Evaluation of Compensatory Prescribing After Opioid-Restricting Legislation

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INTRODUCTION

Legislation has largely reduced the dose and duration of prescription opioids across the USA.[1] While legislation varies by state, providers and healthcare systems collectively are concerned about managing patient pain and mitigating the unintended consequences of prescribing less opioids.[2] Despite these concerns, few studies have investigated compensatory prescribing patterns following opioid-restricting legislation.

METHODS

We used a cross-sectional study design to compare prescribing patterns before and after statewide legislation ("TN Together") that was implemented at Vanderbilt University Medical Center. Outpatient prescriptions for opioid analgesics, nonopioid analgesics, and benzodiazepines were included in the analysis. Nonopioid analgesics included those highlighted by a recent CDC guideline: nonsteroidal anti-inflammatory drugs, acetaminophen, gabapentin, pregabalin, nortriptyline, amitriptyline, and duloxetine.[3] Prescriptions between November 3, 2017, and June 30, 2018, were considered control and compared with prescriptions between July 1, 2018, and July 1, 2019, using multivariable logistic regression. We imputed missing data and used Wald-type methods for hypothesis testing with a type I error rate of 5%. Analyses were conducted with R (R Core Team, 2020), and results were reported according to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guideline.[4]

RESULTS

Of the 563,418 prescriptions that met the inclusion criteria, slightly more were from the post-legislation period (60.7%). Prescriptions were primarily for White (80.0%) and female (57.8%) patients. Physicians signed most prescriptions (54.3%), and most prescriptions were from a hospital discharge (33.2%) or office visit (24%). There were no significant differences between the patient cohorts.

The prescriptions were comprised of 38.4% opioid analgesics, 49.7% nonopioid analgesics, and 11.8% benzodiazepines. Comparing before and after legislation, the proportion of opioid prescriptions decreased from 41.1 to 36.7% (− 4.4, 95% CI, − 4.7 to − 4.2), nonopioid analgesic prescriptions increased from 47.1 to 51.4% (4.3, 95% CI, 4.1 to 4.6), and benzodiazepine prescriptions stayed the same (Table 1). Among opioid analgesics, the median morphine milligram equivalent (MME) per prescription decreased from 315 to 300 (ratio of geometric means, 0.88; 95% CI, 0.86 to 0.89), which is approximately three hydrocodone 5-mg tablets or one oxycodone 10-mg tablet. Prescriptions for ≤ 180 MME and ≤ 3 days' supply increased from 13.8 to 28.2% (14.4, 95% CI, 14.1 to 14.8).

After legislation, the odds of receiving an opioid prescription were lower (AOR, 0.92; 95% CI, 0.87–0.97), a nonopioid analgesic prescription were higher (AOR, 1.12; 95% CI, 1.06–1.18), and an opioid prescription for ≤ 180 MME and ≤ 3 days' supply were higher (AOR, 1.86; 95% CI, 1.67–2.07). Figure 1 depicts the predicted log odds over time for nonopioid analgesics.

DISCUSSION

We examined prescribing pattern changes among opioid and nonopioid analgesics and benzodiazepines with the onset of opioid-restricting legislation. The findings suggest that the statewide legislation may have helped achieve the goal of decreasing prescription opioids by primarily shifting short-term prescriptions to below 180 MME and 3 days' supply. Prescribers appear to have offset, to an extent, the overall decrease of opioid analgesic prescriptions with use of nonopioid analgesics. Without direct requirements for concomitant use of opioids and benzodiazepines, state legislation to restrict opioid prescriptions may have little impact on benzodiazepine prescribing.

It was surprising that the proportion of benzodiazepine prescriptions did not decrease with legislation. Danagoulian and colleagues observed a decrease in the frequency of prescription opioids and benzodiazepines.[5] However, on close inspection of benzodiazepine milligram equivalents, there

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Table 1 Prescription Characteristics for Opioid Analgesics, Nonopioid Analgesics, and Benzodiazepines Before and After Legislation. Data Shown in Median for Continuous Variables, and Frequency for Categorical and Ordinal Variables. Comparisons: Wilcoxson Rank Sum Test for Continuous Variables, and the Pearson Chi-Square Test for Categorical Variables, and the Likelihood Ratio Test for Ordinal Variables. 95% CI for Difference in Two Proportions for Categorical Variables. Effect Estimates at the Time of Legislation Were Calculated from Logistic Models Adjusting for Patient Age, Sex, Race/Ethnicity, Encounter Type, Clinic Type, Provider Type, and Cancer and Sickle Cell Anemia Diagnoses

