13$) were the most commonly prescribed opioids on ED discharge. No long-acting opioids were prescribed.

Comparisons between the two groups with regard to baseline characteristics are in Table 1. The two groups were similar with regard to demographic and clinical characteristics with the exception of white race, which was more common in the pre-PDMP group (Table 1). The pre-PDMP group had greater median opioid use in the ED measured in MME (12 mg [IQR 10–20 mg] versus 8 mg [IQR 8–15 mg]).

3.2. Main results

Opioid prescribing on discharge from the ED occurred in 46% ($n = 62$) of patients in the pre-PDMP group and 48% ($n = 64$) of

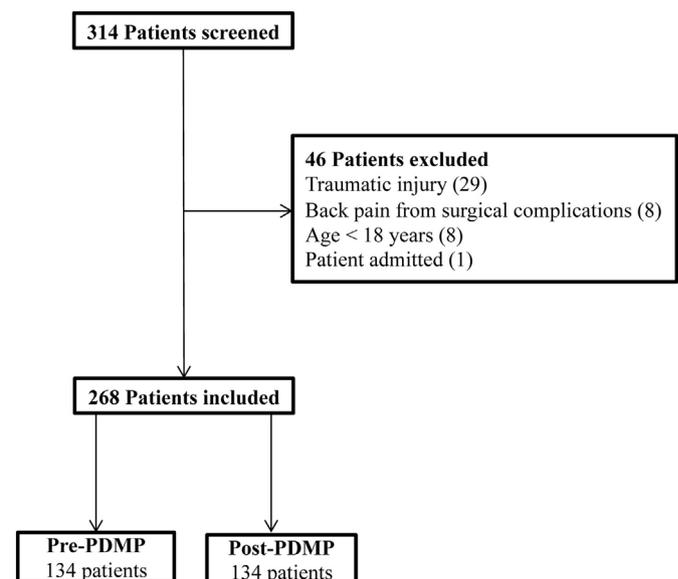


Fig. 1. Flow diagram of patient selection

Table 1
Baseline characteristics

Variable	Pre-PDMP (n = 134)	Post-PDMP (n = 134)	%Difference (95% CI)
Age (mean, SD)	48 (19)	46 (17)	2 (–2 to 6)
Female, n (%)	73 (54)	69 (51)	–3 (–15 to 9)
White race, n (%)	124 (93)	107 (80)	–13 (–21 to –5)
Pain score (median, IQR)	8 (7–10)	8 (6–9)	0 (0 to 1)
Depression, n (%)	14 (11)	6 (5)	–6 (–12 to 0)
Anxiety, n (%)	15 (11)	12 (9)	–2 (–9 to 5)
Opiate naïve, n (%)	82 (62)	73 (58)	–5 (–17 to 7)
Insurance status, n (%)			
Medicaid	46 (34)	44 (33)	–2 (–13 to 10)
Commercial	45 (34)	53 (40)	6 (–6 to 18)
Medicare	32 (24)	27 (20)	–4 (–14 to 6)
Workers	2 (1)	4 (3)	2 (–2 to 5)
Self	9 (7)	6 (5)	–2 (–8 to 3)

PDMP = prescription drug monitoring program; SD = standard deviation; IQR = interquartile range.

patients in the post-PDMP group (difference 2%, 95% CI –11 to 13%). Comparisons between the two groups in regard to specific medications for back pain are in Table 2. Of those who received opioid prescriptions, the median total prescribed MME was 75 mg (IQR 60–120 mg) in the pre-PDMP group and 75 mg (IQR 60–90) in the post-PDMP group (mean difference 8 mg, 95% CI –9 to 24 mg). Non-steroidal anti-inflammatory drug (NSAID) prescribing increased from 40% (n = 54) pre-PDMP to 54% (n = 72) post-PDMP (Difference 14%, 95% CI 2% to 25%). There was no significant change in the prescribing of other analgesics.

In the subset of patients (n = 126) who received opioids on discharge, the median number of tablets prescribed was 12 tablets (IQR 10–20 tablets) in both groups. The median number of days supplied was 3 days (IQR 2–5 days) in the pre-PDMP group and 3 days (IQR 3–4 days) in the post-PDMP group.

