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Trends in Recurrent Overdose and Treatment Initiation Following Emergency Department Visits for Opioid Overdose between 2016 and 2021

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Abstract

Background: Overdose remains a pressing public health concern in the United States, particularly with the emergence of fentanyl and other potent synthetic opioids in the drug supply. We evaluated trends in recurrent overdose and opioid use disorder (OUD) treatment initiation following emergency department (ED) visits for opioid overdose to inform response efforts.

Methods: This retrospective cohort study used electronic health record and statewide administrative data from Rhode Island residents who visited EDs for opioid overdose between July 1, 2016, and June 30, 2021, a period with fentanyl predominance in the local drug supply. The primary outcome was recurrent overdose in the 365 days following the initial ED visit. OUD

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treatment initiation within 180 days following the initial ED visit was considered as a secondary outcome. Trends in study outcomes were summarized by year of the initial ED visit.

Results: Among 1,745 patients attending EDs for opioid overdose, 20% (n=352) experienced a recurrent overdose within 365 days, and this percentage was similar by year (p=0.12). Among patients who experienced any recurrent overdose, the median time to first recurrent overdose was 88 days (interquartile range=23–208), with 85% (n=299/352) being non-fatal. Among patients not engaged in OUD treatment at their initial ED visit, 33% (n=448/1,370) initiated treatment within 180 days; this was similar by year (p=0.98).

Conclusions: Following ED visits for opioid overdose in Rhode Island from 2016–2021, the one-year risk of recurrent overdose and six-month treatment initiation rate remained stable over time. Innovative prevention strategies and improved treatment access are needed.

Keywords

overdose; opioid overdose; opioid use disorder; addiction treatment

1. Introduction

Overdose mortality remains exceptionally high in the United States, primarily due to synthetic opioids, including fentanyl. In 2022, 69% of overdose deaths involved synthetic opioids other than methadone compared to 18% in 2015 (Ahmad et al., 2023). Non-fatal opioid overdoses also increased during this period (Casillas et al., 2022).

In response to this crisis, substantial public funds have been invested in overdose prevention (BPC, 2019). Evidence-based interventions include medications for opioid use disorder (OUD), therapy, support groups, and targeted naloxone distribution, among others (CDC, 2022a; LAC, 2020). Notably, ED visits for opioid overdose have been identified as a key opportunity to connect people with essential services (Chen, et al., 2020), as these patients are at high risk of recurrent overdose and death (Banta-Green et al., 2019; Leece et al., 2020; Olfson et al., 2018; Weiner et al., 2019, 2020).

However, uptake of post-overdose ED services remains low, despite evidence of effectiveness and initiatives to standardize care (Chambers et al., 2023; Papp & Emerman, 2023). Evaluating trends in post-discharge outcomes may help identify the impact of prevention efforts, particularly given the predominance of fentanyl (DEA, 2021; Reuter et al., 2021) and exacerbation of the overdose crisis by the COVID-19 pandemic (Kuehn, 2021). We evaluated temporal trends in recurrent overdose and treatment initiation among patients attending EDs in Rhode Island (RI) for opioid overdose between 2016 and 2021.

2. Materials and Methods

2.1. Study Design and Data

We conducted a retrospective cohort study among RI residents who visited EDs in the state's largest health system for opioid overdose between July 1, 2016, and June 30, 2021. The standard of care in this health system includes offering behavioral counseling, take-home naloxone, referral to addiction treatment, and initiation of buprenorphine, as indicated

(Chambers et al., 2022; RIDOH, 2017). Patients were followed for 365 days after the initial ED visit to evaluate outcomes (i.e., considering data through June 30, 2022). The Supplementary Appendix provides additional detail regarding the study design and data. The study was approved by the health system and Rhode Island Department of Health (RIDOH) institutional review boards.

ED visits for opioid overdose were identified using electronic health record (EHR) data, based on the Centers for Disease Control and Prevention opioid overdose case definition which considers diagnosis codes and chief complaint terms (CDC, 2023). For patients with multiple ED visits meeting study criteria, one was randomly selected for inclusion to maintain independence of observations. Patients' EHR data were deterministically linked with four statewide databases: medical examiners data on fatal accidental drug overdoses, emergency medical services (EMS) data on non-fatal opioid overdoses, prescribing data on buprenorphine treatment, and data on OUD treatment at publicly-licensed facilities.

