



Full length article

Impact of New York prescription drug monitoring program, I-STOP, on statewide overdose morbidity



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ABSTRACT

Background: Prescription Drug Monitoring programs (PDMPs) are intended to reduce opioid prescribing and aberrant drug-related behavior thereby reducing morbidity and mortality due to prescription opioid overdose. Expansion of the New York (NY) State's PDMP in 2013 included the institution of the I-STOP law that mandated clinicians to consult the statewide PDMP database to review the patient's prescription history prior to prescribing opioids.

Methods: Trends in prescription opioid distribution, prescribing, and prescription opioid and heroin overdose morbidity in NY were analyzed using time series. A Chow test was used to test the difference in trends before and after the implementation of I-STOP.

Results: The results indicated that: 1) the number of opioid prescriptions appears to be declining following the implementation of the I-STOP, 2) however, supply chain data shows that the total quantity of opioids in the supply chain increased, 3) statewide trends in inpatient and emergency department visits for prescription opioid overdose increased from 2010 to the third quarter of 2013 where the slope leveled off following I-STOP, but this change in slope was not significant, 4) visits for heroin overdose started escalating in 2010 and continued to increase through the second quarter of 2016. The overall significance of these findings show a small impact of PDMPs on prescription opioid overdose morbidity in NY in the context of the increasing national trend during this time period.

Conclusions: Prescription opioid morbidity leveled off following the implementation of a mandated PDMP although morbidity attributable to heroin overdose continued to rise.

1. Introduction

Unintentional drug poisoning is now the leading cause of injury death for all age groups in the United States (Centers For Disease Control and Prevention, 2009; Rosenblatt et al., 2015; Unick et al., 2013). According to recent analyses of CDC mortality data, drug and alcohol poisoning are the primary drivers of the increased trend in mid-life mortality in the US (Case and Deaton, 2015). The trend in New York (NY) mirrored the national pattern of increasing drug and alcohol poisoning deaths; a 30 percent increase in opioid analgesic-related deaths was registered in NY between 2009 and 2014 (New York State Department of Health, 2015).

Heroin overdose mortality is also increasing. According to the

National Survey on Drug Use and Health (2011, 2013), from 2002 to 2013, the rate of heroin-related overdose deaths nearly tripled (Centers For Disease Control and Prevention, 2015). In NY, heroin was implicated in 55 percent of drug-related deaths in 2015 compared to 16 percent in 2009 (New York State Department of Health, 2016). It has been postulated that measures to reduce the supply of prescription opioids may have the unintended consequence of increasing heroin use (Unick et al., 2015). However, studies thus far have been unable to demonstrate an effect of Prescription Drug Monitoring Programs (PDMP) on heroin overdose deaths (Dowell et al., 2016).

Compared to opioid mortality, opioid morbidity may be a more sensitive way to measure the impact of opioid use on public health. First, studies have found inaccuracies such as failing to record specific

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substances on death certificates which results in an inaccurate account of the number of deaths related to opioid overdose (Slavova et al., 2015; Warner et al., 2013). In addition, whether an individual dies from an overdose is highly dependent on the ability for that person to receive life-saving interventions, such as naloxone. Consequently, overdose-related morbidity provides a more accurate measure of the prevalence of opioid abuse in a community (Rutkow et al., 2015). Furthermore, as efforts to increase distribution of naloxone increase, it is possible that a decrease in opioid mortality may be more reflective of increased naloxone availability as opposed to a decrease in prescription opioid supply or rates of opioid overdose. Therefore, we think morbidity is a unique indicator of opioid use which is potentially a more sensitive and valid indicator of the impact of the opioid epidemic on public health.

The present study examines the effectiveness of a PDMP in New York State to decrease the volume of opioid prescriptions as well as examine trends in prescription opioid and heroin overdose following initiation of this program. The following section outlines the details of prescription monitoring programs and our study questions.

1.1. Prescription drug monitoring programs

Prescription Drug Monitoring programs (PDMPs) are intended to detect high-risk prescribing and patient drug seeking behavior in order to reduce prescription drug supply and diversion (Patrick et al., 2016; Patrick et al., 2016; Rutkow et al., 2015). PDMPs are designed as point-of-care-based information-monitoring tools for clinicians and pharmacists to review prescribing histories for controlled medications (Centers For Disease Control and Prevention, 2016b). By providing clinicians and pharmacists with information about patient's prescription histories, PDMPs reduce the likelihood of individuals receiving multiple prescriptions for controlled substances from multiple clinicians.

