Safety of a Modified Community Trailer to Manage Patients with Presumed Fentanyl Overdose

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Abstract Opioid overdoses (OD) cause substantial morbidity and mortality globally, and current emergency management is typically limited to supportive care, with variable emphasis on harm reduction and addictions treatment. Our urban setting has a high concentration of patients with presumed fentanyl OD, which places a burden on both pre-hospital and emergency department (ED) resources. From December 13, 2016, to March 1, 2017, we placed a modified trailer away from an ED but near the center of the expected area of high OD and accepted low-risk patients with presumed fentanyl OD. We provided OD treatment as well as on-site harm reduction, addictions care, and community resources. The primary outcome was the proportion of patients requiring transfer to an ED for clinical deterioration, while secondary outcomes were the proportion of patients initiated on opioid agonists and provided take-home naloxone kits. We treated 269 patients with opioid OD, transferred three (1.1%) to a local ED, started 43 (16.0%) on opioid agonists, and provided 220 (81.7%) with THN. Our program appears to be safe and may serve as a model for other settings dealing with a large numbers of opioid OD.

Keywords Public health · Opioid overdose · Fentanyl · Addictions medicine

Introduction

The devastating opioid overdose (OD) epidemic resulted in nearly 43,000 fatalities in USA in 2016 [1], and ameliorating morbidity and mortality are challenging. For patients who OD in the community, the main treatment is naloxone given by a bystander or first responder, followed by transport to a local emergency department (ED). [2]

Unfortunately, recent overdose surges have involved dozens of patients in very short-time periods. Philadelphia [3], Cincinnati [4], Baltimore [5], and New York [6] have all reported comparable scenarios, with simultaneous increases in ED visits [7]. The culprit was presumed to be fentanyl in many cases [8–10]. There are few data outlining management of patients with presumed fentanyl OD, but they have been reported as critically ill and requiring larger naloxone doses and prolonged ED observation [11–13]. Furthermore, it is uncertain whether these patients obtain access to addictions care such as opioid agonist therapy, detoxification opportunities, or enhanced social supports.

A recent study from our urban setting indicates that there is a cohort of low-risk patients with presumed fentanyl OD who are unlikely to require additional naloxone or prolonged observation [14]. To reduce prehospital and ED resource use and to improve addictions care, we identified low-risk patients with opioid OD and transported them to a modified community-based trailer for observation, treatment, and support. We hypothesized this would be a safe arrangement and that we would have a low rate of transfers to the ED.

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Methods

Setting

Vancouver, British Columbia, is a 45-square-mile city of 600,000 that is served by six hospitals overseen by the Vancouver Coastal Health (VCH) authority. Many ODs occur in the 20-square-block Downtown Eastside (DTES) neighborhood. The majority of the approximately 10,000 DTES residents receive social assistance: unstable housing, chronic psychiatric illness, and open-air polysubstance use is common. A prior opioid overdose epidemic in 2000 led VCH public health officials to establish the first supervised injection site in North America in the DTES. A number of community health centers provide addictions services including access to opioid agonists.

For the past few years, deaths related to opioid OD have been increasing steadily: in 2016, there were 215 fatal OD in Vancouver, triple the historical rate, including nine fatal OD in the DTES within a few hours on December 15 [15]. As in other North American settings [8, 9], the likely cause was adulteration of the local heroin supply with illicit fentanyl: in August 2016, voluntary testing of Vancouver street drugs demonstrated that 90% of alleged heroin was contaminated with fentanyl [10].

British Columbia Ambulance Services (BCAS) provides all emergency medical services (EMS) although local fire and police departments can provide first aid. In the fall of 2016, EMS responded to a daily average of 30 OD in the DTES, with approximately half of patients accepting transport to the nearest ED (personal communication Dr. John Tallon, medical director, BCAS, August 12, 2018), located approximately 2 miles away. (The remaining patients declined transport.) To cope with EMS and ED pressure, VCH planned to open an addictions clinic that could potentially receive patients with resuscitated opioid OD, but this facility would not open for several months. We proposed placing a specialized trailer in the DTES to decrease resource use for both EMS and EDs, while preserving patient safety and improving addictions care. Since VCH had planning to open a dedicated addictions clinic by March 1, 2017, the trailer would only be open until then.