2.2. Measures

2.2.1. Outcomes.—The primary outcome was recurrent overdose within 365 days following the initial ED visit, including recurrent ED visits for opioid overdose within the health system, statewide EMS runs for non-fatal opioid overdose, and statewide fatal accidental overdoses. For patients with multiple recurrent overdoses during follow-up, overdose type and timing were classified based on the first recurrent overdose. Secondary outcomes included fatal accidental drug overdose and time to any recurrent overdose within 365 days, as well as OUD treatment initiation within 180 days, following the initial ED visit. OUD treatment included buprenorphine via prescription or any publicly-licensed program, including methadone, detoxification, outpatient, intensive outpatient, and residential treatment.

2.2.2. Baseline Measures.—Sociodemographic characteristics included age, sex, race/ethnicity, and health insurance type. Clinical characteristics included history of opioid overdose in the 180 days before the initial ED visit, OUD treatment engagement at time of ED arrival, and mode of ED arrival and discharge.

2.3. Statistical Analyses

Data were analyzed using SAS v9.4 (Cary, North Carolina). Baseline characteristics and subsequent outcomes were summarized overall and by year of the initial ED visit. Chi-squared tests (categorical measures) and log-rank tests (continuous measures) were used to test for differences by year. To evaluate the impact of the years with incomplete data, we conducted a sensitivity analysis excluding patients with initial ED visits in 2016 or 2021.

3. Results

Between July 1, 2016, and June 30, 2021, 1,745 RI residents attended study EDs for opioid overdose and were included in this analysis (Figure S1).

3.1. Baseline Characteristics

3.1.1. Sociodemographics.—Most patients were aged 25 to 44 years (57%), male (69%), non-Hispanic White (73%), and had Medicaid (38%) or private (37%) health insurance (Table 1). In comparisons by year, patients were similar in terms of age and sex but differed in their race/ethnicity (p=0.04) and health insurance type (p<0.01). Specifically, the percentage of non-Hispanic White patients decreased from 75–77% in 2016/2017 to 69–70% in 2020/2021. Additionally, the percentage of patients with Medicaid insurance increased from 27–35% in 2016/2017 to 40–45% in 2020/2021, while those with Medicare decreased from 16–18% to 10–11% during this period.

3.1.2. Clinical Characteristics.—As of the initial ED visit for opioid overdose, 14% of patients had experienced a previous opioid overdose within 180 days, and 21% were currently engaged in OUD treatment. Most patients were brought to the ED by EMS (92%) and discharged home following the ED visit (70%). In comparisons by year, patients were similar, except for their mode of ED discharge (p=0.02). The percentage of patients admitted to the hospital decreased from 14–16% in 2016/2017 to 6–10% in 2020/2021, while those discharged home increased from 66–71% to 72–81% during this period.

3.2. Trends in Post-Discharge Outcomes

3.2.1. Recurrent Overdose.—In the 365 days following the initial ED visit, 20% of patients experienced a recurrent overdose (Table 2). Among patients with any recurrent overdose, median time to first recurrent overdose was 88 days (interquartile range=23–208) with most being non-fatal (85%). Overall, 4% of patients experienced a fatal recurrent overdose within 365 days. The percentage of patients who experienced a recurrent overdose (p=0.12) and fatal recurrent overdose (p=0.16) was similar across years, as was median time to recurrent overdose (p=0.14).

3.2.2. Treatment Initiation.—Among 1,370 patients not currently engaged in OUD treatment at the time of ED arrival, 33% initiated treatment within 180 days following the ED visit. Treatment initiation was similar across years (p=0.98). Buprenorphine and methadone were the most frequently initiated treatment types, and treatment types differed somewhat by year (Table S1).

3.3. Sensitivity Analysis

When excluding patients whose initial ED visit was in a year with incomplete data (2016 or 2021), the findings were similar, except mode of ED discharge no longer differed by year (p=0.23) and recurrent overdose risk within 365 days post-discharge differed by year (p=0.03). Recurrent overdose risk fluctuated around 20% over time, ranging from 17% (2018 visits) to 25% (2019 visits).

4. Discussion

Among ED patients treated for opioid overdose in 2016–2021, 20% subsequently experienced any recurrent overdose and 4% experienced a fatal recurrent overdose within 365 days post-discharge; 33% initiated OUD treatment within 180 days. Recurrent overdose

risk and treatment initiation were similar across years. Although recurrent overdose risk differed significantly by year in the sensitivity analysis among initial ED visits in 2017–2020, this likely reflects year-to-year variability around 20%.

