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ASSOCIATION OF ELECTRONIC MEDICAL RECORDS AND OPIOID PRESCRIPTION

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Key words:

Controlled substances, electronic medical records

Introduction

Controlled substances have been described as a drug or other substance strictly regulated by the government due to the risk of abuse or addiction. This regulation covers how the substance is manufactured, used, handled, stored, and disseminated. Opioids, stimulants, depressants, hallucinogens, and anabolic steroids have been identified as controlled substances (Aro, Hussain, & Bobrin, 2021). In 2019, overdoses involving opioids killed approximately 50,000 people in the U.S., with synthetic opioids accounting for 73% of those deaths. Synthetic opioids, illicitly made fentanyl, are at the heart of the overdose pandemic. Overdoses involving psychostimulants like methamphetamine are also on the rise, both with and without the use of synthetic opioids (Scholl et al., 2018). Even though controlled substances account for only 11% of all prescriptions written, they were prescribed by 90% of clinicians, making it critical to include them in e-prescribing systems (Thomas et al., 2012). The fact that different people have varying tolerance levels and require different opioid doses to achieve adequate pain relief was a challenging aspect of caring for patients with pain (D'Aunno et al. 2019)

With the implementation of Electronic Medical Record (EMR) systems, computerized order entry systems have increased for medication prescriptions, which is now more common than handwritten prescriptions. EMR can auto-populate a default number of pills prescribed, and one potential method to alter prescriber behavior is to change the default number presented via the EMR system. In addition, electronic prescribing for controlled substances has become more widely used as providers and governments combat the opioid epidemic [Chiu et al., 2018).

A Prescription Drug Monitoring Program (PDMP) is an electronic database that tracks controlled substance prescriptions in a state. PDMPs can provide health authorities timely information about prescribing and patient behaviors that contribute to the epidemic and facilitate an agile and directed response. Electronic Prescribing for Controlled Substances (EPCS) aimed to eliminate paper prescriptions by allowing clinical prescribers to write prescriptions electronically, making them digital and trackable for both the prescriber and the pharmacist and has been an essential part of any health information technology system, as well as a requirement for 'meaningful use' (Blumenthal & Tavenner, 2010). However, one of the single most difficult challenges for any prescriber was distinguishing between the legitimate prescription of controlled substances and the prescription potentially used for illegitimate purposes (Preuss et al., 2021).

To limit the likelihood of drug diversion and abuse, the DEA acknowledged the importance of ensuring that the rules regulating electronic prescriptions did not unintentionally enable diversion and abuse (Abramson et al., 2012). As a result, the DEA's Interim Final Rule on EPCS went into effect in June 2010, allowing for e-prescribing and laying out the rules for its use in the U.S. (DEA, 2010). Providers, pharmacies, prescription system application vendors, and pharmacy system vendors were all subject to the rules (Kannry, 2011).

EPCS aimed to reduce prescription opioid addiction, abuse, diversion, and death (Danovich et al., 2019). Additionally, e-prescribing could improve healthcare quality, safety, and efficiency (Kaushal et al., 2010). EPCS has enhanced patient management and reduced prescription fraud associated with paper prescriptions, which account for a small but significant proportion of opioid medications diverted for abuse (Fischer et al., 2010). EPCS gained popularity because of its ability

to detect and prevent opioid diversion by removing paper prescriptions and allowing cross-referencing PDMP databases (Gawande, 2017). Without sacrificing convenience, EPCS provided accountability and security and is a potent weapon in the fight against the nation's opioid problem (Kausha et al., 2010).

While EPCS regulations could improve patient care and provide practitioners with more data for quality improvement, they might also offer new obstacles to practitioners, facilities, and vendors (Kaldy, 2016).

EPCS mandates were in place in 23 states by September 2021, and by 2022, all controlled drugs covered by Medicare Part D must be dispensed through electronic prescribing (Imprivata., 2021). In addition, many current state and local laws aimed at better tracking controlled-substance prescriptions using e-prescribing technology, in conjunction with prescription drug monitoring programs, have aided adoption (Everson et al., 2020).

This study's research purpose was to analyze and assess the association between electronic prescribing-controlled substances and their impact on opioid prescribing.

Methodology

The working hypothesis was that electronic prescribing of controlled substances using the Electronic Medical Record has led to reductions in opioid prescribing.