Trailer Description

The 53-ft trailer was deployed in a vacant lot owned by the City of Vancouver at the geographic center of the

DTES. The trailer can be outfitted in various configurations, and we established a 15' × 25' care space with four chairs and one stretcher with cardiopulmonary monitoring, and numerous storage bins for medical supplies (Appendix 1). We included an advanced airway kit but no ventilator; any critically ill patients would require evacuation to the nearest ED. The trailer included a 10' × 10' office that stored computers, medical records, and non-medical supplies including food and blankets. Laboratory testing (except urine drug screens) and imaging were unavailable.

Program Design

Based upon local ED experience, we felt that patients with an arrival Glasgow Coma Scale of 15 and oxygen levels of 95% would be unlikely to clinically deteriorate [14]; such patients were fully resuscitated, alert, and cooperative, had no additional dangerous co-ingestions, or coincident acute medical conditions. Based upon this, BCAS developed explicit criteria for patients with presumed opioid OD to be transferred to the trailer (Appendix 2), notified all ambulance personnel electronically at regular intervals, and placed a written copy of the criteria inside each ambulance.

We engaged relevant stakeholders prior to establishing this program, including (a) the City of Vancouver, who owned the vacant lot (268' × 120', 0.74 acres) near the center of the DTES, liaised with local businesses and community groups, and paved the lot, provided electrical and water supply; (b) the VCH Department of Public Health; (c) BCAS; (d) emergency nursing, to lead daily trailer operations, and provide emergency care; (e) emergency physicians, to ensure that the patients were stable; (f) addictions specialists, to provide patients with opioid agonist therapy; and (g) social work, to connect patients with community services, including housing, detoxification, and personalized post-discharge follow-up.

Trailer Procedures

Upon patient arrival, a nurse entered relevant demographic information into the electronic health record, constructed a basic chart, and released the EMS personnel (At local EDs, patient registration, triage processes, and the resulting ambulance detention can be lengthy.) A social worker, nurse, or physician quickly—often within seconds of arrival—supplied the patient with warm blankets, food, and juice. The emergency

physician ensured the patient was stable. We placed all patients on continuous pulse oximetry and treated deterioration related to opioids in the following sequence: verbal communication, vigorous tactile stimulation, supplemental oxygen, and, finally, naloxone with a starting dose of 0.4 mg intramuscularly every 2–3 min as needed until adequate clinical response was observed.

Addiction specialists assessed patient and recommended opioid agonist therapy [16, 17] for all those motivated to do so [1]: buprenorphine/naloxone: (a) For patients who had previously taken buprenorphine, we provided six to eight 2 mg tablets and asked patients to take them post-discharge once they were in a moderate state of withdrawal, and provided written handouts describing this. They were also asked to attend either their primary care physician or the trailer the next morning for continuation of buprenorphine. For motivated patients with no prior exposure to buprenorphine, we asked them to refrain from using opioids, discharged them home, and asked them to attend either their primary care physician or the trailer the next morning [2]. For patients wishing methadone treatment, we provided a prescription for 3 days' worth of methadone. Patients who had missed only 1–2 days of methadone treatment were restarted at their prior dose; those who had missed more time, or were methadone-naïve, were started at 20 mg daily. Methadone was not given in the trailer, and patients were requested to attend their primary care physician within 3 days.

Nurses ensured that all patients were provided with THN kits. The outreach team assisted patients with relevant follow-up care including access to detoxification, shelter, and housing. Nurses, physicians, and social workers documented all relevant information on standardized charts. Patients were deemed suitable for discharge when they were awake and oriented with normal vital signs, could consume food and juice, and could interact appropriately with staff, although they could leave at any time.

Data Collection

We obtained all data via the administrative database and have previously described analogous techniques for an ED-based study conducted during a similar time frame. [14] To summarize, a staff emergency physician and three residents, blinded to outcomes and hypothesis, abstracted data according to standards of Kaji et al. [18]. Data were directly entered into an electronic

spreadsheet (Microsoft Excel, Microsoft Corporation, Redmond, WA). Abstractors were instructed on the first 10 charts and had progress monitored at regular intervals. We resolved missing or discrepant information by consensus. The unit of analysis was the patient encounter.