The overall one-year recurrent overdose risk in our study was similar to a prior estimate among Medicaid beneficiaries (19%, 2001–2007) (Olfson et al., 2018) but higher than among patients in Pennsylvania (15%, 2015–2018) (Suffoletto and Zeigler, 2020), potentially because outcome ascertainment in the latter study was limited to ED visits within a health system. The one-year risk of *fatal* opioid overdose in Massachusetts was similar to ours (4%, 2011–2015) (Weiner et al., 2019), while other studies have had lower estimates (1%, 2001–2007, Medicaid beneficiaries; 2%, 2015–2016, Ontario, Canada) (Leece et al., 2020; Olfson et al., 2018), potentially due to differing drug supplies.

In our study, recurrent overdose risk and treatment initiation remained stable following initial ED visits from 2016–2021 (with patient follow-up into 2022), despite focused efforts on improving access to harm reduction and treatment services in RI, including ED-based initiatives (Barre et al., 2019; Brown et al., 2022; Hackman et al., 2020; Mckee, 2017; Raimondo, 2016; Samuels et al., 2021; Waye et al., 2019). The drug supply in RI was changing rapidly during this period (DEA, 2021; Kariisa et al., 2023), making overdose risks unpredictable and overdose prevention more challenging; however, prevention efforts may have prevented these trends from worsening with the predominance of fentanyl. The onset of the COVID-19 pandemic in early 2020 also exacerbated the overdose crisis (Kuehn, 2021), contributing to shifts in public health priorities and barriers within the OUD care cascade, though we were not able to evaluate this in our study. The smaller percentage of patients admitted to hospitals in 2020/2021 may reflect COVID-19-related capacity constraints.

Though the study EDs offer a wide range of post-overdose services, the high risk of recurrent overdose and low rate of treatment initiation warrant a critical examination of existing approaches. Importantly, uptake of post-overdose services in the study EDs remains low, despite initiatives to standardize care (Chambers et al., 2023, 2022). ED visits for opioid overdose can be stressful, as patients have undergone the trauma of an overdose and may be in precipitated withdrawal. Consequently, they may not express interest in immediate engagement with care, as evidenced by the 10% of patients who self-directed discharge. Post-discharge follow-up strategies may be useful for some of these patients (Wightman et al., 2021). Qualitative interviews with ED staff have also highlighted the utility of “opt out” service delivery and peer support, as well as barriers due to structural factors and provider knowledge gaps (Collins et al., 2021). Qualitative research with patients is needed to understand the extent to which post-overdose ED services meet patient needs and preferences, barriers to treatment initiation post-discharge, and factors contributing to recurrent overdose. This patient perspective could inform improved care delivery models, targeting of evidence-based interventions, development of novel interventions, and optimal resource allocation.

The recent influx of opioid settlement funds to address opioid-related harm (National Opioids Settlement, 2022) provides an important opportunity to think creatively about how to reduce barriers to existing evidence-based services while expanding the spectrum of

services available and improving necessary infrastructure (Bicket et al., 2021; Faherty et al., 2020; FXB, 2020; Sharfstein and Olsen, 2020; Samuels, 2018). Enhancement of public and professional education, implementation of evidence-based early intervention strategies including with youth, expanded access to evidence-based treatment (e.g., buprenorphine and methadone) including integration within mainstream healthcare are critical (RAND, 2020; Samuels, 2018). All efforts require a cross-cutting focus on racial equity, particularly given concerning overdose trends among people of color in our study and nationally (AHRQ, 2022), as well as a focus on the well-being of people who use drugs, structural drivers of substance use, and evolving polysubstance use (RAND, 2020; Samuels, 2018). Novel services such as drug-checking initiatives (Collins et al., 2023; Imtiaz et al., 2020; Maghsoudi et al., 2022) and overdose prevention centers (Levengood et al., 2021) may complement existing approaches and prevent fatal overdoses due to the rapidly changing drug supply.

This study had limitations. First, due to the cohort design and lag for finalization of fatality data, the study included initial ED visits through mid-2021 (with follow-up data through mid-2022) and may not reflect more recent trends. Continued monitoring of trends as additional data are available is essential. Second, the study included patients within a single health system in RI, which may limit generalizability to other settings due to variation in drug supplies and services. Third, most state databases do not include information from outside of RI, potentially leading to slight underestimation of study outcomes. Fourth, we used prescription dispensing data to identify buprenorphine initiation, though patients may not have taken dispensed prescriptions. Finally, toxicology data were not available to determine the substances contributing to overdoses over time.

