APPRISS® HEALTH

Evaluating the Impact: NarxCare and Gateway Effectiveness

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INTRODUCTION
OPIOID CRISIS AND PDMPS

The current opioid epidemic is exacting a devastating toll on the health and wellbeing of individuals who live in the US. National data show that in 2015 approximately 12.5 million individuals reported misuse of opioid pain relievers in the past year, with approximately 36% obtaining opioid medications for misuse through filling medications from a prescriber.[1] The devastating effects of opioids have brought to light the major public health burden overuse of prescribed controlled substances has had in the US, including medications such as benzodiazepines[2-5] and stimulants.[6-8] Prescription drug monitoring programs (PDMP) are among the most common state-level approaches to patient- and provider level narcotic prescription surveillance, which capture prescribing and dispensing decisions[9-12]. These programs, therefore, may be utilized to monitor patient health and catalyze needed intervention. Often, data from these systems are the sole source of information that prescribers and pharmacists have available prior to writing prescriptions or dispensing controlled substance medications—thus making PDMPs a last line of defense to prevent deleterious adverse events, including addiction and overdose, from occurring among patients.

Appriss Health is currently the largest vendor of PDMP database systems in the US, covering 43 states and serving approximately one million users[9 15]. With each state managing their own PDMP programs, there are many ways that PDMPs have been implemented. The core set of federally controlled substances are included in every PDMP, yet state-specified controlled substances or drugs of concern, prescriber delegate access, data retention, and other PDMP enhancements can vary widely. What research has been done into the effectiveness of PDMPs provides little guidance into best practices for PDMP implementation. Prior research has focused on four main areas of opioid-related outcomes in evaluating PDMP implementation: opioid prescribing; opioid diversion and supply; opioid misuse; and opioid-related morbidity and mortality and have reported mixed results for the general population[16]. However, when it comes to patients with opioid use disorder, research indicates that investing in screening, intervention, and referral to treatment (SBIRT)

can generate healthcare cost savings that ranges from $3.81 to $5.60 for each $1 spent[17]. In a recent publication, Rhodes et al. completed a systematic review of 22 studies (49 PDMPs) on the effectiveness of PDMPs. Their research determined that two out of eight studies that evaluated the association between PDMP status and opioid-related care outcomes, found that treatment admissions for prescription opioids were lower in states with PDMP programs. Moreover, one of the thirteen studies that focused on adverse events related to opioid use found a significant decrease in opioid-related overdose deaths following PDMP implementation. Another study in this category found a significant increase. Other studies examined the association between PDMPs and opioid-related legal and crime outcomes, however, no statistically significant association was found.[18]

Furthermore, multiple studies show that most physicians find PDMP programs helpful in confirming suspicion of drug abuse and prescribed fewer opioids as a result.[19-20] Hernandez-Meier et al. presented issues related to knowledge gaps, time constraints, and a difficult login process as barriers to PDMP use for emergency department physicians surveyed (n=63).[19] Similarly, Lin et al., also identified lack of knowledge regarding the existence of PDMPs among physicians (n=1000), as well as data access difficulties, having a negative impact on their effectiveness.[20]

Therefore, it is important to try to understand what tools would best enable healthcare providers to screen, identify at-risk patients, and ultimately refer to Screening, Brief Intervention and Referral to Treatment (SBIRT). Appriss manages 43 state PDMPs, including the AWARxE PDMP platform, PMP Gateway enhancement, and NarxCare.

AWARxE PDMP: currently, 43 states depend on this platform to deliver information to providers and policy leaders on the use of controlled substances.

PMP Gateway: brings PDMP data to the point of care within the EHR, making it easier to view a PDMP report for every patient.

NarxCare: adds an additional layer of analytics and patient-level statistics on top of a patient's prescription history. PDMP data is visualized in charts and graphs, and patient risk-scores, all of which are intended to help prescribers identify at-risk patients.

◀ ***Multiple studies show that most physicians find PDMP programs helpful in confirming suspicion of drug abuse and prescribed fewer opioids as a result.***

Figure 1 broadly illustrates the process by which having a PDMP is thought to improve public health, and how Appriss' PDMP products are intended to enhance the PDMP experience.

