

Reduction in Schedule II opioid prescribing by primary care providers, orthopedic and general surgeons, and pain management specialists following the implementation of a State House Bill and an Institutional Controlled Substance Task Force

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ABSTRACT

Objective: Prescription opioid misuse represents a social and economic challenge in the United States. We evaluated Schedule II opioid prescribing practices by primary care providers (PCPs), orthopedic and general surgeons, and pain management specialists.

Design: Prospective evaluation of prescribing practices of PCPs, orthopedic and general surgeons, and pain management specialists over 5 years (October 1, 2014–September 30, 2019) in an outpatient setting.

Methods: An analysis of Schedule II opioid prescribing following the implementation of federal and state guidelines and evidence-based standards at our institution.

Results: There were significantly more PCPs, orthopedic and general surgeons, and pain management specialists with a significantly increased number who prescribed Schedule II opioids, whereas there was a simultaneous significant decline in the average number of Schedule II opioid prescriptions per provider, Schedule II opioid pills prescribed per provider, and Schedule II opioid pills prescribed per patient by providers. The average number of Schedule II opioid prescriptions with a quantity >90 and Opana/Oxycontin prescriptions per PCP, orthopedic surgeon, and pain management specialist significantly decreased. The total morphine milligram equivalent (MME)/day of Schedule II opioids ordered by PCPs, orthopedic and general surgeons, and pain management specialists significantly declined. The ages of the providers remained consistent throughout the study.

Conclusions: This study reports the implementation of federal and state regulations and institutional evidence-based guidelines into primary care and medical specialty practices to reduce the number of Schedule II opioids prescribed. Further research is warranted to determine alternative therapies to Schedule II opioids that may alleviate a patient's pain without initiating or exacerbating a potentially lethal opioid addiction.

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INTRODUCTION

Approximately 100 million Americans suffer from chronic unrelieved pain that affects their quality of life.¹⁻³ The estimated cost ranges between \$560

and \$635 billion annually, which consists of direct healthcare costs, days and hours of work missed, and lower wages.²⁻⁴ In 2018, a total of 67,367 drug overdose deaths were reported in the United States, with approximately 15,000 fatal prescription opioid

overdoses.⁵ Prescription opioids were involved in 32 percent of all opioid overdose deaths. Unintentional and preventable deaths reached the highest number in recorded US history in 2018, reflected predominantly by the opioid crisis.⁶

The amount of opioids prescribed in 2015 were approximately three times higher compared with 1999.⁷ Three factors may be responsible for this escalation in prescribed opioids, including (1) opioids prescribed for noncancer pain; (2) opioids used to treat chronic conditions for increased lengths of time; and (3) higher average dosages of opioid prescriptions.⁷ It has been reported that the top 1 percent of providers account for 49 percent of all opioid doses and 27 percent of all opioid prescriptions in the United States.⁸ PCPs are the main opioid prescribers for chronic noncancer pain despite lacking sufficient knowledge and training about prescribing and managing these addictive and potentially dangerous medications.^{1,9-12} While PCPs are the leading opioid prescribers, orthopedic surgeons are the third highest prescribers of opioids among physicians in the United States.^{13,14} Orthopedic and general surgeons are faced with the dilemma of prescribing opioids postoperatively and must weigh the risks and benefits of controlling patients' pain with the possible risk of misuse.¹³

To combat the prescription opioid overdose epidemic, the morphine milligram equivalent (MME)/day was established to determine a patient's cumulative intake of any opioid drugs over 24 hours. The MME is a numerical value assigned to opioids to reflect their relative potencies by converting opioid prescriptions to their equivalent dose in morphine and divides the total dose of the prescription by days' supply.¹⁵ The MME enables comparison among different types of opioid formulations and strengths while taking into consideration multiple prescriptions that a single patient may receive. In 2016, the Centers for Disease Control and Prevention (CDC) reported their MME guideline which stated that prescribers "should carefully reassess evidence of individual benefits and risks when increasing the dosage to >50 MME/day."¹⁶

In 1999, Kentucky implemented its prescription drug monitoring program (PDMP), Kentucky All Schedule Prescription Electronic Reporting System (KASPER), which tracks all controlled substance prescriptions dispensed within the state.¹⁷ In response to rampant prescription drug misuse and diversion, House Bill 1 (HB1) passed in Kentucky in 2012,

which made drastic alterations in the prescribing and monitoring of controlled prescription drugs in Kentucky (Table 1).¹⁸ This bill regulated pain clinics and required that all providers and dispensers register with and use KASPER. A substantial decrease in the prescribing of controlled substances commonly associated with misuse and diversion (hydrocodone, oxycodone, alprazolam, and carisoprodol) was reported after the implementation of HB1.¹⁹⁻²¹

