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Comparing Changes in Controlled Substance Prescribing Trends by Provider Type

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Abstract

Background and Objectives—Forty-nine out of 50 states have implemented Prescription Drug Monitoring Programs (PDMPs) to monitor controlled substance (CS) prescribing. PDMPs change health care provider behavior, but few studies have examined changes in CS prescription by health care provider type.

Methods—Aggregated yearly data, including number of CS prescriptions, doses, and doses per prescription by health care provider type (physician, APRN, and dentist) for each year from 2011–2017 was provided by the state PDMP, Kentucky All Schedule Prescription Electronic Reporting System (KASPER).

Results—Physicians and dentists showed a trend of decreasing prescriptions and doses for Schedule II opioids from 2012 to 2017. APRNs showed a substantive increase in the number of doses and prescriptions, with increases remaining when controlling for number of providers. Physicians increased doses and prescriptions of Schedule II stimulants, but by a smaller magnitude than APRN increases in stimulants. Dentists showed decreases in Schedule II stimulants prescribed. Similar trends, but more modest in magnitude, were observed for Schedule III–IV.

Discussion and Conclusions—Although monitoring and continuing education requirements are similar across all providers in Kentucky, differences in prescription trends for Schedule II opioids and stimulants were noted for physicians, APRNs and dentists.

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Declaration of interest:

The authors report no conflict of interest relevant to the contents of this manuscript. The authors alone are responsible for the content and writing of this paper.

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Scientific Significance—Changes in prescribing following introduction of mandatory use of KASPER markedly differed based on provider type, with increases observed for APRNs compared to physicians and dentists. These findings advance prior research by providing a detailed examination of prescribing trends by provider type subsequent to a Prescription Drug Monitoring Programs mandatory use law.

Between 1999 to 2015, drug overdose deaths in the United States more than tripled¹. As part of a response to reduce nonmedical prescription drug use, 49 of 50 US states have implemented Prescription Drug Monitoring Programs (PDMPs) to track the prescription and dispensation of controlled substances (CS)². PDMPs can identify patients with characteristics consistent with concerning patterns of CS use. For instance, nonmedical prescription opioid use has been a significant factor in the opioid epidemic, with diversion and doctor shopping responsible for the majority of unintentional deaths due to prescription opioid use^{3,4}. Nonmedical use patterns, such as having 4 or more opioid prescriptions, opioid prescriptions from 2 or more pharmacies, early prescription opioid refills, escalating morphine sulfate dosages, and opioid prescriptions from 2 or more physicians, can be identified using PDMPs⁵. To date, most studies on the effect of PDMP have focused on opioid prescribing⁶. However, there is evidence that as opioid prescriptions are increasingly regulated, other medications, such as gabapentin, may be misused more frequently⁷. Similarly, there are emerging concerns about prescription stimulant misuse, diversion, and concomitant use with other drugs of abuse to mitigate side effects^{8,9}.

PDMPs may change prescriber behavior by decreasing CS prescriptions¹⁰. For example, in study of PDMPs in ambulatory care settings in 24 states from 2001 to 2010, a greater than 30% reduction in the rate of Schedule II opioid prescriptions was observed¹¹. Similar reductions have been observed for benzodiazepines (which are largely Schedule III) after PDMP implementation¹². However, prescribers report varied knowledge and use of PDMPs. In a study of 17,390 providers who prescribed opioids in Washington state, 50% were not registered with PDMP and 27% were registered but had no recorded use¹³. While existing research on PDMPs is largely focused on physicians, it is important to study other types of prescribers. One study found that 11% of opioids were prescribed by non-physicians¹⁴. Dentists had among the lowest per-prescriber opioid drug claims to Medicare in 2013, whereas nurse practitioners (APRNs) and physician assistants (PAs) had per-prescriber rates similar to physicians, but accounted for the third and fourth highest amount of total opioid drug claims to Medicare behind family practice and internal medicine physicians¹⁵.