Figure 1 **Process by which PDMPs Improve Public Health**

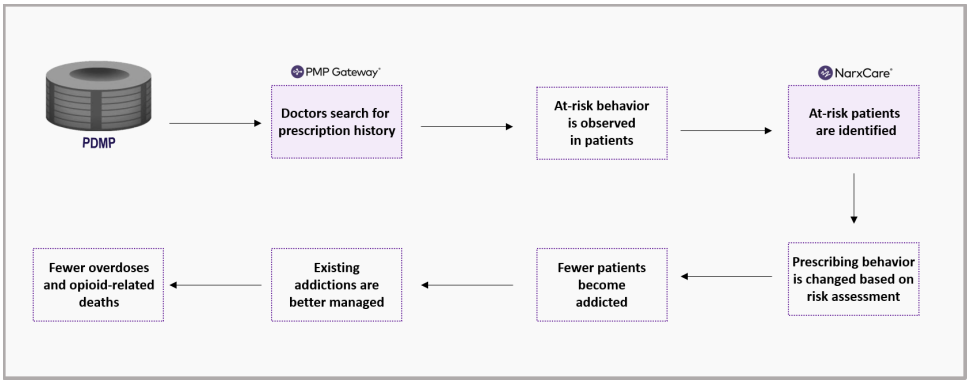

Figure 1: PDMPs are used to research a patient's prescription history, observe their behaviors, determine if any of these behaviors are risky, and then find ways to intervene or modify prescribing behaviors in order to help patients avoid addiction or manage an existing one. Ultimately, this approach should lead to fewer opioid-related deaths and overdoses. PDMP Gateway provides a better and simpler way for physicians to access PDMP data, while NarxCare provides a more descriptive view that helps physicians make accurate assessments

To determine the effectiveness of PDMP integration in a clinical setting using the products described above, Appriss' Health Data Science team has investigated a few key outcomes based on data obtained prior to product implementation and post implementation.

METHODS

The first attempt to quantify the impact of the state PDMP and Gateway/NarxCare enhancements was in Michigan, focusing on changes to prescribing. In Michigan, due to varying dates of implementation, the study was broken into three separate periods: the pre-AWARxE period, from February 6, 2016 – April 3, 2017; the AWARxE period from April 4, 2017—December 3, 2017; and the NarxCare/Gateway period December 4, 2017—May 31, 2018. Due to varying study period lengths, the rate of change in each outcome metric was assessed as a per day average. In Virginia, the study period was limited to January 2015—November 2019, with an implementation date of NarxCare and Gateway in early March 2017.

Changes in prescribing trends were assessed including the per day change in all dispensations, dispensations by drug type (narcotic, sedative, stimulant, other PDMP reportable drug), dispensations by drug schedule, share of all narcotic dispensations by daily MME category (<50, 50-90, 90-120, 120+), and number of buprenorphine MAT dispensations filled. For each period, a slope calculation was performed to determine the average rate of change under each PDMP condition. NarxCare scores were also calculated on a population level to assess any potential changes.

To assess whether changes in controlled-substance dispensations were limited to prescriptions to new patients or whether patients with high-risk prescribing history had improved prescribing characteristics over time, a select cohort of patients called "high-utilizing patients" were defined as being in the top 10th percentile of five prescribing characteristics in the year prior to the study period: the number of narcotic prescriptions filled, the number of distinct prescribers writing narcotic prescriptions, the number of distinct pharmacies filling narcotic prescriptions, the total days-supply of narcotic prescriptions, and the sum total of the MME patients filled compared to the rest of the patient population in the PDMP during that assessment year. Patients had to have been in the top 10th percentile of all five criteria to be included in this cohort. Of the high-utilizing patients who continued to fill prescriptions during the entire study period, the changes in dispensation characteristics (i.e., drug type, schedule, MME category) was assessed.

In Michigan, the quality of opioid prescribing was assessed following the Pharmacy Quality Alliance definitions. Patients identified with the opioid quality measures will be required to have ≥2 prescription opioid fills where the days of supply was ≥15 days.[22] [23] Previous research has demonstrated each of the following three quality measures has strong criterion

validity.[24] [25]

1. **High dosages:** Patients filling daily dosages of >120 morphine milligram equivalents (MME) for ≥ 90 days in the 365 days prior the prescription fill date.

2. **Multiple Pharmacies and Prescribers**: A patient has filled opioid medications in ≥4 pharmacies that were prescribed by≥ 4 prescribers in the 365 days prior the prescription fill date.

3. **Concurrent use of opioid medications and benzodiazepines:** Patients who have ≥2 opioids and ≥2 benzodiazepine fills to have ≥30-day concurrent supply of opioids and benzodiazepines[23] in the 365 days prior the prescription fill date.

RESULTS

For both the Michigan and the Virginia study, there were existing declines in narcotic prescriptions that accelerated after NarxCare/Gateway integration in both states (227% faster MI, 23% faster VA Table 1). PDMP enhancements such as NarxCare and Gateway also coincided with a shift to lower-scheduled and lower daily MME narcotics (Table 2 and 3). The patient demographics within the Michigan PDMP also reflected a shift away from narcotic prescribing, as a smaller share of PDMP patients were filling narcotic prescriptions compared to two comparison states without any PDMP enhancements (participation on the condition that the states remain anonymous) (Figure 1). For patients that were identified as high utilizing, being in the top 10th percentile of five narcotic script characteristics, a shift to lower risk prescribing characteristics was also evident over time. In Michigan, the average number of narcotics dispensed to "abusive" patients per day decreased by 12.7% during the AWARxE period and 19.8% during the NarxCare period. In Virginia, the analysis found that there was a shift from 78% of narcotic prescriptions being for schedule II drugs, to only 72% by the end of the study period.