We previously reported a pilot study (January 1, 2015-December 31, 2015) of PCPs' prescribing practices of Schedule II opioids at our institution in Kentucky, which highlighted the top 10 PCP prescribers compared with the total 149 PCP prescribers.²⁰ The top 10 PCP prescribers accounted for 38.4 percent of the Schedule II controlled substances and 47.8 percent of the Schedule II opioids with >90 pills dispensed. The top 10 PCP prescribers had a

Table 1. Kentucky's House Bills 1 and 333

House Bill 1

- Practitioner or pharmacist required to register with cabinet to use KASPER
- Before initial prescribing or dispensing of Schedule II controlled substance:
 - Obtain complete history and physical
 - Query KASPER every 3 months on patient's personal data
 - Educate patients about specific drug
 - Develop written treatment plan
 - Discuss and obtain a written informed consent
- Prescribing >90 days requires:
 - Random urine drug screen and pill counts
 - Consider referring to a specialist

House Bill 333

- Three-day limit on prescribing for acute conditions unless a physician documents:
 - Description of the acute condition
 - Assessment that more than 3 days is necessary
 - Alternative treatments are inadequate
- If patients are noncompliant: physicians must taper medications, stop prescribing, or refer the patient to an addiction and/or pain management specialist
- Tapering in a slow manner to minimize signs and symptoms of opioid withdrawal
- Refer patients to addiction treatment if they have not achieved improvement of their medical complaint, have experienced significant adverse effects including an overdose, exhibit drug-seeking behavior or diversion, or consuming high-risk medications concurrently

KASPER: Kentucky All Schedule Prescription Electronic Reporting.

considerably higher number of patients with back pain and degenerative disc disease, which may have prompted them to prescribe a higher amount of Schedule II opioids compared with all 149 PCP prescribers. We subsequently reported a 3-year study (October 1, 2014–September 30, 2017) of PCPs' prescribing practices of Schedule II opioids.²¹ A statistically significant increase in the total number of PCPs and PCPs who prescribed Schedule II opioids was observed, whereas there was a concurrent significant decrease in the average number of Schedule II opioid pills prescribed per PCP, Schedule II opioid prescriptions per PCP, Schedule II opioid pills prescribed per patient by PCPs, Schedule II opioid prescriptions with a quantity >90 per PCP, and Opana/Oxycontin prescriptions per PCP. A statistically significant decline in the average MME/day of Schedule II opioids per PCP was noted.

There are no national standards to monitor PCPs' prescribing practices of opioids. The present study expands upon our previous studies by presenting prescribing practices of Schedule II opioids by PCPs, orthopedic and general surgeons, and pain management specialists. Particular attention is devoted to Schedule II opioid prescriptions with a quantity >90, Opana/Oxycontin prescriptions, and MME/day.

METHODS

Under an Institutional Review Board's approved protocol, this 5-year prospective study (October 1, 2014–September 30, 2019) investigated the prescribing practices of Schedule II opioids by PCPs, orthopedic and general surgeons, and pain management specialists at our institution following the implementation of HB1 in Kentucky. Our institution is a community-based hospital system, and this study highlighted prescribing practices in an adult outpatient setting. All other controlled substances besides Schedule II opioids were excluded from the data. Each of the opioid prescriptions were attributed to the "authorizing/signing" provider. These individuals were responsible and were required to meet both governmental and institutional requirements. We also sought to determine whether provider age played a role in prescribing behavior. The provider mean ages and age groups by decade in primary care, orthopedic and general surgery, and pain management are presented.

After HB1 was passed in Kentucky, our institution implemented evidence-based guidelines to adhere to

HB1. All providers were educated about Schedule II opioids, and their prescribing behaviors were monitored and audited. The prescribing data were stratified, and the top 10 percent of providers who prescribed the most Schedule II opioids were identified. These providers received rigorous education and personalized feedback about their prescribing behaviors of Schedule II opioids in relation to their peers. Repeat auditing of the outlier providers was conducted.

Our institution developed a Controlled Substance Task Force in 2016 consisting of PCPs, a pain medicine provider, a pharmacist, a quality outcomes analyst, director of the poison control center, and the director for quality, safety, and compliance. The goals of this committee included ensuring (1) appropriate, responsible, and judicious prescribing of controlled substances, (2) patient safety, and (3) compliance with state and federal regulations regarding the prescribing of controlled substances.

