

Effect of a Statewide Controlled-Substance Monitoring Requirement on the Opioid Prescribing Practice for Treatment of Acute Pain

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ABSTRACT

Background: The US government affirmed the opioid epidemic as a public health emergency in late 2017. Prior to that, as part of the Heroin, Opiate, Prevention, and Education (HOPE) Agenda, the state of Wisconsin enacted 2015 Wisconsin Act 266. This law, which went into effect April 1, 2017, requires prescribers to review data from the state's enhanced Prescription Drug Monitoring Program (ePDMP) before issuing an opioid prescription, in order to reduce inappropriate prescriptions and, ultimately, decrease opioid overuse.

Objective: To evaluate the effect of 2015 Wisconsin Act 266 on opioid prescriptions for acute pain in Mayo Clinic Health System sites in northwest Wisconsin.

Patients and Methods: This retrospective review included all eligible patients who were discharged from emergency or urgent care departments in the Mayo Clinic Health System at northwest Wisconsin sites during the study period. The quantity of opioids prescribed (measured in morphine milligram equivalents per patient encounter) and the total number of opioid prescriptions were compared for the periods May and June 2016 (prior to implementation of Act 266) versus May and June 2017 (post-implementation of Act 266).

Results: A 33% reduction occurred in the median opioid quantity prescribed per patient encounter in the post-implementation period vs the pre-implementation period ($P < .001$). In addition, a 13% relative reduction occurred in the percentage of patient encounters that involved an opioid prescription ($P < .001$). No difference was observed in opioid prescription agents between time periods, except for an increase in morphine prescriptions ($P < .001$).

Conclusion: The HOPE Agenda, specifically 2015 Wisconsin Act 266, appears to have had a positive effect on decreased opioid prescriptions for acute pain at Mayo Clinic Health System sites in northwest Wisconsin.

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INTRODUCTION

In late 2017, the US government affirmed the opioid epidemic as a public health emergency.¹ Opioid medications have been prescribed for the treatment of acute pain in various medical settings.² The Centers for Disease Control and Prevention (CDC) reported the number of overdose deaths related to opioid use was 5 times higher in 2016 than 1999.³ In the United States, approximately 115 people die daily because of opioid overdose. Despite a decrease in nonmedical opioid users, adults ages 45 to 54 years had the most overdose deaths, and adults ages 55 to 64 years had the greatest increase in overdose deaths between 2005 and 2015.² The latter group reported the highest medical use of opioids and had little change in heroin morbidity during the same period. This observation highlights that dependence, rather than abuse, appears to be an important factor in the opioid crisis.

Several agencies and expert panels have developed guidelines that describe the appropriate use of opioids for treatment of

chronic pain, but expert guidance on opioid treatment of acute pain is lacking. Thus, standardization of opioid prescription for treatment of acute pain is a goal for many institutions seeking to reduce the risk of addiction, diversion, and overdose-related deaths.

A 22.2% decrease in opioid prescriptions occurred in the United States from 2013 through 2017, and 19 million fewer opioid prescriptions were dispensed nationally from 2016 through 2017.⁴ More judicious prescribing practices may be due, in part, to increased utilization of state prescription drug monitoring pro-

Table 1. Comparison of Encounter Type Between Implementation Periods

Encounter Type	Patients Per Period, No. (%) ^a		
	Pre-implementation ^b (n=17,557)	Post-implementation ^c (n=17,004)	Total (N=34,561)
Clinic outpatient	5,994 (34.1)	5,624 (33.1)	11,618 (33.6)
Emergency department	8,644 (49.2)	8,512 (50.1)	17,156 (49.6)
Hospital outpatient	2,919 (16.6)	2,868 (16.9)	5,787 (16.7)

^a The difference between the encounter types was not significant ($P=.11$).

^b Pre-implementation of 2015 Wisconsin Act 266, May and June 2016.