CONCLUSION

In both states where extensive assessments of controlled-substance prescribing changes were assessed, there were existing declines prior to the implementation of NarxCare and Gateway PDMP enhancements. After those enhancements were enabled, most outcomes that were assessed declined even faster. The Appriss Health Data Science team is now working to standardize these PDMP prescription outcome assessments for availability in all AWARxE supported PDMPs.

While other factors such as legislation and provider education are likely contributing to changes in PDMP prescription outcomes, PDMPs and PDMP enhancements such as patient risk scoring and in-EHR workflow presentation of PDMP information appear to influence the rate at which change occurs. Next steps include linking individual prescriber and pharmacist PDMP search behavior to subsequent changes in prescribing patterns and then linking county and state level surveillance of the opioid epidemic, including diagnosed Substance Use Disorder, overdoses and overdose deaths.

More research is needed to determine the effectiveness of PDMPs. To this end, the Appriss Health Data Science team is now working to standardize PDMP prescription outcome assessments for availability in all AWARxE supported PDMPs.

Table 1 **Change in Avg. Daily Dispensations for All Drugs & Narcotics**

		All PDMP Drugs		Narcotics	
STATE	Study Period	Change per Day Dispensations	% Change	Change per Day Dispensations	% Change
Michigan	Pre-Appriss	-6.6	-	-4.5	-
	AWARxE	-11.9	80% faster decline	-7.9	76% faster decline
	NarxCare	-14.8	124% faster decline	-14.7	227% faster decline
Virginia	Pre-Rollout	-2.87	-	-2.79	-
	Post-Rollout	-3.53	23% faster decline	-3.26	17% faster decline