Statistical analysis

The methodology utilized for the statistical analysis consisted of the Mann–Kendall test for trend in time series data, with the Holm correction for multiple comparisons. The analysis was performed for each month over the 5-year period, reflecting a 60-month test for trend in time. $P < 0.05$ indicated statistical significance.

RESULTS

Schedule II opioid prescribing by PCPs, orthopedic and general surgeons, and pain management specialists

There were more PCPs, orthopedic and general surgeons, and pain management specialists as well as an increased number of providers who prescribed Schedule II opioids and all prescriptions at our institution over the 5-year period (PCPs, general surgeons, pain management specialists: all $p < 0.001$; orthopedic surgeons: $p < 0.001$, $p < 0.001$, and $p = 0.001$, respectively; Tables 2-5). The total number of patients prescribed Schedule II opioids and Schedule II opioid prescriptions also decreased (PCPs, general surgeons, and pain management specialists: all $p < 0.001$; orthopedic surgeons: $p = 0.293$ and $p < 0.001$, respectively; Tables 2-5). For PCPs, orthopedic and general surgeons, and pain management specialists, the average number of Schedule II opioid prescriptions per provider,

Table 2. PCPs' prescribing of Schedule II opioids at our institution (October 1, 2014-September 30, 2019)

Metric	October 2014	September 2019	p-Value (trend)
Total number of PCPs	174	291	<0.001
Total number of PCPs who prescribed Schedule II opioids	137	160	<0.001
Total number of all prescriptions written by PCPs	115,402	159,831	<0.001
Total number of patients prescribed Schedule II opioids by PCPs	5,901	3,455	<0.001
Total number of Schedule II opioid prescriptions written by PCPs	8,910	4,286	<0.001
Average number of Schedule II opioid pills prescribed per PCP	5,117	1,274	<0.001
Average number of Schedule II opioid pills prescribed per patient by PCPs	151	107	<0.001
Average number of Schedule II opioid prescriptions per PCP	51	15	<0.001
Percentage of PCPs who prescribed Schedule II opioids	78.7	55.0	<0.001
Percentage of total number of prescriptions prescribed by PCPs that were Schedule II opioids	7.7	2.7	<0.001
Total number of Schedule II opioids prescriptions with a quantity >90 written by PCPs	4,321	1,430	<0.001
Average number of Schedule II opioid prescriptions with a quantity >90 per PCP	24.8	4.9	<0.001
Percentage of Schedule II opioid prescriptions >90 out of all Schedule II prescriptions written by PCPs	48.5	33.4	<0.001
Total number of Opana/Oxycontin prescriptions written by PCPs	148	47	<0.001
Average number of Opana/Oxycontin prescriptions per PCP	0.85	0.16	<0.001
Total MME/day of Schedule II opioids ordered by PCPs	400,208	175,632	<0.001
Average MME/day of Schedule II opioids per PCP	45.2	41.1	<0.001
PCP percentage of total MME/day	54.6	45.8	<0.001
PCP: primary care provider; MME: morphine milligram equivalent.			

Schedule II opioid pills prescribed per provider, and Schedule II opioid pills prescribed per patient by providers all decreased (all $p < 0.001$; Tables 2-5 and Figure 1). A decline was noted in the percentage of PCPs, general and orthopedic surgeons, and pain management specialists who prescribed Schedule II opioids and percentage in total number of prescriptions prescribed by PCPs, general and orthopedic surgeons, and pain management specialists which were Schedule II opioids (PCPs and general surgeons: all $p < 0.001$; orthopedic surgeons: $p < 0.001$ and 0.440, respectively; pain management specialists: $p = 0.438$ and $p < 0.001$, respectively; Tables 2-5).

PCPs and Schedule II opioids with a quantity >90

The total number of Schedule II opioid prescriptions with a quantity >90 and the average number of Schedule II opioid prescriptions with a quantity >90 per PCP, orthopedic surgeon, and pain management specialist decreased during our 5-year study (all $p < 0.001$; Tables 2, 3, and 5). Additionally, the percentage of Schedule II opioid prescriptions >90 out of all Schedule II prescriptions written by PCPs, orthopedic surgeons, and pain management specialists declined (all $p < 0.001$; Tables 2, 3, and 5). No general surgeons prescribed Schedule II opioids with a quantity >90 during our 5-year study.

