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Characteristics of self-inflicted drug overdose deaths in North Carolina

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ABSTRACT

Background: Drug overdose mortality is a major public health concern in the United States, with prescription opioids contributing substantially to recent increases in drug overdose deaths. Compared to unintentional drug overdose deaths, relatively little data describes intentional self-inflicted drug overdose deaths (i.e., suicide by drug overdose). The aim of this study was to examine the characteristics of self-inflicted drug overdose deaths, overall and in comparison to unintentional drug overdose deaths.
Methods: We linked vital statistics, prescription drug monitoring program, and toxicology data for self-inflicted and unintentional drug overdose deaths among North Carolina residents in 2012.
Results: Most self-inflicted (79.2%) and unintentional (75.6%) drug overdose decedents had a prescription for a controlled substance within one year of death. Toxicology results revealed that antidepressants contributed to a significantly higher percent of self-inflicted compared to unintentional drug overdose deaths (45.0% vs. 8.1%). Among deaths in which commonly prescribed opioids (oxycodone, hydrocodone) or benzodiazepines (alprazolam, clonazepam) contributed to death, a significantly higher percent of self-inflicted drug overdose decedents had a prescription for the substance within 30 days of death compared to unintentional drug overdose decedents.
Conclusions: The results highlight the use of prescription opioids, benzodiazepines, and antidepressants among self-inflicted drug overdose decedents. Importantly, the results indicate that self-inflicted drug overdose decedents were more likely than unintentional drug overdose decedents to have potential contact with the health care system in the weeks preceding death, offering an opportunity for professionals to identify and intervene on risk factors or signs of distress and potential for self-harm.

1. Introduction

1.1. Drug overdose mortality

Drug overdose mortality is a major public health concern in the United States. From 2000 to 2014, the age-adjusted rate of drug overdose death increased from 6.2 to 14.7 deaths per 100,0000 population (Rudd et al., 2016). Importantly, prescription opioids have contributed substantially to the dramatic increase in drug overdose deaths observed over the past two decades (Rudd et al., 2016). From 1999 to 2012, the rate of prescription opioid-related mortality more than tripled, and in 2012 39% of drug overdose deaths involved a prescription opioid (Warner et al., 2014).

The majority of drug overdose deaths in the United States are unintentional, with 82% classified as unintentional in 2014 (CDC WISQARS, 2017). As a result, public health surveillance and prevention efforts have largely focused on understanding the characteristics of unintentional drug overdose deaths and the role of prescription opioids and other controlled substances in these deaths. However, 12% of drug overdose deaths in 2014 were intentionally self-inflicted (i.e., suicide by drug overdose), with this proportion remaining relatively stable from 2005 to 2014 (CDC WISQARS, 2017). Moreover, from 1999–2014, the rate of opioid-related suicide deaths doubled (Braden et al., 2017). As such, self-inflicted drug overdose deaths represent an important aspect of the opioid overdose epidemic warranting further investigation.

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1.2. Self-inflicted drug overdose deaths

Compared to unintentional drug overdose deaths, there is relatively little data that describes the characteristics of those who died as a result of a self-inflicted drug overdose (Madadi and Persaud, 2014; Braden et al., 2017). Among the existing research, there is evidence that opioids are a contributing factor in a notable number of suicide deaths, including deaths due to self-inflicted drug overdose (Karch et al., 2012; Shields et al., 2006). Toxicology data from the 2009 National Violent Death Reporting System (NVDRS) found that opioids, including both prescription and illicit (i.e., heroin) opioids, were present in the toxicology results of 21% of suicide decedents tested for those substances (Karch et al., 2012). Similarly, toxicology data from the Kentucky Medical Examiner showed that 35% of male and 39% of female self-inflicted drug overdose decedents had opioids detected in their blood (Shields et al., 2006). In addition, National Vital Statistics data revealed that the percent of suicide deaths with opioids found to be a contributing cause increased from 2.2% in 1999 to 4.3% in 2014 (Braden et al., 2017). A limitation of these studies is that they did not differentiate between prescription and illicit opioids in describing toxicology results, which may have differing implications in terms of prevention strategies.

