

Identification and Description of Non-Fatal Opioid Overdoses using Rhode Island EMS Data, 2016–2018

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INTRODUCTION

The Centers for Disease Control and Prevention (CDC) has identified drug overdoses as an epidemic that has been increasing steadily for more than a decade.¹ In 2017, Rhode Island had the tenth highest rate of drug overdose deaths in the country.² To help combat the epidemic, the Rhode Island Department of Health uses multiple sources of data to identify, track, and respond to changes in drug overdose trends, including the Rhode Island Emergency Medical Services (EMS) Information System (RI-EMSIS), which provides real-time surveillance of prehospital assessment and care for opioid overdoses.

Per Rhode Island EMS protocol, naloxone, a medication that can rapidly reverse an opioid overdose, can be administered to a patient with altered mental status if drug use is suspected or unknown.³ Because naloxone, commercially known as Narcan®, is commonly and appropriately used to rule out the occurrence of a drug overdose in patients with altered mental status, severe respiratory depression or apnea, administration of naloxone alone is not always an accurate indicator of overdose. In addition, differences in the data fields used to identify use of naloxone can result in different counts. To accurately and systematically identify opioid overdose-related EMS runs, the Rhode Island Department of Health (RIDOH) developed a case definition⁴ based on primary/secondary impression, naloxone selected in a medication given dropdown field, response to medication as indicated in a dropdown field, and key word search of the report narrative. Dropdown fields provide categorized data that are easy to summarize, while reliance on key word search of the narrative requires a significant amount of testing to ensure accuracy. In 2018, the RIDOH case definition for opioid overdose identified 1,470 overdoses (719 had both mention of naloxone in the narrative and selected in the medication given dropdown field, 62 had naloxone selected in the dropdown but not in the narrative, and 679 had mention of naloxone in the narrative but not in the dropdown). There were an additional 1,060 EMS runs in 2018 that had mention of naloxone in the narrative or in the dropdown field that did not meet the case definition. Based on record reviews, using naloxone administration, without consideration of other factors, may result in either an overcount or incorrect identification of overdoses. Accurate identification of overdoses is important to ensure appropriate informing of public health practice.

METHODS

Rhode Island EMS data for this analysis are from RI-EMSIS. National EMS Information System (NEMSIS) version 3.4 compliant data from January 2016 to November 2018 are current as of 12/5/18 and December 2018 data are current as of 1/23/19. NEMSIS version 2.2.1 compliant data for 2016 are current as of 10/22/18, 2017 data are current as of 2/1/19, and January-October 2018 data are current as of 1/24/19; data after October 2018 are not included. However, all data are preliminary and subject to change. For consistency with CDC reporting requirements, an EMS run is excluded if it is an interfacility transfer, the patient is determined to be biologically dead upon arrival, or the patient is under 11 years of age. To determine the number of repeat overdoses, records were matched using first letter of patient's first name, first five letters of the patient's last name, date of birth, and gender. Records were excluded if the name was unknown or an obvious false name (e.g. Jane Doe) or date of birth was missing; this accounted for approximately two percent of opioid overdose records. When location of incident was missing or indicated as "other location" (121 in 2016, 56 in 2017, 21 in 2018), narrative reports and incident addresses were reviewed to determine location where possible. All analyses were conducted using SAS 9.4. Opioid overdose-related EMS runs are herein referred to as opioid overdoses or overdoses.