Table 3. Orthopedic surgeons' prescribing of Schedule II opioids at our institution (October 1, 2014-September 30, 2019)

Metric	October 2014	September 2019	p-Value (trend)
Total number of orthopedic surgeons	41	64	<0.001
Total number of orthopedic surgeons who prescribed Schedule II opioids	36	49	<0.001
Total number of all prescriptions written by orthopedic surgeons	5,378	5,157	0.001
Total number of patients prescribed Schedule II opioids by orthopedic surgeons	1,270	1,067	0.293
Total number of Schedule II opioid prescriptions written by orthopedic surgeons	1,706	1,469	<0.001
Average number of Schedule II opioid pills prescribed per orthopedic surgeon	2,967	1,035	<0.001
Average number of Schedule II opioid pills prescribed per patient by orthopedic surgeons	96	62	<0.001
Average number of Schedule II opioid prescriptions per orthopedic surgeon	41.6	23.0	<0.001
Percentage of orthopedic surgeons who prescribed Schedule II opioids	87.8	76.6	<0.001
Percentage of total number of prescriptions prescribed by orthopedic surgeons that were Schedule II opioids	31.7	28.5	0.440
Total number of Schedule II opioids prescriptions with a quantity >90 written by orthopedic surgeons	442	1	<0.001
Average number of Schedule II opioid prescriptions with a quantity >90 per orthopedic surgeon	10.8	0	<0.001
Percentage of Schedule II opioid prescriptions >90 out of all Schedule II prescriptions written by orthopedic surgeons	25.9	0.1	<0.001
Total number of Opana/Oxycontin prescriptions written by orthopedic surgeons	5	0	<0.001
Average number of Opana/Oxycontin prescriptions per orthopedic surgeon	0.1	0	<0.001
Total MME/day of Schedule II opioids ordered by orthopedic surgeons	98,340	80,307	<0.002
Average MME/day of Schedule II opioids per orthopedic surgeon	57.9	54.9	0.990
Orthopedic surgeons' percentage of total MME/day	13.4	20.9	<0.001
MME: morphine milligram equivalent.			

Opana/Oxycontin

A reduction in the total number of Opana/Oxycontin prescriptions and average number of Opana/Oxycontin prescriptions per PCP, orthopedic surgeon, and pain management specialist was observed (all $p < 0.001$; Tables 2, 3, and 5). No

general surgeons prescribed Opana/Oxycontin during our 5-year study.

Morphine milligram equivalent per day

Both the total MME/day of Schedule II opioids ordered by PCPs, orthopedic and general surgeons,

Table 4. General surgeons' prescribing of Schedule II opioids at our institution (October 1, 2014-September 30, 2019)

Metric	October 2014	September 2019	p-Value (trend)
Total number of general surgeons	15	22	<0.001
Total number of general surgeons who prescribed Schedule II opioids	15	18	<0.001
Total number of all prescriptions written by general surgeons	1,023	1,427	<0.001
Total number of patients prescribed Schedule II opioids by general surgeons	429	456	<0.001
Total number of Schedule II opioid prescriptions written by general surgeons	470	528	<0.001
Average number of Schedule II opioid pills prescribed per general surgeon	895	454	<0.001
Average number of Schedule II opioid pills prescribed per patient by general surgeons	31	22	<0.001
Average number of Schedule II opioid prescriptions per orthopedic surgeon	31	24	<0.001
Percentage of general surgeons who prescribed Schedule II opioids	100.0	81.8	<0.001
Percentage of total number of prescriptions prescribed by general surgeons that were Schedule II opioids	45.9	37.0	<0.001
Total MME/day of Schedule II opioids ordered by orthopedic surgeons	27,750	18,956	<0.001
Average MME/day of Schedule II opioids per orthopedic surgeon	59	35.9	<0.001
General surgeons' percentage of total MME/day	3.8	4.9	<0.001
MME: morphine milligram equivalent.			

and pain management specialists and average MME/day of Schedule II opioids per PCP, orthopedic and general surgeon, and pain management specialist decreased during the 5-year period (all $p < 0.001$, except average MME/day of Schedule II opioids per orthopedic surgeon: $p = 0.990$; Tables 2-5). Interestingly, the percentage of the total MME/day prescribed by PCPs and pain management specialists significantly decreased (both $p < 0.001$), whereas the percentage of the total MME/day prescribed by orthopedic and general surgeons significantly increased (both $p < 0.001$).