To address opioid prescribing in NY, the Internet System for Tracking Over-Prescribing (I-STOP) was implemented on August 27, 2013. Unique to PDMP implementation in NY, I-STOP was the first state to mandate that clinicians consult the PDMP database to review the patient's prescription history prior to prescribing (Seller, 2012). It serves as an expansion of the state's PDMP, and is intended to decrease the volume of prescriptions written for controlled opioids and thereby reduce opioid-related harm (Olsen, 2016). There are significant exemptions to the I-STOP mandate including: institutional dispensers, emergency department prescriptions for less than five day supply, hospice programs, methadone programs, as well as the VA Hospital system, active military and Indian health services. Since hydrocodone was one of the most abused medications, the NY Public Health Law shifted it from a Schedule III to Schedule II controlled substance effective February 23, 2013 (Fischer et al., 2013; Sgarlato, 2015). This change to Schedule II led to a 17.7 percent decrease in hydrocodone prescriptions one year after I-STOP was implemented (Soslow and Woolf, 1992; US Department of Justice, 2014). Additionally, tramadol, a 'drug of concern' that was previously unscheduled, was changed to a Schedule IV substance. I-STOP also established a safe disposal program providing a place for New Yorkers to get rid of expired and unneeded drugs to ensure that they are not diverted or misused. Subsequent refinements of the I-STOP legislation included mandatory e-prescribing as of March 27, 2016 and joining the Interconnect Hub shared database in December 14, 2015 that includes 30 states.

The purpose of the present study is to examine whether: 1) the supply and/or prescribing of opioids decreased; 2) opioid overdose/morbidity decreased; and 3) heroin overdose morbidity changed following the implementation of I-STOP.

2. Methods

2.1. Data and measures

The Drug Enforcement Agency's (DEA) Office of Diversion Control requires manufacturers and distributors to report to its Automated Reports and Consolidated Orders System (ARCOS) on a quarterly basis. The number of grams of each monitored substance distributed to pharmacies, practitioners, hospitals, teaching institutions, and narcotics treatment programs in each state must be reported to ARCOS (Drug Enforcement Administration, 2017). We chose to focus on the distribution of six prescription opioids (fentanyl base, hydrocodone, hydromorphone, oxycodone, codeine and morphine) because these are among the most prescribed and most commonly abused opioids (Unick et al., 2013). The NY ARCOS data from 2010 to 2015 were converted from grams into morphine milligram equivalents (MME). Each substance was converted into MME separately, then the MME for the five prescription opioids were combined by year, and trends were analyzed for this time period. The MMEs were calculated into milligrams using the following conversion factors: fentanyl ($1,000,000 \times 2.4$), oxycodone (1000×1.5), hydrocodone (1000), morphine (1000), hydromorphone (1000×4), and codeine ($1000 \times .15$) (Centers For Disease Control and Prevention, 2016a). MMEs allows us to examine the distribution of the most commonly abused opioids using a comparable metric of morphine to indicate the potency of opioids examined over the study period.

NYSDOH Bureau of Narcotics Enforcement (BNE) data were obtained from the NY Department of Health. These data provide the total number of opioid prescriptions filled from 2010 to 2015. Pharmacies report the number of opioid prescriptions filled to the BNE. These data are only available at yearly intervals.

The Statewide Planning and Research Cooperative System (SPARCS) collects individual level data on patient characteristics, diagnoses and treatments, services, and charges for inpatient and outpatient health care facilities in NY (New York State, 2017). All licensed hospitals, hospital extension clinics and diagnostic and treatment centers in NY are required to submit inpatient and outpatient data to SPARCS. Outpatient data includes ambulatory surgery, emergency department, and outpatient services. We identified opioid use disorders or heroin use disorders from SPARCS inpatient and emergency department data using ICD-9 codes for the combined number of emergency department and inpatient admissions for: 1) prescription opioid overdose (ICD9 codes 965.00, 965.02, 965.09, E850.1, E850; ICD10 codes T400 × 1A, T400 × 2A, T400 × 3A, T400 × 4A, T403 × 1A, T403 × 2A, T403 × 3A, T403 × 4A, T402 × 1A, T402 × 2A, T402 × 3A, T402 × 4A), 2) heroin overdose (ICD9 code 965.01, E850.00; ICD10 codes T401 × 1A, T401 × 2A, T401 × 3A, T401 × 4A), 3) combined prescription opioid and heroin overdose, and 4) the percent of overdoses that were due to heroin. These inpatient and ED data were aggregated quarterly from the first quarter of 2010 to the 2nd quarter of 2016. With regard to substance abuse treatment, SPARCS only captures cases from substance rehabilitation centers that are co-located with a hospital.

2.2. Data analysis

Data trends were examined starting in 2010 in order to coincide with the national trend in the plateauing of opioid prescribing and to establish a baseline in NY prior to the initiation of ISTOP in 2013. I-STOP was implemented in the third quarter of 2013 so the third quarter was selected to form the structural break in the time series analyses. The significance of the structural break was tested using the Chow Test, which uses a sum of squares to identify to identify changes in a time series from before versus after the pre-designated time point (New York City Bar, 2013). In addition to the application of the Chow Test, the time series data were fitted with an autoregressive time series model

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