The Kentucky All Schedule Prescription Electronic Reporting System (KASPER) is the state of Kentucky's PDMP that tracks all controlled substance prescriptions in the state. KASPER began in 1999, allowing providers, pharmacists, and law enforcement access to an individual's CS prescription record. In 2012, state law mandated prescriber registration and universal use of KASPER before CS prescription. Mandatory access provisions have previously been demonstrated to change behavior. For instance, PDMPs without a mandatory access provision are associated with 56% reduction in doctor shopping but an 80% reduction in states where there is a mandatory access provision prior to clinical visits¹⁶. An initial review of CS prescribing patterns between 2010 and 2013 found that practitioners, including physicians and dentists, had a small decrease in CS prescription whereas APRNs

had an overall increase in both number of CS prescriptions but also in number of available prescribers¹⁷. This project further evaluated changes in CS prescriptions by examining the number of prescriptions and doses by health care professionals (i.e., physicians, APRNs, and dentists) based on KASPER data from 2011 to 2017. Our goal was to compare prescribing habits for Schedule II opioids and stimulants as well as Schedule III-V CS by prescriber type over time since implementation of a mandatory access provision for a statewide PDMP.

Methods

Data

Annual KASPER data is collected by the Kentucky Cabinet for Health and Family Sciences (CHFS) including all scheduled prescriptions and number of doses provided by health care professionals. CHFS provided aggregated, de-identified yearly data on controlled substance prescribing, including number of prescriptions, doses, and doses per prescription for each year from 2011–2017. Although the KASPER system became operational in 1999, the year 2011 was selected as a benchmark because 2012 was the first year in which practitioners were required to register in the KASPER system¹⁷. At the time of our analysis, 2011–2017 KASPER data were publicly available. This dataset contained analyzed information on Schedule II prescription opioids and stimulants as well as Schedule III-V compounds from 119 counties in Kentucky representing, for example, 9,411,101 prescriptions and 576,743,152 individual doses in 2017. A human subjects research exemption was granted by the Medical Institutional Review Board.

Provider Type

Provider type was selected based on ability to prescribe all schedules of CS in Kentucky with monitoring through KASPER. Categories were defined by Kentucky Cabinet for Health and Family Services (CHFS). APRNs with prescriptive authority in Kentucky included Nurse Practitioners, Certified Registered Nurse Anesthetists, Nurse Midwives, and Clinical Nurse Specialists. Dentists included both Dentists (DMD) and oral surgeons (DDS). Physicians included all specialties of those with MD, DO, MBBS and similar degrees. During the study period 2011–2017 in Kentucky, Physician's Assistants, Chiropractors, Naturopaths, Optometrists and other providers were unable to prescribe controlled substances or limited in the categories they could prescribe (e.g., Optometrists could prescribe schedule III-V but not schedule II¹⁸.) For the purposes of this study, aggregate data was provided with groupings by CHFS from the defined categories without any link to individual providers.

Data Analysis

Given the use of complete population data for Kentucky, data were analyzed using descriptive statistics and evaluated for visual trends. Analyses included prescriptions categorized into Schedule II opioids, Schedule II stimulants, and Schedule III-V CS. Stimulants and opioids were specifically selected as they are the majority of Schedule II drugs prescribed and because they represent two prototypic categories implicated in diversion and nonmedical use in the United States. Schedule II drugs were divided into these groupings to improve the specificity of the presented analyses. Similar trends were observed

when Schedule II drugs were collapsed into a single Schedule II grouping, as the majority of prescriptions in the Schedule II category were either stimulants or opioids. Analyses focused on 1) the number of doses prescribed, 2) the number of prescriptions, and 3) average doses/prescription (a composite of the first two values). These values were collected for each provider type (physicians, APRNs, and dentists) and the percentage change from 2011 computed for each year from 2012 to 2017. See Table 1 for raw number of doses and prescriptions for each year by provider type. Additional per-provider analyses were conducted by computing the number of doses and number of prescriptions delivered per provider (note that this transformation does not change the number of doses per prescription). These analyses controlled for changes in the number of providers year-to-year.

Of note, buprenorphine and buprenorphine/naloxone are Schedule III and therefore not reflected in the schedule II opioid numbers¹⁹. Hydrocodone combination products were moved from schedule III to schedule II in October 2014. They are included in Schedule III-V figures prior to that date, but included in the schedule II figures following that date. Gabapentin became a Schedule V in Kentucky effective July 1, 2017 so it would be reflected in the schedule III-V for 2017.

Results

Schedule II Opioid Prescriptions

Figure 1 contains Schedule II opioid prescriptions in raw (top panels) and adjusted per-provider (middle panels) values as well as doses per prescription (bottom panel). Physicians and dentists showed a consistent, decreasing trend in prescriptions and doses delivered for Schedule II opioids from 2012 to 2017. The number of doses per prescription was also stable over this time period for physicians and dentists. In contrast, APRNs showed a substantive increase in the number of doses and prescriptions provided in raw values. These trends were partially explained by increases in the number of APRNs as indicated by the per-provider analysis for prescriptions. However, increases in the number of doses delivered by APRNs remained in the per-provider analysis, which translated to increases in the number of doses delivered per prescription (37.7% increase from 2011 to 2017).