^c Post-implementation of 2015 Wisconsin Act 266, May and June 2017.

grams (PDMPs). More than 1.5 million providers nationwide were registered in state PDMPs in 2017—a substantial increase from 471,896 providers registered in 2014. In addition, providers nationwide queried PDMPs 300.4 million times before prescribing an opioid in 2017, an increase of 121% from 2016.⁴

In Wisconsin, the prescription rate for opioid medications in 2015 was 69.1 prescriptions per 100 persons—slightly below the national average of 70 prescriptions per 100 persons.⁵ The drugs most commonly associated with death due to prescription drug overdose were hydrocodone, oxycodone, and methadone.⁶

In 2016, as part of the Heroin, Opiate, Prevention, and Education (HOPE) Agenda, the state of Wisconsin enacted 2015 Wisconsin Act 266. This law, which went into effect April 1, 2017, requires prescribers to review data from the state's enhanced Prescription Drug Monitoring Program (ePDMP) before issuing an opioid prescription, to reduce inappropriate prescriptions and, ultimately, decrease opioid overuse.⁷ The law does not require prescribers to review the ePDMP when the number of doses being prescribed is intended to last the patient 3 days or less. In January 2017, there were approximately 100,000 queries to the Wisconsin ePDMP by health care professionals; this number rose to approximately 600,000 per month from April through December 2017. From April 1 to June 30, 2017, the number of opioid doses dispensed in Wisconsin was 17.5 million less than for the same period in 2016—a decrease of approximately 12%.⁸ In addition, the number of dispensed opioid prescriptions in 2017 was 20% less than in 2015.⁹

The primary objective of this study was to evaluate the effect of Wisconsin Act 266 on opioid prescriptions for acute pain within Mayo Clinic Health System sites in northwest Wisconsin to ensure that the organization is following similar trends. A secondary objective was to identify any change in opioid agents prescribed, for example, a shift from prescriptions for oxycodone to tramadol.

METHODS

Study Design and Patient Selection

A multicenter retrospective review was conducted in urgent care and emergency departments at Mayo Clinic Health System sites in northwest Wisconsin. Patients were included in the study if they

presented to and were discharged from these departments (each classified as a patient encounter) during May and June 2016, or May and June 2017, (pre- and post-implementation of Wisconsin Act 266, respectively). Study criteria excluded patients admitted to the hospital from these departments and patients who had the medication or medications administered exclusively during their encounter. All data were obtained from the health system's electronic health record and included patient name, health record number, name of the prescribed opioid, quantity of the opioid, and the site and department where the prescription originated. Medications analyzed included codeine, fentanyl, hydrocodone, hydromorphone, methadone, morphine, oxycodone, and tramadol. The Mayo Clinic Institutional Review Board approved the study protocol.

End Points

The primary end point of the study was comparison of the quantity of opioids prescribed in morphine milligram equivalents (MME) per patient encounter in the urgent care and emergency departments during the pre-implementation period vs post-implementation. Secondary end points were whether an opioid was prescribed in the encounter and the number of prescriptions issued for each opioid agent.

Statistical Analyses

Encounter characteristics were compared for the 2 periods with use of the Pearson χ^2 test for categorical variables and the Kruskal-Wallis test for continuous variables. Among patients with an opioid prescription, the MMEs per encounter were compared for the pre- and post-implementation groups using the Kruskal-Wallis test. Pearson χ^2 test was used to compare the proportion of all encounters in which an opioid was prescribed pre- vs post-implementation. Differences in the agents prescribed between groups were assessed with Pearson χ^2 test or Fisher exact test, depending on data sparsity. Statistical software (SAS version 9.4; SAS Institute Inc) was used for all analyses.

RESULTS

Patient Characteristics

Data on all patient encounters in the urgent care and emergency departments were reviewed for the study periods. In total, 34,561 patients were included in the study. Distribution of encounter type was similar for both periods (Table 1), and a total of 2,680 patients received an opioid prescription during one of the periods. Among those patients who received an opioid prescription, no statistical difference was found in age and sex (Table 2), and the median age was 44 years.