The conceptual framework for this research followed the research framework and process utilized the adoption of technology by Yao et al. (2010). The methodology used for this research study was a review of academic literature, involving the following steps:

Step 1: Literature Identification and Collection

The electronic databases of Marshall University nursing allied health, Marshall University Digital Scholar, ProQuest, PubMed research databases, Evidence-Based Medicine, JAMA, and Cochrane were searched for the terms "Electronic Prescription Controlled substances" OR "EPCS" OR "E narcotics prescription" OR "Prescription AND "Pharmacology opioid misused" OR "OPIOIDS" OR "DRUG Abuse" "AND "The United States." Using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis and PRISMA method (Moher et al., & The PRISMA Group 2009), the search identified 28 relevant articles.

Step 2: Formation of Inclusion Principles and Literature Analysis

A total of 28 Articles, written in English and published from 2010-2022, with relevant information about the electronic prescribing of controlled substances that intended to reduce opioid prescribing rates by reducing fraud and experienced more significant reductions in opioid prescribing, were scrutinized and used in the presentation of the project study.

Results

In a study done in the United States between January 2014 and March 2015, the number of pharmacies that were equipped with EPCS increased slightly, from 78% (46,711) to 79% (47,971) across the country (Gabriel et al., 2016). The degree to which a state could help its citizens varied tremendously. In March 2015, for example, state pharmacy enablement ranged from 30% to 92%. The highest rate of EPCS pharmacy facilitation was in Rhode Island (96%), and the lowest was in North Dakota (30%). Between January 2014 and March 2015, national EPCS enablement among prescribers increased by 3.7%, with more enablement in the urban areas than rural areas (Gabriel et al., 2016) (see Table 1).

Author(s)	Study	Outcome
Gabriel et al., 2016	Secondary analysis of electronic transactions of controlled substances from U.S. pharmacies using Surescripts	The highest rate of EPCS pharmacy facilitation was in Rhode Island (96%) and the lowest was in North Dakota (30%). From January 2014-March 2015 the number of pharmacies that were equipped with EPCS increased slightly from 78% (46,711) to 79% (47,791)
Cao, Monteiro, & Wills, 2020	Cross sectional survey of 92 medical directors in ACS-verified and state designated level 1 and level 2 pediatric trauma centers	Physician residents were the most common provider who supplied opioid prescriptions at discharge (79.1%), advanced practice professionals (APP, 77.6%), and attending physicians (71.6%)
Kivekäs, et al., 2016	Web-based survey done in Finland involving 269 general practitioners (GPs)	GPs' job flexibility has been boosted by electronic health records and e-prescribing
Achar, Sinha, & Norcross, 2021	Systematic review of 7 studies published between 1990-2020	Benefits of EPCS with EHR included fewer prescribing errors (from 12% to 0%), a decrease of 53% opioid prescriptions in New York after the EPCS mandate, and savings ranging from \$1.4 million to \$1.1 billion
Meisenberg et al., 2018	Evaluation of morphine milligram equivalents (MME), 44,000 clinical encounters pre and post multifocal education intervention from June 2015-April 2018 in a single setting healthcare facility	Post intervention the monthly MME per encounter was 58% lower than the average of the 6-month baseline, MME per opioid prescription per month was 34% less than the average of the baseline and the opioid prescription rate was 38% lower than the average of the baseline

Chiu et al., 2018	Pre/post study of 1447 pre intervention, 1463 post intervention procedures, with the intervention being the lowering the default opioid prescription from 30 to 12 pills prescribed after procedures	After the default change, the median number of opioid pills prescribed decreased from 30 (interquartile range, 15-30) to 20 (interquartile range, 12-30) per prescription. The percentage of prescriptions written for 30 pills decreased from 39.7% before the default change to 12.9% after the default change and the percentage of prescriptions written for 12 pills increased from 2.1% before the default change to 24.6% (after the default change).
Rasubala et al., 2015	Single site dental urgent care in New York, pre post intervention (1,464 subjects), with the intervention being a mandatory prescription drug monitoring program	For patients who were prescribed pain medications, 452 (30.6%), 190 (14.1%), and 140 (9.6%) received opioid analgesics in the three study periods respectively, signifying a statistically significant reduction in the number of opioid prescriptions after implementation of the mandatory PDMP (p<0.05). Total numbers of prescribed opioid pills in a 3-month period decreased from 5096 to 1120, signifying a 78% reduction in absolute quantity.
Dowell, Haegerich, & Chou, 2016	Meta-analysis performed by CDC on US patients	States implementing mandatory PDMP and pain clinic laws reduced the combined drug overdose death rate by -1.1 per 100,000 residents
Brandeau, Pitt, & Humphreys, 2018	U.S. population aged 12 years and older, using 11 different intervention strategies	National policy, including electronic prescribing and prescription drug monitoring led to a decrease in the illegal opioid prescription supply
García et al., 2019	EHR retrospective prescription data from 31,422 primary care providers serving approximately 17 million patients over 166 weeks using Athenahealth EHR	Overall percentage ranged from 5.2% in large central metropolitan counties to 9.6% in noncore counties. Patients in noncore counties had an 87% higher chance of receiving an opioid prescription than did patients in large central metropolitan areas during the study period.