RESULTS

Opioid overdose trends

There was a decline in non-fatal and fatal opioid overdoses between 2016 and 2018. The number of opioid overdose-related EMS runs in Rhode Island decreased by 12.7% between 2016 and 2018, and the rate of opioid overdoses per 100 EMS emergency responses decreased steadily from 1.3 in 2016 (1,684 of 130,125) to 1.2 in 2017 (1,374 of 115,371) and 1.1 in 2018 (1,470 of 133,545), in persons aged 11 and over when the patient was not determined to be biologically dead at the scene. This follows a similar trend compared to opioid overdose-related Emergency Department (ED) visits; however, the lower number of EMS reports in 2017 and early 2018 are due to missing data related to a system transition from NEMSIS version 2.2.1 to version 3.4, which should be rectified in 2019. Differences between EMS and ED data may be related to a variety of factors such as data quality

and completeness, differences in overdose case definitions, variations in population (a patient may arrive at the ED via means other than EMS), and transport refusal. However, the number of opioid overdoses where the patient refused treatment and/or transport represents a small proportion of overdoses with 0.5% (9) in 2016, 1.0% (14) in 2017 and 1.1% (16) in 2018. The number of fatal opioid-involved overdoses, defined by the Office of the State Medical Examiners as having an opioid listed as a contributing cause of death, decreased by 10%, from 211 opioid-involved overdose deaths in January-September 2016 to 190 in January-September 2018. (Figure 1). The proportion of fatal overdoses of all opioid-involved ED visits decreased slightly from 17.9% in 2016 (February-December) to 16.9% in 2017 and 16.7% in 2018 (January-October).

Demographics

In 2018, when looking at six categories of age groupings, persons ages 25 to 34 had the largest percentage of opioid overdoses, 33.7% (496). (Figure 2). Males experienced a higher proportion, 67.5% (992), than females. This pattern was seen across all age groups. Race and ethnicity are not reported due to a high number of missing values, 79.8% in 2018.

Naloxone administration route and dose

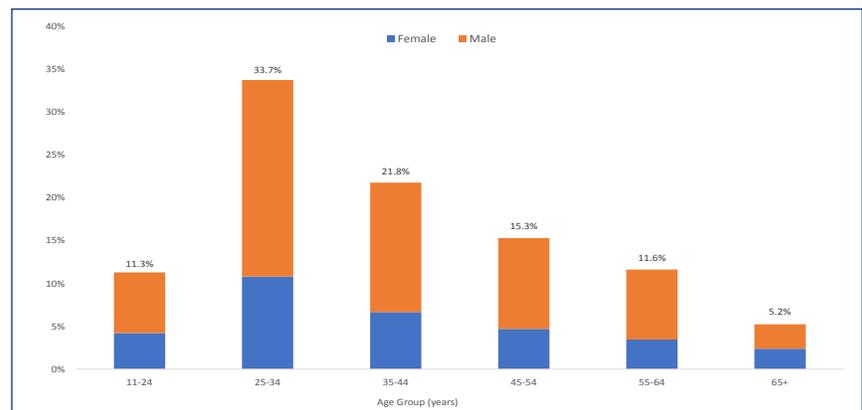
Rhode Island EMS protocol for administration of naloxone by advanced life support practitioners is to give 0.4 mg to 2 mg via intranasal, intravenous, or intramuscular routes every 3-5 min until adequate ventilation is restored or a total of 10 mg is administered.⁴ Of 1,470 overdoses in 2018, 791 records (53.8%) have valid information on medication given. Because multiple doses of naloxone may be given per overdose, 1,006 administrations of naloxone were documented. The largest percentage of naloxone administrations were intranasal, 46.5% (468), while 44.3% (446) were intravenous, 7.3% (73) intramuscular, and 1.9% (19) had an undocumented route of administration. The average total mg of naloxone given per opioid overdose was 2.7 in 2018 (of 789 records with valid information on dose), which increased slightly from 2.4 in 2016 (of 1,228 records with valid information on dose). Of 791 opioid overdoses with valid data on medication given, 26.4% had multiple naloxone administrations (MNAs). Monitoring MNAs has been proposed as a real-time indicator of opioid potency.⁵

Figure 1. Number of non-fatal and fatal opioid overdoses in Rhode Island, by year, month, and data source, 2016–2018



Source: RI Center for the Office of the State Medical Examiners; Emergency Department 48 hour Reporting System; RI-EMSIS

Figure 2. Percent of opioid overdoses by age group and gender, 2018, Rhode Island



Source: RI-EMSIS

Note: Opioid overdoses with unknown age (1.0%) are not shown in the figure above.