Outcomes

For this novel program, we focused upon the safety of managing patients with opioid OD in a trailer. Therefore, in order to evaluate [1] our pre-hospital criteria and the ability of EMS personnel to risk-stratify OD patients in the field, and [2] overall trailer care, the primary outcome was the proportion of patients who required transfer to a local ED for clinical deterioration, either from the OD itself, or from an acute coincident illness that was not apparent in the field.

We also recorded the following: the number of patients who [1] left the trailer prior to physician assessment, [2] received naloxone in the trailer, [3] received supplemental oxygen in the trailer, [4] had a serious prespecified adverse event (intubation, chest compressions, or death), [5] accepted buprenorphine/naloxone in the trailer, or accepted a prescription for buprenorphine/naloxone or methadone, [6, 16, 17] accepted THN. We also obtained the length of stay for each patient.

Data Analysis

Microsoft Excel 2016 (Microsoft Corp, Redmond, WA, USA) was used for data entry and analysis. Categorical variables were reported as proportions with intervals of 95% confidence, while continuous variables were presented as medians with interquartile ranges.

Results

From December 13, 2016, to March 1, 2017, 255 unique patients had 269 attendances for an opioid OD; patients had a median age of 37 (interquartile range 30 to 47), and 209 (78.6%) were male. Overall, 248 (93.2%) arrived by ambulance with 112 (45.2%) already having received bystander naloxone; EMS administered naloxone to 134 (54.0%). Twenty-one patients (7.9%) left prior to physician assessment.

No patients had a serious adverse event, and four (1.5%, 95% CI 0.5 to 4.0%) were administered naloxone: three patients were administered a single dose at 0.2 mg

and one patient was administered two doses; six (2.2%, 95% CI 0.9 to 5.0%) required supplemental oxygen. Three patients (1.1%, 95% CI 0.3 to 3.5%) were transferred to a local ED: one who endorsed that his OD had been a suicide attempt, one who developed chest pain while in the trailer, and one who endorsed a recent assault and possible head injury. All three were discharged from the ED after brief treatment and observation.

One hundred ninety-five patients (73.3%) were assessed by an addictions physician, 27 (10.0%) accepted “to-go” buprenorphine/naloxone, 14 [5.2%] re-attended the trailer the next day) 16 (5.9%) accepted a prescription for methadone, and 220 (81.7%) accepted THN. A further 50 (18.6%) patients promised to follow up with their primary care physician or else return the next day for induction of buprenorphine/naloxone, of whom 26 (9.7%) attended the trailer within 24 h. The median length of stay was 94 min (IQR 70 to 149 min).

Discussion

The opioid epidemic shows few signs of abatement, and prehospital providers and emergency departments will continue to be an essential part of the response. In a dense urban area with a high prevalence of opioid OD, our findings show that many patients with opioid can be safely treated—including overdose management and evidence-based addictions care—in a modified community trailer. This may assist public health officials, prehospital personnel, medical and nursing personnel, social workers, and others involved managing at-risk patients in planning a strategy to ameliorate the impact of opioid OD, especially in urban settings.

The most important aspect of our program was safety; each day, an average of four patients with opioid OD were diverted from the ED and safely managed in the trailer—the three patients who were transferred did not have an OD-related reason for transfer. Importantly, only one trailer patient required naloxone, similar to our local ED experience involving low-risk patients [14]. This implies that the protocols we developed in conjunction with our prehospital providers were likely adequate, and that ambulance personnel identified patients with high-risk opioid OD and correctly transferred them directly to a local ED.

While nearly one-quarter of ED patients with opioid OD may leave prior to physician assessment, or against

medical advice, [14] only 8% left the trailer under these circumstances. While the exact reasons are unclear, we were careful to establish an environment-focused-upon management of patients with opioid OD; we chose staff specifically for this intervention, nurses, and physicians attended patients within seconds of arrival, we quickly provided amenities such as food, juice, and blankets, and there was immediate access to social work and addiction treatment. This environment may be very challenging to reproduce in a busy, crowded ED with long wait times and less focus on patients with opioid OD. Importantly, the higher rate of retention allowed a greater proportion of patients to be assessed by staff, obtain opioid agonists and THN, and access social work and community outreach. Since these benefits are lost when patients inappropriately self-discharge, future efforts should focus on decreasing this cohort by focusing upon their needs when they present to a facility for post-overdose care.