Figure 2 **Percent of Patients Filling Narcotic Prescriptions Per Day**

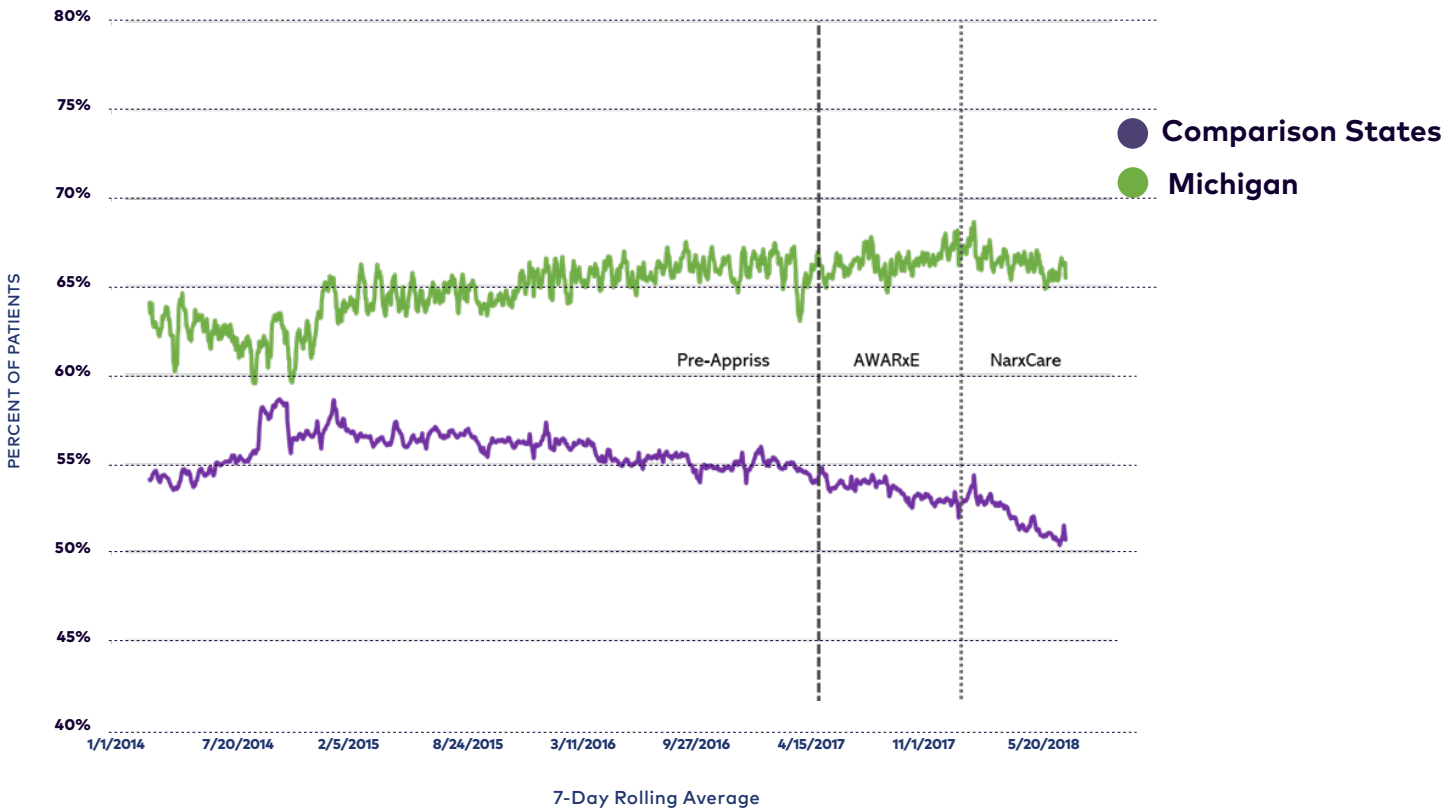

Figure 2: Comparing the Percent of patients filling narcotic prescriptions per day within the PDMP in Michigan to two other states (2014-2018). In comparison to the Pre-Appriss period, the percent of PDMP patients filling narcotics decreased by 2.96% during the AWARxE period and 5.6% during the NarxCare period

Table 2 **Key Outcomes from the Michigan Effectiveness Study**

Metric	Result (Pre-Integration vs. Post-Integration)
Number of PDMP Prescriptions	Average number of daily prescriptions decreased by 3.5% during the AWARxE period and 7.3% during the NarxCare period
Number of Narcotic Scripts	Average number of daily narcotics prescriptions decreased by 5.6% during the AWARxE period and 11.1% during the NarxCare period (~14.7% fewer)
Number of Sedative Scripts	Increased during NarxCare, likely due to Appriss re-classifying pregabalin as a sedative instead of "other"
Proportion of Narcotics filled by "Abusive" Patients	The average number of narcotics dispensed to "abusive" patients per day decreased by 12.7% during the AWARxE period and 19.8% during the NarxCare period
Number of Private Pay Scripts	The average number of private pay prescriptions per day decreased 7.5% during the AWARxE period and 10.0% during the NarxCare period
Multi-Payment Events (Cash and other payment type on the same day)	Decreased by 2.76% during the AWARxE period and 6.19% in the NarxCare period
Average Monthly Percent of Patients using 4+ Prescribers and 4+ Pharmacies	Declined by 70.4%
Patients Filling Narcotic Scripts >30 Days Supply	Declined by 18.7%
Average Percent of Patients Receiving Substance Use Disorder Treatment Medications	Increased by 15.2% during AWARxE and 28.7% during NarxCare
Patients Identified with Probably Opioid Misuse	3.5% of patients during the pre-Appriss period, 2.8% during the AWARxE period, and 2.3% during the NarxCare period
Number of High ORS Patients	39.7% lower during the AWARxE period and 55.2% lower during the NarxCare period
Number of High Narcotics NarxCare score patients	Decreased an average of 35.2% during the AWARxE period and 58.4% during the NarxCare period

Table 2: Key outcomes from the Michigan Effectiveness Study following in the swap to AWARxE PDMP platform and NarxCare/ Gateway Rollout in 2017.

Table 3 **Key Outcomes from the Virginia Effectiveness Study**

Metric	Result (Pre-Integration vs. Post-Integration)
Number of PDMP Prescriptions	In the pre-integration, each day there were 2.87 fewer PDMP prescriptions. Post-integration there were 3.53 fewer prescriptions each day (23% acceleration in the decline)
Number of Narcotic Scripts	Declined 17% faster post integration compared to pre.
Number of Sedative Scripts	Declined 44% faster, stabilizing at around 10,000 scripts per day
Number of Schedule II and IV Scripts	Declined 28% and 31% faster, respectively
Number of Schedule V Scripts	Increased 182% faster (likely due to replacement of lower-scheduled drugs)
Percent of Narcotics filled with Daily MME <= 50	Increased from 75% to 82%
Number of Scripts filled Between 50 and 90 MME	59% faster decline
Average Number of New Patients Filling Buprenorphine MAT	19% faster increase post integration
Number of High ORS Patients	Accelerated decline by 25%
Proportion of Narcotics filled by "Abusive" Patients	Down from 78% to 72% for Schedule II Drugs

Table 3: Key outcomes from the Virginia Effectiveness Study following the statewide Gateway and NarxCare implementation in 2017.

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