Schedule II Stimulant Prescriptions

Figure 2 contains Schedule II stimulant prescriptions in raw (top panels) and adjusted per-provider (middle panels) values as well as doses per prescription (bottom panel). Consistent with the Schedule II opioid results, APRNs showed a steady increase in the number of doses and prescriptions provided. This trend was observed for both raw values as well as when adjusted for per provider. A modest increase was also observed for physicians, but was of a smaller magnitude (e.g., 71.0% increase in the number of doses per provider from 2011 to 2017 by APRNs versus 20.7% by physicians). The number of doses per prescription was relatively constant across each year reflected by parallel increases in the number of doses and prescriptions provided. Dentists, in contrast, showed decreases in Schedule II stimulants prescribed across all metrics.

Schedule III-V Prescriptions

Figure 3 contains Schedule III-V prescriptions in raw (top panels) and adjusted per provider (middle panels) values as well as doses per prescription (bottom panel). A steady increase in the raw number of doses and prescriptions was observed over the analyzed time period for APRNs. These increases were smaller when presented as per-provider values with increases only apparent in the most recent years. Physicians showed a similar trend as Schedule II opioids and stimulants with decreases in the number of prescriptions and doses over each year. Dentists, in contrast, showed a modest decrease in the number of doses prescribed, but a modest increase in the number of prescriptions written.

Discussion

We observed differences comparing prescribing patterns over time between APRNs and physicians or dentists in CS prescribing. Although notable differences were observed in Schedule II opioids, similar, but less marked, patterns were observed over time by provider type in Schedule II stimulant and Schedule III-V prescriptions. Even when APRNs did not increase CS prescriptions (such as the number of prescriptions for opioids per provider), they also did not decrease consistent with the other provider types which was observed for physicians and dentists. While prior studies that examine controlled substance prescribing by different types of providers are limited, some studies have found that APRNs may be less likely to prescribe opioids in chronic pain management²⁰. Studies on psychotropic prescribing in children, which would include stimulants, have also found similar rates and quality metrics in physicians and APRNs^{21,22}. In contrast, the data available from KASPER suggest that both doses per provider and doses per prescription for both opioids and stimulants have remained elevated for APRNs compared to the 2011 benchmark.

Current state monitoring requirements are similar across all provider types. For instance, physicians, dentists, and APRNs are subject to the same requirements to participate in PDMP in Kentucky when prescribing CS, although APRNs are required to have a collaborative agreement with a physician for controlled substance prescriptions for the first four years of prescriptive authority²³.

One difference between various providers may be differences in pharmacology education. APRNs in some studies have reported that their education does not adequately prepare them for independent practice²⁴. One study of nurse practitioners in New York State reported an average of 3 hours education total on addiction in APRN graduate programs²⁵. Specifically examining CS prescriptions by APRNs, one study reported 22% and another reported 44.1% of respondents felt inadequately prepared to prescribe CS^{26,27}. However, once health care providers are prescribing controlled substances, the required continuing education contact hours are similar across all provider types, with 1.5 hours of required continuing education for APRNs, physicians, and dentists per Kentucky House Bill 1 Requirements¹⁷. Additional continuing education requirements for APRNs who are prescribing controlled substances could provide additional education about safe prescribing practices.

An emphasis on patient satisfaction may also contribute to different patterns of CS prescribing over time. For instance, the promotion of “Pain as the Fifth Vital Sign” has been

associated with increasing opioid use for chronic, non-cancer pain²⁸. Nursing training may emphasize patient-centered communication styles which could exacerbate prescription in response to subjective patient complaints, such as inattention or discomfort²⁹. Additionally, patient's ratings of satisfaction may have differential effects on various provider types, but little information is currently available³⁰.

Rural areas have been predominantly affected by nonmedical prescription opioid misuse³¹. Prior analyses using KASPER data have noted differences in regional CS prescription, with more opioids prescribed in Appalachian regions³². Differences in the availability of providers may also lead to changes in prescriptive patterns. Some studies have demonstrated greater APRN presence in rural primary care compared with urban areas³³, although those rural-urban differences in the availability of providers have not been consistently noted³⁴. A recent qualitative study of APRNs who provide care for those with both chronic pain and substance use disorders reported a subjective increase in the number of patients being shifted to APRN management without a concomitant increase in availability other services³⁵. Additional work is needed to understand rural/urban and regional differences by provider type.