Chua et al., 2022	Single-center retrospective study of 1107 children with forearm and elbow fractures who presented to the emergency department for evaluation and subsequent orthopedic follow-up between January 15, and September 19, 2017. The default dispensing quantity was decreased on June 1, 2016 from 30 doses to 12 doses.	Rates of opioid prescribing were similar preintervention and postintervention (61% vs 56%, $P = 0.13$). After the change to the default quantity, the median number of doses decreased from 18 to 12 doses, with opioid prescriptions of 30 or more doses dropping from 35% to 11%.
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Table 1. Summary Of Studies by Study Design and Outcomes

Physician residents were the most common kind of provider who supplied opioid prescriptions at discharge (79.1%), followed by advanced practice professionals (APP, 77.6%), and finally attending physicians (71.6%) (Cao et al., 2020). However, according to a web-based survey done in Finland involving 269 general practitioners (GPs), G.P.s' job flexibility has been boosted by electronic health records and e-prescribing (Kivekäs et al., 2016).

Electronic prescription of controlled substances and fraud

EPCS improved patient safety by reducing the risk of fraud and diversion observed with paper opioid prescriptions. With up to 9% of opioid paper prescriptions suspected of being forged or fraudulent, the widespread use of EPCS has influenced opioid prescribing (Achar, Sinha, & Norcross, 2021). According to the DEA, EPCS reduced the following types of prescription diversion: stealing prescription pads or printing them and writing non-legitimate paper prescriptions; altering a legitimate prescription to obtain a higher dose or more dosage units (e.g., changing a "10" to a "40"); phoning-in non-legitimate remedies late in the day when it is difficult for a pharmacy to complete a confirmation call to the practitioner's office; and altering a prescription record at the pharmacy to hide diversion from pharmacy stock (Achar et al., 2021).

Electronic prescribing of controlled substances and the opioid crisis

In a case study done at Anne Arundel Medical Center from April 2016 to April 2018, about 44,000 clinical contacts were documented. From a beginning level of 34.4 morphine milligram equivalents (MME) per month, the total health system MME per encounter decreased by 1.0 MME per month. The monthly MME per interaction was 58% lower after the post-intervention observation than the 6-month baseline average. From a baseline level of 428 MME per month, morphine milligram equivalents per opioid prescription declined by 8 MME per month. The MME per prescription each month was 34% lower after the 16-month post-intervention period than at the start (Meisenberg, Grover, Campbell, & Korpon, 2018). From a starting point of 11.5%, the

percentage of clinical contacts resulting in an opioid prescription was lowered by 0.2% each month. As a result, the opioid prescription rate was 38% lower at the end of the 16-month post-intervention period than at the start (Meisenberg et al., 2018).

A case study done at Yale-New Haven Health System from February 2017 to August 2017 revealed that the median number of opioid pills prescribed per surgery reduced from about 30 pills before the prescription default modification to about 20 pills following the change in the prescription default (Chiu et al., 2018). Prescriptions issued for 30 pills reduced from 39.7% (554 of 1397) before the EPCS to 12.9% (183 of 1420) after the EPCS, while prescriptions written for 12 pills rose from 2.1% (29 of 1397) before EPCS to 24.6% (349 of 1420) after EPCS. The number of prescriptions written for 20 tablets increased significantly from 12.2% (171 of 1397) before EPCS to 19.6% (278 of 1420) after EPCS. After acquiring EPCS, the total opioid prescription was reduced by 34.41 MME (Chiu et al., 2018).