Ages of the providers

The mean ages and age groups by decade of the providers in primary care, orthopedic and general surgery, and pain management are presented in Table 6. The ages of the providers remained

consistent throughout the 5-year study for each medical field.

DISCUSSION

The goal of opioid prescribing is to treat a patient's acute pain with the lowest effective dose for a shortest period of time. Our study highlights a model that incorporates federal and state guidelines as well as institutional strategies to drastically reduce opioid prescribing by PCPs, orthopedic and general surgeons, and pain management specialists. Although there was a significantly higher number of PCPs, orthopedic and general surgeons, and pain management specialists with a significantly increased number who prescribed Schedule II opioids, there was a simultaneous significant decline in the average number of Schedule II opioid prescriptions per provider, Schedule II opioid pills prescribed per provider, and Schedule II opioid

Table 5. Pain medicine specialists' prescribing of Schedule II opioids at our institution (October 1, 2014-September 30, 2019)

Metric	October 2014	September 2019	p-Value (trend)
Total number of pain medicine specialists	4	5	<0.001
Total number of pain medicine specialists who prescribed Schedule II opioids	3	5	<0.001
Total number of all prescriptions written by pain medicine specialists	3,173	2,154	<0.001
Total number of patients prescribed Schedule II opioids by pain medicine specialists	1,538	908	<0.001
Total number of Schedule II opioid prescriptions written by pain medicine specialists	2,036	1,055	<0.001
Average number of Schedule II opioid pills prescribed per pain medicine specialist	49,827	20,095	<0.001
Average number of Schedule II opioid pills prescribed per patient by pain medicine specialists	130	111	<0.001
Average number of Schedule II opioid prescriptions per pain medicine specialist	509	211	<0.001
Percentage of pain medicine specialists who prescribed Schedule II opioids	75.0	100.0	0.438
Percentage of total number of prescriptions prescribed by pain medicine specialists that were Schedule II opioids	64.2	49.0	<0.001
Total number of Schedule II opioids prescriptions with a quantity >90 written by pain medicine specialists	1,037	423	<0.001
Average number of Schedule II opioid prescriptions with a quantity >90 per pain medicine specialist	259.3	84.6	<0.001
Percentage of Schedule II opioid prescriptions >90 out of all Schedule II prescriptions written by pain medicine specialists	50.9	40.1	<0.001
Total number of Opana/Oxycontin prescriptions written by pain medicine specialists	91	3	<0.001
Average number of Opana/Oxycontin prescriptions per pain medicine specialist	22.8	0.6	<0.001
Total MME/day of Schedule II opioids ordered by pain medicine specialists	98,085	37,357	<0.001
Average MME/day of Schedule II opioids per pain medicine specialist	48.8	35.9	<0.001
Pain management specialists' percentage of total MME/day	13.4	9.7	<0.001
MME: morphine milligram equivalent.			

pills prescribed per patient by providers. The average number of Schedule II opioid prescriptions with a quantity >90 and Opana/Oxycontin prescriptions per PCP, orthopedic surgeon, and pain management specialist significantly decreased. The total MME/day

of Schedule II opioids ordered by PCPs, orthopedic and general surgeons, and pain management specialists significantly declined.

Numerous efforts have been made nationally and by our state to address the opioid epidemic.