Nearly one-sixth of patients accepted buprenorphine/naloxone, or else accepted a prescription for methadone; a further one-fifth agreed to attend next-day follow-up for initiation of opioid agonists, with half of those attending the trailer. It was previously unclear if patients who have been resuscitated from opioid OD would accept such medications. In D’Onofrio’s study of patients randomized to buprenorphine or other treatments, less than 10% attended the ED for an overdose [19], and there is little description from EDs regarding safety and success of ED-based induction of opioid agonist [20]. An important component of our protocol was that we engaged patients about their wishes for opioid agonist therapy. While space limitations ensured that we could not admit patients to the trailer for the minimum 8–12 h required for a formal buprenorphine/naloxone initiation, we empowered patients to make their own decisions regarding agonist therapy and follow-up. Although 10% of patients were discharged with “to-go” buprenorphine/naloxone tablets to self-induce, a larger trailer might have permitted on-site inductions. As such, approximately half of patients returned the next morning for initiation or continuation of therapy.

Furthermore, nearly 82% of our patients accepted THN, and this may compare favorably with the 68% observed in at-risk ED patients [21].

Given our patient selection and safety outcomes, paramedics, nurses, physicians, and social workers could likely staff a similar space in a vulnerable urban location to achieve similar results; however, it is

important to engage relevant stakeholders prior to the initiation of such a program.

Limitations Patient numbers are likely too small to draw definite safety conclusions, although stable patients appear to perform well in an ED setting [14]. Our environment may be unique; there is a legal nurse-supervised injection site nearby, and bystander naloxone use is common. Addiction physicians may have had variable levels of risk tolerance for post-OD induction of opioid agonists. We did not have access to primary care records and almost certainly underestimated the number of patients who followed up with their community physician. We did not consult patient, peer, or family representatives prior to design or implementation, and undertaking this step could potentially have improved results. Overall, our model must be regarded as a care bundle, and it would be challenging to isolate a single aspect that disproportionately contributed to our results. The provincial government and the City of Vancouver assumed costs, and this may not be feasible elsewhere.

Conclusion

Based on our experience of providing care to a dense urban environment, stable patients with uncomplicated opioid OD may be safely received and managed in a modified trailer, which may obviate the need for mandatory ED transfer. Patients may be more receptive to evidence-based addictions care in this setting when compared with an ED.

Appendix 1: Trailer Supplies (*Ultimately Used for Patients with Opioid Overdose)

Basic Equipment

- 4 Chairs
- 2 Stretchers with cardiopulmonary monitoring
- 1 Workbench for nurses and physicians
- 1 Refrigerator with at least 20 juices and 20 sandwiches per day
- 1 Warmer with warm blankets and spare clothing
- 1 Microwave

Standard Medications

- Intravenous lines and normal saline*
- Antiemetics including dimenhydrinate and ondansetron*
- Naloxone/take-home naloxone kits*
- Antiseizure medications including phenytoin
- Sedatives including benzodiazepenes and quetiapine (for induced withdrawal)
- Analgesics including acetaminophen, ibuprofen*
- Opioids: hydromorphone, long-acting morphine, and buprenorphine/naloxone*

Critical Care Equipment

- Oxygen*
- Bag-valve mask
- Difficult airway cart including endotracheal tubes, stylets, and intubating blades
- Vasoactive medications including epinephrine

Office Supplies

- Standardized paper forms including medical charts, applications for government assistance, and information regarding detoxification and housing, etc.
- Computers and printers

Appendix 2: British Columbia Ambulance Service Criteria for Transport of Patients with Opioid Overdose to the Trailer

- Patients had to be greater than 15 years of age, not pregnant, cooperative, and willing to be transferred.
- Patients could not have obvious acute medical, surgical, traumatic, obstetrical, or psychiatric illness, including severe agitation.
- Patients could not have additional ingestions of other prescription or illicit drugs.
- Patients had to regain normal vital signs prior in the field prior to transfer: Glasgow Coma Scale 15 and cooperative, respiratory rate > 12, oxygen saturations > 95% on room air, systolic blood pressure > 90 mmHg, and temperature from 35.0 to 37.5° C.

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