Outcomes

For the primary end point among patients with an opioid prescription, the median (interquartile range) MMEs prescribed per

patient encounter were 90 (60-120) in the pre-implementation period and 60 (60-120) in the post-implementation period. This represents a 33.3% reduction between the two periods ($P<.001$) (Figure).

The number of urgent care or emergency department encounters in which an opioid was prescribed was 1,464 (8.3%) in the pre-implementation period vs 1,216 (7.2%) post-implementation. This absolute reduction of 1.1% is a relative reduction of 13% ($P<.001$).

Among specific opioid agents prescribed during the time periods, the only statistically significant difference was for morphine, which had an absolute increase of 1.4% in the post-implementation period ($P<.001$) (Table 3). Hydrocodone was the most-prescribed opioid for both periods; no statistical difference existed for tramadol prescription rates. Far fewer prescriptions were written for the other agents, and no statistically significant difference was observed for codeine, hydromorphone, fentanyl, and methadone rates between the two periods.

DISCUSSION

This study demonstrates significant decreases in both total MMEs per encounter and in urgent care and emergency department encounters in which an opioid was prescribed. The requirement for clinicians to check the Wisconsin ePDMP before prescribing an opioid appears to have helped reduce opioid prescriptions for treatment of acute pain at Mayo Clinic Health System sites in northwest Wisconsin. Prior to data analysis, postulation was that a shift to more prescriptions for a less potent agent (eg, tramadol) may have occurred, but this shift was not seen. There was, however, an increase in morphine prescriptions from the pre-implementation to the post-implementation period. The reason is not clear, although it may have been due to a prescribing preference for morphine by providers working more during the post-implementation period vs pre-implementation. Another potential reason may be that during the second timeframe, more patients had allergies to opioids other than morphine, leading providers to prescribe morphine on discharge.

A limitation of this study is the assumption that patients in the urgent care and emergency departments received opioid prescriptions for the indication of acute pain. When developing the study protocol, we were challenged to define acute pain in an all-encompassing way. We initially trialed the idea of pulling data from the *International Statistical Classification of Diseases, Tenth Revision* (ICD-10) related to acute pain to specifically include the patients who received opioid prescriptions for such pain. However, in many scenarios, acute pain is secondary to another diagnosis, thus determination of the appropriate inclusion criteria was difficult for ICD-10 codes. In addition, not all ICD-10 codes may be included in an encounter or potentially are coded incorrectly,

Table 2. Demographic Comparison Between Periods Among Patients With an Opioid Prescription

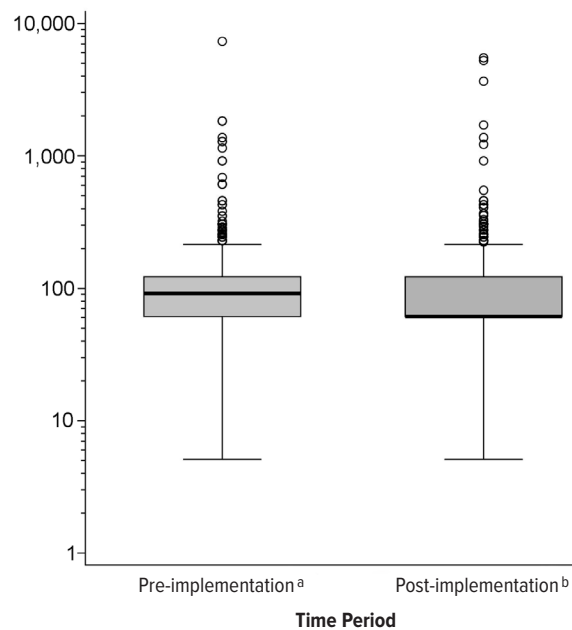
Variable	Period With Opioid Prescription			P-value
	Pre-implementation ^a (n=1,464)	Post-implementation ^b (n=1,216)	Total (N=2,680)	
Age, median (IQR), y	43 (32-60)	45 (31-60)	44 (31-60)	.60
Female sex, No. (%)	812 (55.5)	651 (53.5)	1,463 (54.6)	.32

^aPre-implementation of 2015 Wisconsin Act 266, May and June 2016.