4. Discussion

The key finding of this study is that a legislative mandate to review PDMP information did not reduce opioid prescribing for

Table 2
Medications used

Controlled substance	Pre-PDMP (n = 134)	Post-PDMP (n = 134)	%Difference (95% CI)
Administered in the ED			
Opioids, n (%)	49 (37)	54 (40)	4 (–8 to 15)
Benzodiazepines, n (%)	25 (19)	18 (13)	–5 (–14 to 4)
Muscle relaxants, n (%)	12 (9)	17 (13)	4 (–4 to 11)
NSAID, n (%)	58 (43)	88 (66)	22 (11 to 34)
Acetaminophen, n (%)	12 (9)	2 (1)	–8 (–13 to –2)
Corticosteroid, n (%)	4 (3)	10 (8)	5 (–1 to 10)
Lidocaine transdermal, n (%)	4 (3)	9 (7)	4 (–1 to 9)
Prescribed on ED discharge			
Opioids			
Hydrocodone/acetaminophen, n (%)	23 (17)	36 (27)	10 (0 to 20)
Oxycodone/acetaminophen, n (%)	21 (16)	19 (14)	–2 (–10 to 7)
Oxycodone, n (%)	7 (5)	5 (4)	–1 (–6 to 4)
Codeine/acetaminophen, n (%)	1 (1)	0 (0)	–1 (–2 to 1)
Tramadol, n (%)	10 (8)	3 (2)	–5 (–10 to 0)
Non-opioids			
Benzodiazepines, n (%)	12 (9)	6 (4)	–5 (–11 to 2)
Muscle Relaxants, n (%)	53 (40)	42 (31)	–8 (–20 to 3)
NSAID, n (%)	54 (40)	72 (54)	13 (2 to 25)
Acetaminophen, no. (%)	8 (6)	3 (2)	–4 (–9 to 1)
Corticosteroid, n (%)	23 (17)	15 (11)	–6 (–14 to 2)
Lidocaine transdermal, n (%)	16 (12)	15 (11)	–1 (–8 to 7)

PDMP = prescription drug monitoring program; NSAID = non-steroidal anti-inflammatory drug; ED = emergency department.

back pain upon discharge from the ED. The quantity of opioids prescribed also did not change in terms of MME, number of tablets or days supplied. This is in contrast to previous studies, which have shown a decrease in opioid prescribing after legislative changes to mandate PDMP review [6,7,14].

An analysis of national prescription data has revealed that mandated provider PDMP review was associated with an 8% decrease in opioids prescribed and a 12% decrease in opioid overdose deaths [7]. In the State of Ohio, House Bill 341 required providers to check the State PDMP prior to prescribing opioids or benzodiazepines [6]. After the effective date of the law, the quantity of opioids and benzodiazepines decreased by 8.9% and 7.5%, respectively [6]. The effect of a similar mandate has been studied in the State of New York. The authors evaluated opioid prescribing by dentists 3-months before the law, and two successive 3-month periods after the law [14]. In patients who received analgesics, the proportion who were prescribed opioids decreased from 31% to 14% to 10% in the three measurement periods. However, these previous studies were not specific to the ED setting.

In the State of Washington, an automatic query was implemented for patients who visited the ED. [15] A PDMP report was automatically created and accessible to ED providers. However, the PDMP query was not associated with reductions in ED opioid prescribing (5.8, 95% CI –0.11 to 11.8) per 1000 encounters or the quantity of opioids prescribed in terms of MME. This finding was similar even in the subgroup of high-risk patients. Although the PDMP report was automatically generated, it is unknown if providers referred to them. Thus, although the system facilitated PDMP review, the intervention here is not synonymous with a mandated review of the PDMP. Our study builds on this literature by evaluating a mandated review on ED opioid prescribing. The lack of effect on ED prescribing is intriguing. It is possible that the availability of PDMPs for several years in Arizona prior to the legislation has already resulted in providers commonly utilizing this resource, especially for patients who are deemed to be high-risk based on clinical judgement. Thus, the lack of an incremental effect of the mandate could be because providers were already utilizing the PDMP optimally. The American College of Emergency Physicians policy statement supports the use of electronic PDMPs [16]. However, the statement endorses that such systems should be voluntary and minimize burdensome requirements on the provider. It is important to emphasize that PDMPs are useful and their implementation into practice should be supported. However, our results suggest that the addition of a mandate does not change care. An alternative possibility is that ED providers were not compliant with the mandate. However, we could not measure this in our study.