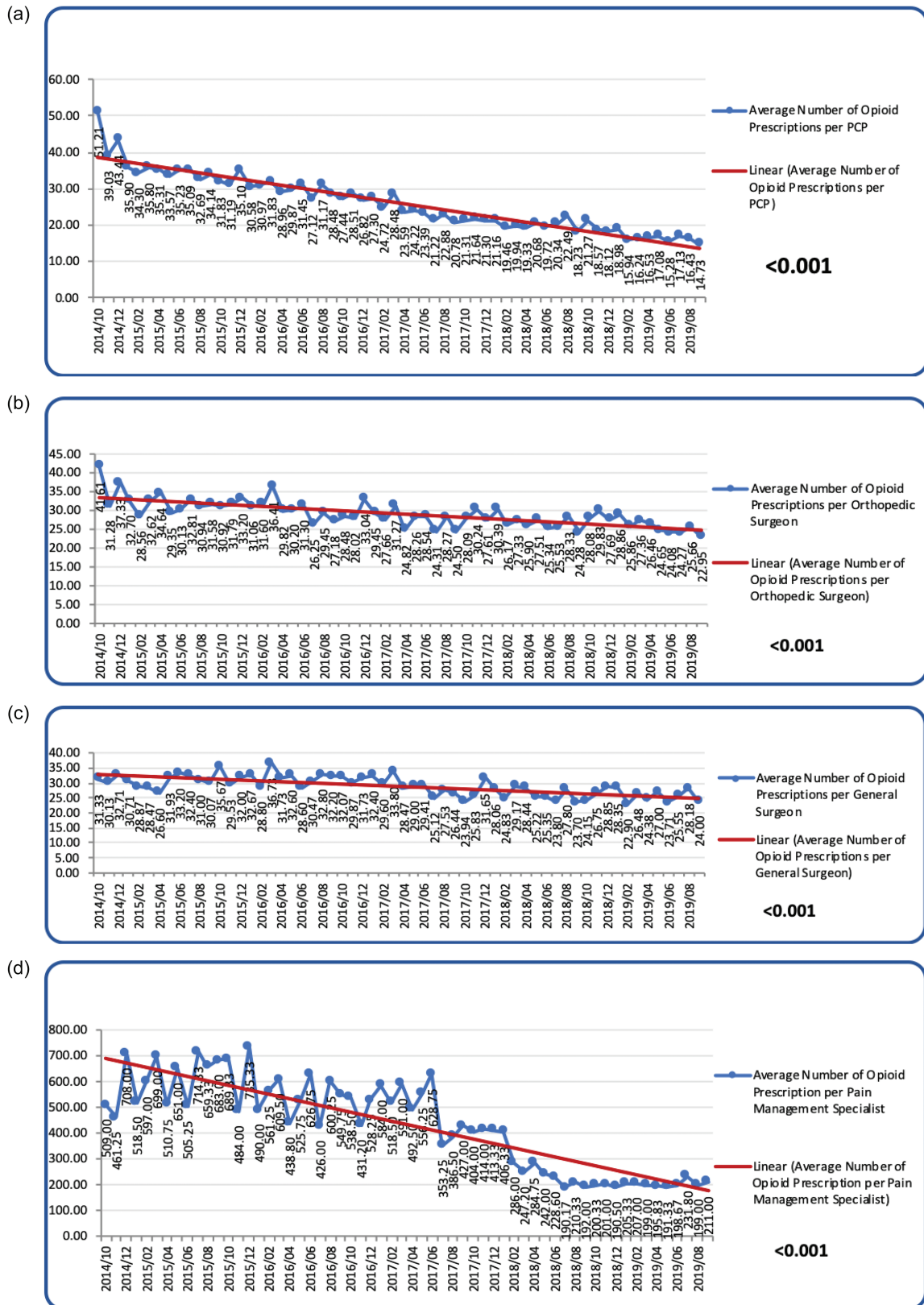


Figure 1. Trend curves demonstrating the average number of Schedule II opioid prescriptions at our institution between October 1, 2014 and September 30, 2019 (a) per PCP, (b) per orthopedic surgeon, (c) per general surgeon, and (d) per pain management specialist. All $p < 0.001$.

Table 6. Age of providers at our institution (2015-2019)							
			Provider age groups (years)				
Specialty	MD age (mean, years)	APP age (mean, years)	30-39	40-49	50-59	60-69	70-79
2015							
PCP	50	44	29	40	32	17	3
Orthopedic surgery	47	43	11	10	5	4	1
General surgery	52	38	3	1	7	1	0
Pain management	49	N/A	0	1	1	0	0
2016							
PCP	50	42	35	42	38	19	4
Orthopedic surgery	46	N/A	15	12	7	4	1
General surgery	53	37	3	1	7	1	0
Pain management	51	N/A	0	1	2	0	0
2017							
PCP	49	41	66	55	50	29	7
Orthopedic surgery	45	39	24	16	9	5	1
General surgery	51	29	3	1	7	2	0
Pain management	51	N/A	0	1	1	0	0
2018							
PCP	50	44	56	62	49	27	6
Orthopedic surgery	45	45	25	17	7	5	1
General surgery	53	36	5	2	7	1	0
Pain management	57	N/A	0	0	3	0	0
2019							
PCP	52	44	66	58	57	24	7
Orthopedic surgery	46	39	28	20	8	5	0
General surgery	51	38	8	3	7	2	0
Pain management	58	N/A	0	0	3	0	0
APP: advanced practice provider; PCP: primary care providers.							