Overdose reversal

Opioid overdoses are reversed when naloxone is administered and the patient's level of consciousness or respiratory function improves. Current challenges with data completeness make it difficult to accurately monitor the number of reversals. Of 1,470 opioid overdoses in 2018, valid data on medication given and medication response are available for 46.0% (673) of records. Of these 673 opioid overdoses, 89.9% (605) indicated that the patient improved and 10.1% (68) had no change or their condition worsened.

Location

Among opioid overdoses that occurred in Rhode Island in 2018, 61.2% (900) occurred in a private setting such as personal residence. However, between 2016 and 2018, there was a 15.5% increase in publicly occurring overdoses from 29.6% (499) to 34.2% (503), which includes a variety of settings, such as streets, parking lots, parks, restaurants, stores,

beaches, fire stations, etc. (Figure 3). Based on preliminary data, the percent of opioid overdoses that occurred in a public setting continued to increase to 37.0% in January 2019. In 2018, 19.0% (279) of all opioid overdoses occurred on a street, roadway, parking lot, service area, gas station, or in a vehicle. Street or roadway accounts for 13.9% (205). Please note that records with an incident type of street or roadway do not further specify if the patient was in a vehicle.

Repeat Overdose

In calendar year 2018, after excluding records that did not have valid names and dates of birth, there were 1,437 opioid overdose incidents that occurred among 1,288 patients. The percent of patients who experienced repeat overdoses within the calendar year was 9.9%. Of these patients, 7.2% (93) experienced two opioid overdoses within the calendar year, and 1.7% (22) experienced three or more. Patients who experienced repeat overdoses accounted for 18.4% (264) of the 1,437 overdoses with valid name and date of birth in 2018.

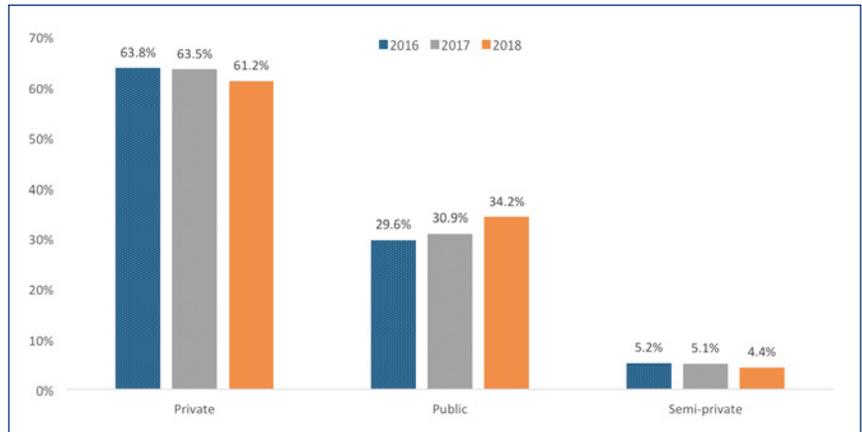
The number of repeat overdoses was assessed among a cohort of 1,288 patients who experienced an opioid overdose in 2018. If a patient had multiple opioid overdoses within 2018, the last overdose was selected. Among the cohort, 13.2% (170) had at least one prior opioid overdose within one year and patients with two or more overdoses accounted for 2.6% (34). (Figure 4). The maximum number was 9 prior opioid overdoses. In a two-year period prior to the 2018 overdose, 16.8% (216) of patients had experienced a previous opioid overdose.

Of the 2018 cohort, 38.6% (318) had a prior involvement with EMS, which may or may not have been overdose related, within one year prior to their overdose. (Figure 5). More specifically, 17.5% (144) had one involvement with EMS prior to their 2018 opioid overdose, 11.9% (98) had 2–3 prior involvements, 7.0% (58) had 4–10 prior involvements and 2.2% (18) had 11 or more. The maximum number of EMS interactions in the year prior to the 2018 opioid overdose was 101.