A recent study of Veterans Health Affairs patients examined the association of self-inflicted drug overdose death and prescribed opioid dose among patients with chronic pain (Ilgen et al., 2016). The results revealed that the risk of self-inflicted drug overdose death increased as prescribed opioid dose increased (e.g., HR = 1.59, 95% CI 1.12, 2.27 for 20 to < 50 mg/day compared to 1 to < 20 mg/day; Ilgen et al., 2016). A similar study examined the association between benzodiazepine prescription history and drug overdose death, including both self-inflicted and unintentional drug overdose deaths, among veteran patients who were prescribed opioids (Park et al., 2015). Approximately half (49%) of the drug overdose deaths occurred when patients were concurrently receiving prescriptions for opioids and benzodiazepines, and the risk of drug overdose death was higher for those with former (HR = 2.33, 95% CI 2.05, 2.64) or current (HR = 3.86, 95% CI 3.49, 4.26) benzodiazepine prescriptions compared to those with no history of benzodiazepine prescriptions (Park et al., 2015). Because neither study analyzed the toxicology results of decedents, it is unclear as to whether prescription opioids or benzodiazepines contributed directly to the overdose deaths. In addition, both studies were among veterans prescribed opioids, limiting the generalizability of results. Even so, the results underscore the importance of examining prescription medication history, particularly for opioids and other controlled substances, among drug overdose decedents, including those who died as a result of a self-inflicted drug overdose.

1.3. Aims

The purpose of the present study was to link vital statistics, prescription drug monitoring program, and toxicology data in North Carolina to provide a more comprehensive understanding of self-inflicted drug overdose deaths. In North Carolina from 2000 to 2012, the rate of self-inflicted drug overdose deaths increased from 1.6 to 2.1 deaths per 100,000 population, and the rate of unintentional drug overdose deaths increased from 3.9 to 10.4 deaths per 100,000 population. During this timeframe, the number of drug overdose deaths to which prescription opioids contributed increased by 178% (data not shown). Thus, we aimed to 1) describe the demographics, controlled substance prescription history, and toxicology results of self-inflicted drug overdose decedents and 2) compare self-inflicted overdose decedents to unintentional drug overdose decedents in order to understand whether manner-specific prevention strategies are warranted.

2. Methods

We conducted a population-based study of self-inflicted and unintentional drug overdose deaths among North Carolina residents in 2012.

2.1. Data sources

2.1.1. Death certificate

We used North Carolina death certificate data to identify self-inflicted and unintentional drug overdose decedents. We included North Carolina residents who died in 2012 and had an underlying cause of death code indicating self-inflicted (International Classification of Diseases, Tenth Revision [ICD-10] codes X60-X64) or unintentional (ICD-10 codes X40-X44) drug overdose death. All deaths that occur in North Carolina are certified by trained medical examiners or attending physicians. Deaths due to injury or violence, including drug overdose deaths, are investigated by pathologists at the North Carolina Office of the Chief Medical Examiner (OCME) to determine the underlying cause (s) and manner of death. Investigations include a full external and internal (i.e., autopsy) examination of the decedent and may include a death scene investigation.

2.1.2. Prescription drug monitoring program

We obtained data regarding decedents' history of dispensed prescriptions for controlled substances (DEA, 2017), including prescription opioids and benzodiazepines, from the North Carolina Controlled Substance Reporting System (NC CSRS), North Carolina's prescription drug monitoring program (PDMP). The NC CSRS is a statewide database managed by the North Carolina Division of Mental Health, Developmental Disabilities, and Substance Abuse Services (DMH/DD/SAS). The NC CSRS collects data regarding prescriptions for Schedule II–V controlled substances dispensed at North Carolina pharmacies. Data fields captured include patient demographics, drug name, date of dispensing, quantity dispensed, and prescriber and pharmacy Drug Enforcement Agency (DEA) registration numbers. Due to federal regulations and state laws, data is not collected from pharmacies in Veterans Administration and Department of Defense facilities, Indian Health Service clinics, physician in-clinic dispensing, veterinary clinics, and outpatient opioid dependence treatment programs. For each decedent, we included prescriptions for controlled substances dispensed within 365 days prior to death.

2.1.3. Toxicology

We obtained toxicology reports for deaths occurring in North Carolina in 2012 from the North Carolina OCME. Standard postmortem serum toxicology analyses are conducted as part of the autopsy for suspected drug overdose deaths (NC OCME, 2017). The role of each substance in the death is determined by the OCME toxicologist according to an established classification system: primary (i.e., the drug was at a concentration sufficient to have caused the death alone, regardless of other substances detected); additive (i.e., the drug was not at a concentration sufficient to have caused the death alone, but was capable of causing the death in combination with other substances detected); or behavioral (i.e., the drug was present in the body at the time of death, but did not contribute directly to the death). For this study, we included only substances classified as having contributed in a primary or additive manner to the death.

2.2. Data linkage

Each self-inflicted and unintentional drug overdose decedent identified through the death certificate data was queried in the NC CSRS to capture prescriptions for controlled substances dispensed to the