Several limitations should be noted. This analysis focused on Kentucky, which has unique demographic factors and been particularly affected by the opioid epidemic, which may limit generalizability to other areas³¹. Additionally, the available data was aggregated and de-identified, so it is possible that individual outliers could influence the overall data set. Although our data set only included 2011–2017, examining longer periods of time may provide additional trend data. Because of the nature of the PDMP information received, we were unable to look at specific medications, only the general number medications prescribed within a DEA schedule. For instance, both oxycodone and methadone would have been categorized as Schedule II opioids even though the use of each may be quite different.

All healthcare providers who are able to prescribe controlled substances should be recognized as a potential source of prescriptions. Additional education may help to increase provider knowledge and comfort with controlled substance prescribing and decrease external pressures such as patient satisfaction metrics. In the future, PDMPs may be used to provide individual feedback for quality improvement; for instance, for providers to be able to compare themselves with community norms, practice guidelines, and widely accepted standards of care. Further research on the differences in CS prescribing by health care provider type would clarify whether the trends that were observed in KASPER would be observed in other states, including those with independent practice for APRNs.

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Figure 1. Percentage Change in Schedule II Opioid Prescriptions 2011–2017 by Kentucky Providers.

Plotted are the percentage changes from 2011 in Schedule II opioid doses, prescription, and doses/prescriptions divided by provider type (Physician [black bar], APRN [stripped bar], Dentist [white bar]). Raw values are in original total units. Per Provider values are presented as changes in doses or prescriptions delivered per number of providers in each subgroup. Y-axes are scaled –100% to 100% unless values went beyond that upper bound (see top panels).

Figure 2. Percentage Change in Schedule II Stimulant Prescriptions 2011–2017 by Kentucky Providers.

Plotted are the percentage changes from 2011 in Schedule II stimulant doses, prescription, and doses/prescriptions divided by provider type (Physician [black bar], APRN [stripped bar], Dentist [white bar]). Raw values are in original total units. Per Provider values are presented as changes in doses or prescriptions delivered per number of providers in each subgroup. Y-axes are scaled –100% to 100% unless values went beyond that upper bound (see top panels).

Figure 3. Percentage Change in Schedule III-V Prescriptions 2011–2017 by Kentucky Providers. Plotted are the percentage changes from 2011 in Schedule III-V doses, prescription, and doses/prescriptions divided by provider type (Physician [black bar], APRN [stripped bar], Dentist [white bar]). Raw values are in original total units. Per Provider values are presented as changes in doses or prescriptions delivered per number of providers in each subgroup. Y-axes are scaled –100% to 100% unless values went beyond that upper bound (see top panels).

Table 1.

Controlled Substance Prescribing by Provider Type in Kentucky 2011–2017

Year	Schedule II Opioids			Schedule II Stimulants			Schedule III-V		
	Physicians	APRN	Dentist	Physicians	APRN	Dentist	Physicians	APRN	Dentist
	Prescriptions (thousand)								
2011	3703.7	149.7	347.9	590.4	25.4	0.30	4512.8	275.0	42.3
2012	3561.7	194.3	321.3	642.7	36.7	0.29	4520.4	346.4	39.3
2013	3158.4	219.9	298.7	676.1	47.6	0.13	4242.7	392.9	38.3
2014	2969.5	259.9	337.4	700.7	58.8	0.15	4024.0	460.2	46.0
2015	2788.5	321.6	302.5	758.8	73.6	0.15	4024.7	596.5	59.0
2016	2711.6	351.6	284.4	793.5	89.3	0.12	4010.2	675.2	56.1
2017	2509.3	330.7	254.7	807.1	110.3	0.09	4435.6	912.1	51.4
	Doses (hundred thousand)								
2011	2648.1	80.1	63.6	246.1	9.8	0.20	2772.5	152.8	9.9
2012	2607.5	117.4	56.7	263.8	14.3	0.24	2666.7	188.8	8.2
2013	2390.8	144.4	51.1	277.8	19.2	0.06	2455.1	219.9	7.5
2014	2239.1	179.5	56.5	289.0	23.8	0.06	2327.1	263.4	8.4
2015	2123.9	233.8	53.2	315.6	30.1	0.07	2283.1	336.7	10.0
2016	2057.6	257.6	49.7	331.3	36.3	0.05	2169.0	367.2	9.0
2017	1903.4	243.5	43.1	336.0	45.2	0.04	2628.4	559.9	7.9