In a study done at a dental facility in New York from over three months before the required Prescription Drug Monitoring Programs (PDMP), and from December 1, 2013, and February 28, 2014, after PDMP implementation, the most prescribed opioid analgesics were hydrocodone, codeine, and oxycodone (Rasubala et al., 2015). Ibuprofen and acetaminophen were the most prescribed non-opioid analgesics. Following the mandated PDMP's introduction, there was a general trend toward fewer opioid prescriptions and more non-opioid analgesic prescriptions by the end of the trial, the total number of opioid analgesics prescribed over three months dropped from 5096 to 1120 pills, a 78% decrease in absolute numbers (Rasubala et al., 2015).

States implementing mandatory PDMP and pain clinic laws reduced the combined drug overdose death rate by -1.1 per 100,000 residents (Dowell et al., 2016). In addition, combining mandatory provider reviews of state-run prescription drug monitoring program data with pain clinic regulations reduced opioid prescription volumes by 8% and prescription opioid overdose death rates by 12% (Brandeau et al., 2018).

Concerns that lowering opioid prescribing rates may lead to more patients experiencing unmanaged pain. Chua et al. (2022) found this is not a valid concern. These researchers evaluated opioid prescriptions for 1107 patients in a single site emergency department and discovered that a reduction in opioid prescriptions of 30 or more doses from 35% to 11% led to no significant change in reported pain management for the patients (Chua et al., 2022).

Interestingly and most concerning to Appalachia, researchers have found that opioid prescribing by primary care providers have been much higher in rural than in urban counties due to that population abusing opioids at a younger age, and /or because rural areas tend to have a large elderly population who have been coping with chronic pain (García et al. (2019).

Cost of implementation of electronic prescribing for controlled substances.

The cost of implementing an advanced system with alarms, reminders, and system integration was \$29,000 per physician the first year and \$4,000 per physician each year after that (Hahn & Lovett, 2014).

Discussion

EPCS has been an essential tool in healthcare facilities. It facilitated the monitoring of prescribed controlled substances, curbing prescription errors and abuses that might occur. In addition, EPCS provides a complete record of controlled substance prescription; both physicians and patients can be monitored through it. These are particularly important for public health and law enforcement initiatives like the DEA addressing misuse and diversion of opioid medications.

The clinical response to the opioid crisis demands an obligation from health systems and their physician leaders. They employ or contract with many clinicians both in hospitals and in the community, propose and carry out quality improvement, have a mission to improve and protect the public's health, and existing channels of communication to educate and inform the public and patients about opioid risks and alternatives.

The CDC issued the CDC Guideline for Prescribing Opioids for Chronic Pain in 2018 to supply recommendations for prescribing opioid pain drugs for patients 18 and older in primary care settings, and on February 10, 2022, it released a draft revision to its 2018 opioid prescribing guideline. If observed by pharmacy chains, health insurance companies, and policymakers, this new guideline supplies a way to withdraw unplanned prescribing thresholds, correct balance, and sustain complete, compassionate treatment.

Physicians have been prescribing fewer opioid painkillers as the medical system deals with the current opioid epidemic. The emphasis has been on primary care doctors treating chronic or acute pain, but every patient who receives anesthesia receives fentanyl, an IV opioid more potent than heroin. As a result, coming up with alternatives is problematic. Nothing treats pain like opioids, but it is possible to use a mixture of pre-and post-surgery methods, like nerve blocks, drugs equivalent to Novocain, and even Tylenol to get the desired effect. However, those alternatives have been slow to catch on.

Practical Implication

Opioid-related instruction has been being acknowledged as an essential topic, but its adoption in many medical schools has been limited by a lack of time available in medical education and promising strategies for assessing students' learning

The practical suggestion resulting from this literature and case study must be evaluated in the future analysis, including consideration of outcome for the control of opioids epidemic nationwide after implementing Electronic Prescription Controlled substances effect achieving scale. Adopting EPCS widely might improve overall safety efficacy, quality, and control of the opioid crisis. Further research using a meta-analysis design is advised to measure the effect size of EPCS.

These implications are enormous with the current opioid crisis in Appalachia, particularly in West Virginia, Kentucky, and southern Ohio. Reducing the availability of opioid prescriptions and tracking prescriptions may enable clinicians, social services, law enforcement, and substance abuse treatment professionals to work together to decrease opioid abuse and addiction.

Conclusion

This review has shown that the utilization of the EMR and electronic prescribing has had the potential to detect and prevent opioid diversion by eliminating paper prescriptions and improving healthcare quality, safety, and efficiency while also lowering drug costs. Therefore, providers who have been prescribing controlled medications should use electronic prescribing that reduces or prevent adverse effects from avoiding misuse.

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