^bPost-implementation of 2015 Wisconsin Act 266, May and June 2017.

Abbreviation: IQR, interquartile range.

Figure. Opioid MME per Patient Encounter per Period



Abbreviation: MME, morphine milligram equivalent.

^aPre-implementation of the 2015 Wisconsin Act 266, May and June 2016.

^bPost-implementation of 2015 Wisconsin Act 266, May and June 2017.

The median MME per encounter was 90 for the pre-implementation timeline and 60 for the post-implementation timeline ($P<.001$). The band within the interquartile range boxes represents the median. Bars extend to the minimum and maximum values within 1.5 times the interquartile range beyond the lower and upper quartiles.

Table 3. Comparison of Specific Opioid Prescription Rates After Implementation of 2015 Wisconsin Act 266

Prescribed Opioid	Rate of Opioid Prescriptions, No. (%)			P-value
	Pre-implementation ^a	Post-implementation ^b		
Codeine	29 (2.0)	16 (1.3)		.23
Fentanyl	1 (0.1)	3 (0.2)		.34
Hydrocodone	900 (61.5)	750 (61.6)		.95
Hydromorphone	4 (0.3)	7 (0.6)		.24
Methadone	1 (0.1)	0 (0)		>.90
Morphine	3 (0.2)	20 (1.6)		<.001
Oxycodone	285 (19.5)	218 (17.9)		.31
Tramadol	268 (18.3)	218 (17.9)		.79

^aPre-implementation, May and June 2016.

^bPost-implementation, May and June 2017.

which could lead to missing or extraneous data. By focusing our analyses specifically on urgent care and emergency departments, it was thought that chronic pain would not be treated in most encounters within these settings. It is possible, however, that some opioid prescriptions for chronic pain and acute exacerbations of chronic pain may have been included in the data.

Another study limitation is that the later timeframe for data analysis occurred almost immediately after implementation of Wisconsin Act 266 in April 2017, requiring providers to query the ePDMP before prescribing an opioid. Thus, opioid prescriptions in May and June 2017 may have been affected particularly. After learning about the new requirement, providers could have been more vigilant in checking the ePDMP, potentially leading to a reduction in the quantity of opioids prescribed. In contrast, some providers may not have been aware of the requirement or the details surrounding it, so it may not have altered their prescribing pattern. However, Wisconsin ePDMP data show that prescriber queries stayed high for the remainder of 2017, after implementation of Wisconsin Act 266.⁸

One barrier encountered was the inability to obtain organization-specific data on the number of provider queries in the ePDMP, which initially were intended to be an end point of the study. The Wisconsin ePDMP provides data at the statewide level for research purposes, including the number of provider queries per month, but the functionality currently does not allow researcher acquisition of institutional data. A medical coordinator account is required to obtain access to institution-specific data, and to study this data, each provider must show written consent to the established medical coordinator. This is possibly a future option for sites to better use ePDMP data and functionality.

The results of this study will contribute to the Wisconsin ePDMP efforts to reduce inappropriate prescription of opioids for acute pain and to develop more standardized practices for opioid prescription in the urgent care and emergency department settings. Quantities of opioids prescribed at a statewide level have decreased over the past several years, and it is important to sustain these efforts by continuing to analyze prescribing data and how the data correlate to opioid overdose deaths in Wisconsin.

CONCLUSION

The HOPE Agenda, specifically 2015 Wisconsin Act 266, appears to be associated with a decrease in opioid prescriptions for patients with acute pain presenting to urgent care and emergency department settings.

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