The Office of National Drug Control Policy strives to reduce prescription drug abuse annually by expanding state-based PDMPs, disposing medications, educating providers and patients, and reducing “pill mills” and “doctor shopping.”¹ In 2012, the

FDA approved the risk evaluation mitigation strategies for extended release and long-acting opioids with specific educational information about the safe use and disposal of these medications.¹ In 2015, the American Society of Addiction Medicine proposed

national practice guidelines for evaluating and treating individuals with opioid use disorder.²² In 2016, the CDC provided recommendations for PCPs who prescribe opioids for chronic pain (pain that persists >3 months or past the time of normal tissue healing) outside of active cancer treatment, palliative care, and end-of-life care.¹⁶ The primary goals of these guidelines included (1) improving communication between PCPs and patients about the benefits and risks of opioids for chronic pain; (2) improving safety and effectiveness of pain treatment; and (3) decreasing the risks associated with long-term opioid therapy.¹⁶ In addition to Kentucky's HB1, Kentucky's House Bill 333 passed in 2017 and modified the Kentucky Board of Medical Licensure (KBML) regarding the prescribing of Schedule II medications (Table 1).²³ Kentucky physicians are required to adhere to the KBML requirements and satisfy documentation requirements.

KASPER represents the “gold standard” for PDMPs. KASPER provides many essential roles including (1) assisting prescribers with their treatment decisions, (2) identifying patients who would benefit from substance misuse treatment, (3) recognizing doctor shoppers, and (4) serving as an investigative tool for law enforcement and regulatory agencies.¹⁸ The number of KASPER report requests substantially increased between 2010 and 2019 (Figure 2). Additionally, the percent change of opioid analgesics drastically decreased by 35 percent between July 2011 and June 2012 (prior to the passage of HB1), and July 2018 and June 2019 as reported to KASPER (Table 7). These data confirm the reduction in opioid prescribing following the implementation of KASPER.

A wide variability exists in opioid prescribing among general and orthopedic surgeons and within each individual procedure.^{18,24-27} Furthermore, there are no guidelines for postoperative opioid prescribing.^{24,28,29} Numerous studies have reported that general and orthopedic surgeons prescribe higher numbers and doses of opioids than required for postoperative pain, with 40-94 percent of prescribed opioid pills remaining unused postoperatively.^{24,25,27,29-31} The opioids that are not consumed are often diverted for nonmedical use.^{32,33} Not only are postoperative patients at an increased risk for chronic opioid use, but also preoperative opioid use is an important risk factor for persistent or chronic opioid use postoperatively.^{27,29,30,34,35} To address this concern, the American Academy of Orthopaedic Surgeons

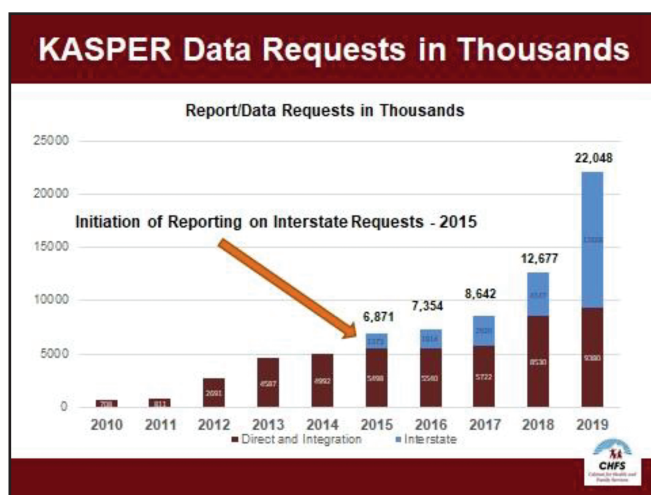


Figure 2. Controlled substances dispensed statewide prior to and following the implementation of HB1 in Kentucky. The maroon section of the bar represents both direct requests from users logged into their KASPER accounts via the KASPER portal and requests received via users through an electronic health record or pharmacy management system that is integrated with KASPER. The blue section of the bar reflects authorized users of other state PDMPs logged into their home state PDMP who requested Kentucky data on their patients via Kentucky's interstate data sharing capability (KASPER data provided by the Cabinet for Health and Family Services, Frankfort, KY).

Table 7. Kentucky's House Bill 1-controlled substance dispensing comparison.