DISCUSSION

Carefully analyzed EMS data provide important insight into the opioid crisis in Rhode Island and can inform public health response. Benefits include monitoring trends in overdoses, identifying

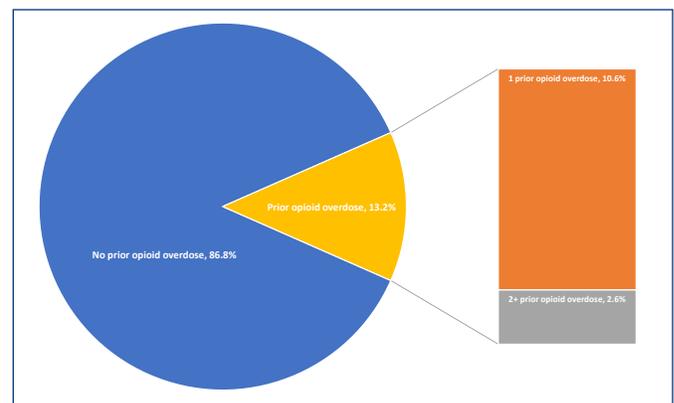
Figure 3. Percent of opioid overdoses by incident location type and year of incident, Rhode Island, 2016–2018



Source: RI-EMIS

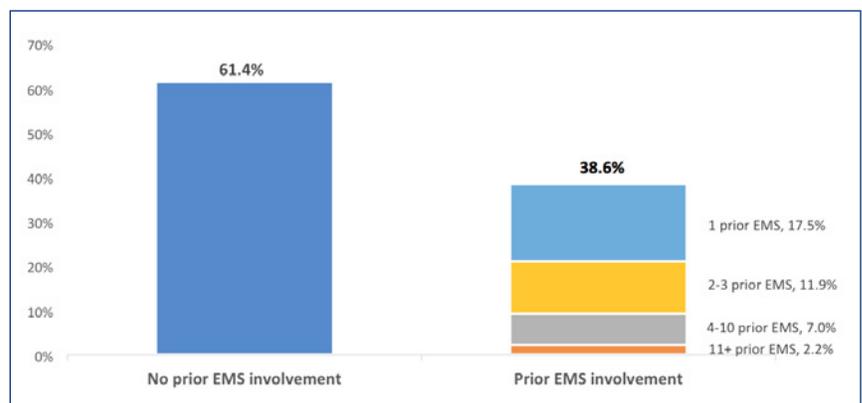
Note: Incident location was unknown in 1.4% of opioid overdoses in 2016, 0.5% in 2017 and 0.1% in 2018. Semi-private includes places such as hospital, assisted living facility, nursing home, prison, residential institution, hotel/motel.

Figure 4. Percent of patients who had an opioid overdose within one year prior to their 2018 opioid overdose, by number of prior opioid overdoses, Rhode Island



Source: RI-EMIS

Figure 5. Percent of patients who had involvement with EMS for any reason within one year prior to their 2018 opioid overdose, Rhode Island



Source: RI-EMIS

populations at risk of non-fatal overdose and repeat non-fatal overdoses, providing an assessment of pre-hospital treatment and location of overdose, and allowing real-time surveillance. EMS data can be used alongside other data sources to monitor trends in opioid overdoses. Between 2016 and 2018 there was a decrease in opioid-involved overdoses seen across multiple sources. In addition, among those in Rhode Island who experienced an overdose, the proportion that resulted in death decreased slightly during this timeframe. It is possible that these decreases may be related to an increase in naloxone availability among the general public, either by reducing the number of overdoses that result in death or reducing the number of times emergency care is sought after an overdose. In 2018, 16,771 naloxone kits were distributed in Rhode Island through pharmacies, clinical settings, and community-based organizations, which is an increase from 6,341 kits in 2016.⁶ EMS services recently began tracking administration of naloxone prior to their arrival. However, fear of arrest may prevent some people from seeking professional medical help after administering naloxone.