5. Conclusions

Following ED visits for opioid overdose in RI from 2016 to 2021, the one-year risk of recurrent overdose and six-month treatment initiation rate remained stable over time. Concerted public health response efforts during this period likely prevented trends from worsening. However, these findings underscore the need for innovative strategies to prevent overdose and improve access to treatment, especially with a rapidly evolving drug supply.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlights

- 20% of ED patients treated for opioid overdose in 2016–2021 had a recurrent overdose within a year
- Additionally, 4% had a fatal recurrent overdose within a year
- Among those not in treatment, 33% started treatment within six months
- Recurrent overdose and treatment initiation rates were stable over time
- Novel prevention strategies and improved treatment access are urgently needed

Table 1.

Baseline Characteristics of Patients Attending Study EDs for Opioid Overdose in Rhode Island, Overall and by Year

	Overall N=1,745 n (%)	2016* N=194 n (%)	2017 N=338 n (%)	2018 N=361 n (%)	2019 N=388 n (%)	2020 N=303 n (%)	2021† N=161 n (%)	P-value
Sociodemographic Characteristics								
Age Group, Years								
<18	7 (<1)	1 (1)	3 (1)	0 (0)	2 (1)	0 (0)	1 (1)	0.36
18–24	211 (12)	29 (15)	46 (14)	44 (12)	39 (10)	28 (9)	25 (16)	
25–34	575 (33)	67 (35)	112 (33)	118 (33)	133 (34)	104 (34)	41 (25)	
35–44	412 (24)	40 (21)	67 (20)	85 (24)	101 (26)	78 (26)	41 (25)	
45–54	291 (17)	28 (14)	68 (20)	55 (15)	67 (17)	48 (16)	25 (16)	
55–64	167 (10)	16 (8)	30 (9)	39 (11)	29 (7)	32 (11)	21 (13)	
≥65	82 (5)	13 (7)	12 (4)	20 (6)	17 (4)	13 (4)	7 (4)	
Sex								
Female	541 (31)	54 (28)	103 (30)	112 (31)	137 (35)	84 (28)	51 (32)	0.32
Male	1,204 (69)	140 (72)	235 (70)	249 (69)	251 (65)	219 (72)	110 (68)	
Race and Ethnicity								
Hispanic, Any Race	276 (16)	31 (16)	47 (14)	61 (17)	54 (14)	50 (17)	33 (20)	0.04
Non-Hispanic Black	143 (8)	11 (6)	27 (8)	18 (5)	41 (11)	33 (11)	13 (8)	
Non-Hispanic White	1,274 (73)	146 (75)	260 (77)	266 (74)	280 (72)	209 (69)	113 (70)	
Non-Hispanic Other	52 (3)	6 (3)	4 (1)	16 (4)	13 (3)	11 (4)	2 (1)	
Health Insurance Type								
Medicaid	670 (38)	53 (27)	119 (35)	137 (38)	159 (41)	137 (45)	65 (40)	<0.01
Medicare	207 (12)	35 (18)	53 (16)	38 (11)	34 (9)	30 (10)	17 (11)	
Private	653 (37)	82 (42)	127 (38)	137 (38)	145 (37)	102 (34)	60 (37)	
Other	25 (1)	0 (0)	6 (2)	4 (1)	6 (2)	7 (2)	2 (1)	
None	183 (10)	24 (12)	33 (10)	39 (11)	43 (11)	27 (9)	17 (11)	
Unknown	7 (<1)	0 (0)	0 (0)	6 (2)	1 (<1)	0 (0)	0 (0)	
Clinical Characteristics								
Experienced an Opioid Overdose Within 180 Days Prior to ED Visit‡								
Yes	246 (14)	27 (14)	40 (12)	54 (15)	58 (15)	44 (15)	23 (14)	0.86
No	1,499 (86)	167 (86)	298 (88)	307 (85)	330 (85)	259 (85)	138 (86)	
Currently Engaged in OUD Treatment at Time of ED Visit								
Yes	375 (21)	31 (16)	79 (23)	87 (24)	75 (19)	64 (21)	39 (24)	0.19
No	1,370 (79)	163 (84)	259 (77)	274 (76)	313 (81)	239 (79)	122 (76)	
Mode of Arrival to ED								
EMS	1,607 (92)	177 (91)	307 (91)	327 (91)	367 (95)	279 (92)	150 (93)	0.41
Walk-in	128 (7)	17 (9)	29 (9)	33 (9)	18 (5)	21 (7)	10 (6)	