House Bill 1 Controlled Substance Dispensing Comparison			
Drug	July 2011 through June 2012	July 2018 through June 2019	Percent Change
Opioid Analgesics	5,762,843	3,770,735	-35%
Opioid Analgesic Average Daily MED	45	39	-13%
Benzodiazepines and Other Sedatives	2,666,208	1,683,861	-37%
Stimulants	1,171,718	1,455,651	+24%
Gabapentin	Not Scheduled	1,759,496	
Buprenorphine/Naloxone	331,190	1,053,251	+218%
All Controlled Substances	11,992,912	11,194,891	-7%

All figures based on dispensed controlled substance prescription data reported to KASPER

reported a position statement in 2015 to educate physicians and the public on the use, misuse, and abuse of opioids in orthopedics with the primary goal of standardizing opioid prescription protocols and policies.³⁶ They recommended a strict limit on opioid prescription size and minimized extended-release

opioids. Additionally, nonopioid analgesics such as nonsteroidal anti-inflammatory drugs (NSAIDs) and acetaminophen as well as gabapentin were strongly encouraged for the postoperative management of pain.^{29,33} Other treatments such as early mobilization, ice and cold therapy, massage, acupuncture, and yoga may also prove beneficial.

Similar to the present study, Hill et al.³³ utilized an educational intervention to reduce opioid prescribing following general surgical operations. Patients completed a survey that documented their postoperative opioid use and described proper disposal of unused opioids. The guidelines satisfied 80 percent of patients' opioid requirements. Surgeons encouraged patients to use NSAIDs and acetaminophen before consuming opioids, and 85 percent of patients used either of these medications. These authors reported that the mean number of opioid pills prescribed decreased by 53 percent when compared with the number that would have been prescribed before the educational intervention. Furthermore, only one patient required a refill opioid prescription.

Our 5-year prospective study of opioid prescribing by PCPs, orthopedic and general surgeons, and pain management specialists in a metropolitan community in Kentucky reflects the importance of educating providers in the proper prescribing of Schedule II opioids, closely monitoring their prescribing practices, and auditing the outlier providers. Our institution had a strong desire to alter prescribers' behavior. The prescribers who were outliers received further auditing and met with fellow colleagues and senior leadership to address issues that needed changing. Providers were able to reconcile their concerns after these focused discussions. Continued auditing of the outliers revealed improvements in their opioid prescribing behavior.

Myriad activities were implemented at our institution to reduce Schedule II opioid prescribing (Table 8). By incorporating these strategies into daily practice, the number of Schedule II opioids and total MME/day of Schedule II opioids prescribed significantly declined. Providers are urged to prescribe fewer Schedule II opioids, discontinue these medications as soon as possible, promote the use of nonopioid analgesics, and reduce each patient's MME/day. Patient education focusing on the safe administration of opioids as well as careful storage and disposal of opioids is also warranted. The alterations in prescribing behaviors of Schedule

Table 8. Activities implemented at our institution to reduce Schedule II opioid prescribing

- Controlled Substance Task Force developed in 2016
- Provider education about Schedule II opioids via personal and group dashboards
- Patient education regarding safe use of Schedule II opioids
- Utilization of Appriss software showing risk scores for overdose
- Emphasis on MME/day since 2017
- Enhancement of EHR templates to ensure correct documentation
- Address outlier providers of Schedule II opioids
- Monthly audits for previous outlier providers of Schedule II opioids

MME: morphine milligram equivalent; EHR: electronic health record.

II opioids were primarily due to the efforts of the Controlled Substance Task Force developed at our institution in conjunction with HB1. KASPER reporting was not a significant driver in decreasing prescribing of Schedule II opioids.

Over the 5-year span of this study, it may be assumed that providers who wrote opioid prescriptions received better education about opioids and pain management in their medical training. However, the ages of the providers in primary care, orthopedic and general surgery, and pain management remained consistent throughout the 5 years of our study. The prescribers at our community-based hospital system are typical to those at similar institutions. In this respect, our study serves as a model that may be applied to other community-based hospital systems with adult outpatient settings.

The limitation of this study is the sole focus on the prescribing of Schedule II opioids. We intend to investigate the provider prescribing of stimulant and sedative medications in future studies.

CONCLUSION

Not only there was a substantial decrease in opioid analgesic-controlled substances following the implementation of HB1 and KASPER in Kentucky, but there was also a simultaneous significant decrease in Schedule II opioid prescribing among PCPs, orthopedic and general surgeons, and pain management specialists at our institution over this 5-year study. Continued adherence to national recommendations regarding the safe prescribing of

opioids as well as persistent monitoring of provider prescribing practices are necessary to identify providers who may benefit from additional education about the appropriate prescribing of Schedule II opioids. Further research is warranted to determine alternative therapies to Schedule II opioids that may alleviate a patient's pain without initiating or exacerbating a potentially lethal opioid addiction.

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