Prescription characteristics	All prescriptions, no. (%)		95% CI
	Pre-legislation (n = 221,234)	Post-legislation (n = 342,184)	
Multimodal analgesics and benzodiazepines			
Opioid analgesic	91,008 (41.1)	125,562 (36.7)	− 4.4 (− 4.7 to − 4.2)
Nonopioid analgesic	104,216 (47.1)	176,051 (51.4)	4.3 (4.1 to 4.6)
Benzodiazepine	26,013 (11.8)	40,571 (11.9)	0.1 (− 0.3 to 0.1)
	Opioid prescriptions, median (IQR)		
	Pre-legislation (n = 91,008)	**Post-legislation** (n = 125,562)	**95% CI**
Opioids			
MME per prescription	315 (150, 900)	300 (90, 900)	0.88 (0.86 to 0.89)
MME per day	30 (20, 60)	30 (20, 60)	1.03 (1.02 to 1.04)
Opioid MME/prescription category	Opioid Prescriptions, No. (%)		
≤ 180 MME	29,395 (32.3)	53,711 (42.8)	10.5 (10.1 to 10.9)
181–500 MME	26,173 (28.8)	24,289 (19.4)	− 9.4 (− 9.8 to − 9.1)
501–1200 MME	18,734 (20.6)	24,600 (19.6)	− 1.0 (− 1.3 to − 0.7)
> 1200 MME	16,628 (18.3)	22,858 (18.2)	− 0.1 (− 0.4 to 0.3)
Opioid days' supply/prescription category			
≤ 3 days' supply	13,491 (14.9)	37,229 (29.7)	14.8 (14.5 to 15.2)
4–10 days' supply	33,701 (37.2)	31,208 (24.9)	− 12.3 (− 12.7 to − 11.9)
11–30 days' supply	43,382 (47.9)	56,752 (45.3)	− 2.6 (− 3.0 to − 2.1)
Opioid MME and days' supply category			
≤ 180 MME and ≤ 3 days' supply	12,570 (13.8)	35,429 (28.3)	14.4 (14.1 to 14.8)
		Pre- versus post-legislation	
		AOR (95% CI)	***P* value***
Nonopioid analgesic		1.12 (1.06–1.18)	< .001
Benzodiazepine		0.94 (0.86–1.02)	.17
Opioid		0.92 (0.87–0.97)	< .001
Opioid ≤ 180 MME and ≤ 3 days' supply category		1.86 (1.67–2.07)	< .001

AOR adjusted odds ratio, IQR interquartile range, CI confidence interval, MME morphine milligram equivalent
**P value was calculated using the multi-degree chunk test of the variable including time by legislation interaction effect*

may have been an increase in the average dosage. Since our analysis found stable benzodiazepine prescribing but did not assess milligram equivalents, these findings may be of concern.

Prior analyses assessing the impact of opioid-controlling legislation have largely used claims data sets. The use of electronic health record data in the present analysis allowed us to control for granular information about patients, prescribers, and clinics. While our findings suggest an offset of opioid pain medication prescriptions with nonopioids, this analysis was a cross section at the prescription level; therefore, we were not able to determine the extent of the offset for

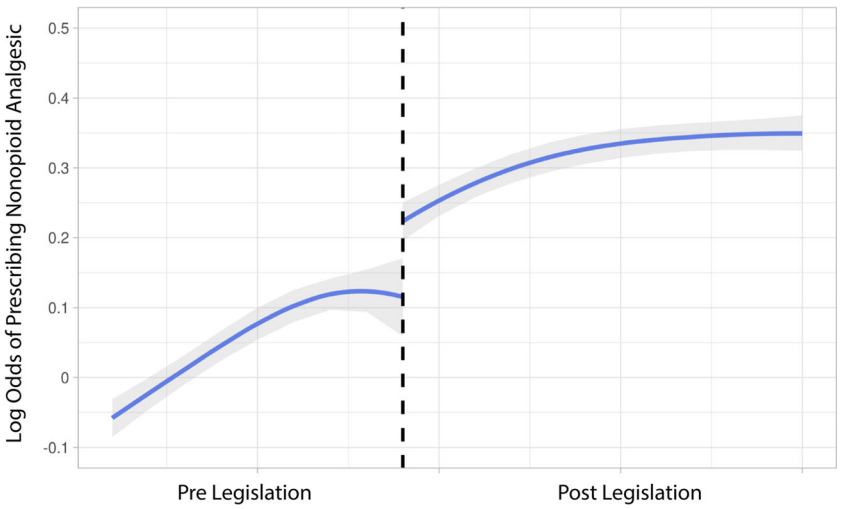

Figure 1 Predicted log odds over time with 95% confidence bands for nonopioid analgesic prescribing pre- and post-legislation (dashed vertical line).

individual patients. Further, this study was subject to the limitations of a single academic medical center with a primarily White patient population.

Legislation restricting prescription opioids vary, though most focus on the initial prescription for acute and short-term pain.[6] We observed a dramatic shift of opioid prescriptions to below 180 MME and 3 days' supply, which appears to be a direct result of legislation. Since TN Together was among the strictest legislation nationwide, this analysis provides a benchmark for how prescribing patterns can be expected to change with similar legislation. It is, however, possible that some patients in this study had inadequately managed pain. Research is now needed to inform future policies that combine a patient-centered approach with prescriber autonomy to further improve patient outcomes and address the opioid crisis in the long term. Subsequent analyses evaluating the impact of opioid-restricting legislation should investigate the use of non-prescription analgesics, opioids for chronic pain, and buprenorphine for opioid use disorder and pain.

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Declarations:

Conflict of Interest: *The authors declare that they do not have a conflict of interest.*

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