Seeking emergency care after an overdose is important and providers should encourage patients to call 9-1-1 if they experience or witness an overdose, and remind them that Rhode Island's Good Samaritan Overdose Prevention Act⁷ protects bystanders from liability if they help someone who may be experiencing an opioid overdose. Providers can also have a conversation with patients about the importance of obtaining naloxone from the pharmacy if they are worried about themselves, a loved one, or simply want to be able to respond to an overdose. Rhode Island legislation allows lay people to get naloxone from pharmacies without a prescription through a collaborative pharmacy practice agreement.⁸ All health insurers in Rhode Island cover at least one type of generic naloxone with a no cost/low-cost co-payment. In addition, July 2018 updated regulations require prescribers of Schedule II controlled substances to co-prescribe naloxone in three different high-risk clinical scenarios: 1) Prescribing an opioid individually or in aggregate with other medications, greater than or equal to 50 oral MMEs/day; 2) Prescribing any dose of an opioid or a benzodiazepine to a patient concurrently, or to a patient who has been co-prescribed either in the past 30 days; and, 3) Prescribing any dose of an opioid to a patient who has a history of opioid use disorder or overdose.⁹

Some research suggests that patients who have survived a non-fatal overdose are at a greater risk of experiencing a fatal overdose.¹⁰⁻¹² Among a cohort of patients who experienced an overdose in 2018, 13.2% had experienced a previous opioid overdose within a year prior. This is in line with research in other states.¹³ Approximately one in three patients who experience an opioid overdose had at least one involvement with EMS in the year prior to overdose. EMS providers can serve an important role in providing care and interventions. Since community paramedicine programs are allowed by

Rhode Island Statewide EMS protocol, RIDOH will continue to encourage local communities to develop plans to address the overdose crisis by performing preventative interventions such as follow-up visits within the community and promotion of home naloxone kits. RIDOH is also exploring options for EMS to leave Narcan behind in instances of transport refusal or with family and friends after the transport of an overdosed patient. Future analyses will explore if repeat overdoses are a risk factor for fatal overdose in Rhode Island.

Monitoring the location of overdoses can be helpful in providing targeted services. In 2018, a majority, 61.2%, of opioid overdoses occurred in a private setting, which is consistent with national data from 2012-2015.⁵ However, the percent of overdoses that occurred in a public setting increased by 15.5% between 2016 and 2018, and preliminary data for January 2019 show a continued increase. This increase may be related to an increase in overdoses that occur in parking lots or service areas. Approximately one in five opioid overdoses occurred on a street or roadway or in a vehicle-related setting. Future analyses will explore cluster analyses of overdose location, with a focus on the location of publicly occurring overdoses.

Limitations of this report include challenges with data quality and completeness. There are data missing from a portion of 2017 due to a system transition from NEMESIS version 2.2.1 to version 3.4, although the issue should be rectified in the first quarter of 2019. Training of EMS providers to improve quality of data reporting is an ongoing effort, with emphasis on improved narrative composition and comprehensive use of dropdown menus. The RIDOH opioid overdose case definition is continually reviewed and modified to ensure accurate identification of opioid overdoses, and improvements to the process for identifying repeat overdoses will be explored.

In addition to the current uses of EMS data, RIDOH has been working to improve and develop additional capacity for EMS and other data. In January 2019, new regulations required reporting of EMS incidents within two hours after completion of the call. With this change in regulation, RIDOH anticipates implementing, in 2019, a real-time automated overdose outbreak detection system with web-based dashboards and alerting features for EMS data. Use of EMS data, in combination with other data sources, will hopefully provide information regarding the opioid epidemic in Rhode Island that can be helpful for informing policy decisions and public health interventions.

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