In one study, the effect of PDMP data on the clinical management of patients who presented to the ED with painful conditions was evaluated [9]. The study involved 179 patients who were treated by 18 ED providers. Providers were asked a set of questions regarding the anticipated analgesic prescription for the patient. They were then shown PDMP data for a given patient to determine extent of changes in decision-making. Review of PDMP data changed clinical management in 41% (74/114) of cases. Although in majority of cases (61%, 45/74) the altered management resulted in fewer or no opioid medications prescribed than originally planned, in 39% (29/74) it resulted in more opioid medication than anticipated. This highlights that PDMP review by providers has value in the ED setting. The effect of PDMP review is likely to be greater in those who were chronically taking opioids prior to ED presentation. The majority of our sample was opioid naïve, which potentially decreases the effect of a PDMP review.

Our study focused on patients who presented with back pain. Low back pain is responsible for more than 2.6 million ED visits in the US annually [17]. We decided to select one presenting condition to include a homogeneous population and minimize confounding. A recent guideline from the American College of Physicians reported that opioids are ineffective or there is insufficient evidence for their use in managing acute back pain [18]. In

our sample, 47% of patients received a prescription for an opioid analgesic confirming previous reports that opioids are the most commonly prescribed medications for back pain in the ED. [18] In addition, the use of NSAIDs increased significantly in the post-PDMP group. This is an appropriate therapy that is consistent with the aforementioned guidelines. However, this increase in the use of NSAIDs did not lead to a reduction in opioid prescriptions. The publication of the guidelines occurred prior to both phases of this study. It is possible that the information about the law change resulted in a renewed focus on the guidelines, resulting in an increase in NSAID prescribing.

There was a significant reduction in the total MME administered in the ED during the post-PDMP phase. This was accompanied by increased administration of NSAIDs. The change in the law was not expected to have an effect on analgesic use within the ED. This is likely attributed to a national shortage of parenteral opioids that occurred in the post-PDMP phase that affected intravenous opioid availability in our facility. However, this change toward less opioid use is welcomed. In one study, the implementation of an approach that utilized non-opioids first was associated with a significant decrease in opioid consumption in the ED. [19] Opioid prescribing upon discharge for back pain still occurred in almost 50% of the cohort. This is higher than necessary, and a culture shift away from opioids would be beneficial. It is possible that education or other modalities to decrease opioid prescribing in general would have a greater effect than a mandate for PDMP review.

A strength of our study is that we manually collected data about opioid and non-opioid analgesic use for ED administered medications and discharge prescriptions. This overcomes an important limitation of data collection using the PDMP itself which may fail to capture hard copy prescriptions provided to the patient but never filled by a pharmacy. We reported important clinical data such as pain scores and patient history that are not available in administrative databases used in previous investigations.

Our study has a few limitations. The legislative change requiring PDMP review was passed in early 2017. However, the effective date was October 17, 2017. Therefore, it is possible that our ability to detect a difference was reduced by a general awareness of the upcoming legislative requirements resulting in providers incorporating PDMP utilization ahead of the effective date during the baseline data collection period. The duration of the review period was based on our sample size calculation. We did not evaluate trends over longer periods of time. Although, we could not collect date of ED visit due to ethical constraints, when evaluating sequence of enrollment as a surrogate for dates, we did not see any trends over the duration of the study. We were unable to measure compliance with the legislative requirement. Thus, it is unclear if providers in the post-PDMP phase actually utilized the reports for all patients. At the time of the study, the hospital did not have a mechanism to track compliance with the requirement. Also, we did not classify prescribers by intensity of controlled substance prescribing. It is possible that certain provider subsets are more likely to benefit from a PDMP review mandate. We did not identify patients who were obtaining prescriptions from multiple prescribers. It is possible that PDMP review would have a greater effect on prescribing for these patients. If these patients were a very small subset of the sample, then it could explain the lack of effect of PDMP mandate. This is a single center study, which needs to be replicated in multiple sites to improve the confidence in our results.

5. Conclusion

A legislative requirement for provider PDMP review did not change the proportion of patients in the ED who were prescribed opioids for back pain. The quantity of opioids prescribed also did not change. Future research should guide how utilization of PDMPs can be optimized to guide opioid prescribing.

Conflicts of interest and source of funding

None.

Poster presentation

None.

Author contributions statement

AP, SP, and MK conceived of and designed the study. MK collected the data. AP analyzed the data and all authors interpreted the data. MK wrote the first draft of the manuscript and SP and AP contributed substantially to its revision. AP takes responsibility for the paper as a whole.

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