	Overall N=1,745 n (%)	2016* N=194 n (%)	2017 N=338 n (%)	2018 N=361 n (%)	2019 N=388 n (%)	2020 N=303 n (%)	2021† N=161 n (%)	P-value
Other	10 (1)	0 (0)	2 (1)	1 (<1)	3 (1)	3 (1)	1 (1)	
Mode of Discharge From ED								
Admitted to Hospital	216 (12)	32 (16)	46 (14)	57 (16)	42 (11)	29 (10)	10 (6)	0.02
Discharged Home	1,213 (70)	128 (66)	239 (71)	239 (66)	259 (67)	218 (72)	130 (81)	
Left Without Being Seen	50 (3)	4 (2)	7 (2)	10 (3)	17 (4)	8 (3)	4 (2)	
Self-Directed Discharge	169 (10)	12 (6)	34 (10)	40 (11)	41 (11)	33 (11)	9 (6)	
Transferred to Another Facility	33 (2)	7 (4)	3 (1)	5 (1)	9 (2)	6 (2)	3 (2)	
Other	64 (4)	11 (6)	9 (3)	10 (3)	20 (5)	9 (3)	5 (3)	

Abbreviations: ED, emergency department; EMS, emergency medical services; OUD, opioid use disorder.

*Includes ED visits from July 1, 2016, through December 31, 2016.

†Includes ED visits from January 1, 2021, through June 30, 2021.

‡Includes ED visits for opioid overdose at study EDs, statewide EMS runs for opioid overdose, and statewide fatal accidental drug overdoses.

Table 2.

Health Outcomes Following an Initial ED Visit for Opioid Overdose at Study EDs in Rhode Island, Overall and by Year of the Initial ED Visit

	Overall N=1,745	2016* N=194	2017 N=338	2018 N=361	2019 N=388	2020 N=303	2021† N=161	
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	P-value
Within 180 Days								
Initiated OUD Treatment‡								
Yes	448 (33)	51 (31)	85 (33)	97 (35)	105 (34)	72 (30)	38 (31)	0.98
Within 0–30 Days	210 (15)	22 (13)	43 (17)	45 (16)	48 (15)	35 (15)	17 (14)	
Within 31–180 Days	238 (17)	29 (18)	42 (16)	52 (19)	57 (18)	37 (15)	21 (17)	
No	922 (67)	112 (69)	174 (67)	177 (65)	208 (66)	167 (70)	84 (69)	
Within 365 Days								
Experienced a Recurrent Overdose§								
Yes	352 (20)	36 (19)	66 (20)	60 (17)	96 (25)	60 (20)	34 (21)	0.12
Fatal¶	53 (3)	7 (4)	15 (4)	7 (2)	9 (2)	10 (3)	5 (3)	
Non-Fatal¶	299 (17)	29 (15)	51 (15)	53 (15)	87 (22)	50 (17)	29 (18)	
No	1,393 (80)	158 (81)	272 (80)	301 (83)	292 (75)	243 (80)	127 (79)	
Time to Recurrent Overdose, Days (Median [IQR]) §¶‖	88 (23–208)	114 (27–247)	102 (19–243)	72 (28–175)	105 (37–193)	86 (12–221)	66 (18–188)	0.14
Experienced a Fatal Recurrent Overdose								
Yes	73 (4)	7 (4)	22 (7)	12 (3)	11 (3)	12 (4)	9 (6)	0.16
No	1,672 (96)	187 (96)	316 (93)	349 (97)	377 (97)	291 (96)	152 (94)	

Abbreviations: ED, emergency department; EMS, emergency medical services; IQR, interquartile range; OUD, opioid use disorder.

*Includes initial ED visits from July 1, 2016, through December 31, 2016.

†Includes initial ED visits from January 1, 2021, through June 30, 2021.

‡Among patients not currently engaged in OUD treatment at the time of the initial ED visit.

§Includes ED visits for opioid overdose at study EDs, statewide EMS runs for opioid overdose, and statewide fatal accidental drug overdoses.

¶For patients who experienced multiple recurrent overdoses during the 365-day period, overdose type (fatal vs. non-fatal) and timing (days since initial ED visit) classified based on the first recurrent overdose.

‖Among patients who experienced a recurrent overdose.