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Intravenous use of illicit buprenorphine/naloxone to reverse an acute heroin overdose

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Abstract

A case of heroin overdose reversed through the intravenous (IV) administration of a crushed sublingual tablet of buprenorphine/naloxone (Suboxone®) by a lay responder is described. Although the sublingual administration of buprenorphine/naloxone to reverse an overdose has been reported elsewhere, this is the first report of IV administration. Healthcare professionals should be aware that injection drug users may respond to an opioid overdose by injecting buprenorphine/naloxone and should consequently counsel all opioid-using patients on the proper response to an overdose. Physicians should also consider prescribing naloxone to at-risk patients. The work of community-based naloxone distribution programs should be expanded.

Keywords

buprenorphine/naloxone; Suboxone; overdose; opioid overdose; opiate overdose; naloxone; lay responder; injection drug users

BACKGROUND AND OBJECTIVES

Unintentional drug overdose is the second leading cause of adult accidental death in the United States, claiming more than 27,000 lives each year.^{1,2} In the United States alone, opioid analgesics were responsible for ~12,000 fatal overdoses in 2007, with an additional 2,000 overdose deaths attributable to heroin.³ In addition to the high mortality rates due to opioid overdose, significant morbidity is also associated with overdose events, including pneumonia, renal failure, mental impairment, and cardiac arrhythmia.⁴

The provision of naloxone (brand name Narcan®) to at-risk injection drug users (IDUs) and their friends and families is a proven public health and biomedical intervention to reduce overdose-associated morbidity and mortality.^{5,6} Naloxone is a μ -opioid receptor antagonist capable of reversing an acute overdose when administered intravenously, intranasally, or intramuscularly.⁷ For more than 12 years in the United States, community-based programs have distributed naloxone to lay responders who have a high risk of experiencing or observing an overdose event and trained them in overdose prevention, recognition, and response.^{6,8–11} Most individuals trained by these programs are IDUs or their friends and families. Similar efforts to prevent overdose mortality among prescription opioid users have not yet been extensively undertaken.

Here, we present the case of a heroin overdose reversed through the intravenous (IV) administration of a crushed and dissolved buprenorphine/naloxone sublingual tablet. Although the sublingual administration of buprenorphine/naloxone to reverse a heroin overdose has been reported previously,¹² we believe this is the first report of IV administration of buprenorphine/naloxone to reverse an opioid overdose. An unsuccessful attempt to reverse a heroin overdose with IV administration of buprenorphine monoproduct has been documented elsewhere.¹³

ESSENTIAL FEATURES AND UNIQUENESS OF THE CASE

During an overdose prevention training session offered by The Miriam Hospital in Rhode Island, a 34-year-old male heroin injector reported an instance of using illicit Suboxone® (buprenorphine/naloxone) via IV injection to reverse an opioid overdose in a female in her mid-20s, after the pair injected heroin together. He reported that the overdose victim was under the sole influence of heroin and did not respond to verbal or physical stimulation. After being unable to arouse the overdose victim, the lay responder crushed an 8-mg tablet of Suboxone® (intended for sublingual administration), dissolved it in slightly less than 1 mL of water, and injected it into a vein in the overdose victim's arm using a new 1-mL insulin syringe. The overdose victim reportedly regained consciousness in less than 3 minutes. As the lay responder was a chronic heroin injector who was well acquainted with the overdose victim, we believe that his claims were credible that heroin was the only drug consumed by the victim and that the drug consumed was indeed heroin.

The lay responder reported purchasing the Suboxone® tablet on the street and was able to provide a brief description of Suboxone's physical appearance, including its color and shape. Although the lay responder had purchased Suboxone® from both street-level drug dealers and individuals with a prescription in the past, he could not remember the source from which he obtained the Suboxone® used to reverse this overdose. The lay responder knew that pure naloxone is used by emergency responders to reverse opioid overdoses and reported that he would have preferred to use that medication if it had been available at the time of this overdose event. The lay responder provided consent for this case report to be published in a peer-reviewed journal so that medical providers and public health professionals would be aware of his story.

DISCUSSION

The use of sublingual buprenorphine/naloxone to reverse an overdose has been reported previously.¹² However, in that instance, the medication was administered sublingually, and the overdose was likely reversed by the buprenorphine component and not by the naloxone component of Suboxone®, as the latter has poor sublingual bioavailability.¹⁴ The case reported here also differs from that reported by Welsh et al. because, in this instance, the lay responder specifically chose to use Suboxone® due to his knowledge of the naloxone component's ability to precipitate acute withdrawal via IV delivery. Here, the naloxone component of Suboxone® likely reversed the overdose, as naloxone has high IV bioavailability. The naloxone component is specifically coformulated with buprenorphine to precipitate withdrawal if uboxone® is injected by opioid users.¹⁴

Buprenorphine is a high affinity partial μ -receptor agonist. It was first introduced in the United States as an opioid analgesic in 1985.² Buprenorphine mono-product, sold under the brand name Subutex®, has been used in various regions of the world for the treatment of opioid dependence since the 1980s.¹⁵ In 2002, buprenorphine and buprenorphine/naloxone were approved for office-based treatment of opioid dependence in the United States under the Drug Abuse Treatment Act of 2000.¹⁶ The United States Substance Abuse and Mental Health Services Administration recommends buprenorphine/naloxone for office-based treatment of opioid dependency, as this coformulated product has lower abuse potential than buprenorphine monoproduct.¹⁷ There are currently ~15,700 physicians who are approved to prescribe buprenorphine and, in 2009 alone, 5.08 million buprenorphine prescriptions were dispensed in the United States.¹⁸ Diversion and illicit use of buprenorphine/naloxone have been documented in Rhode Island and other regions of the United States.^{19,20} Therefore, we find the lay responder's claim of acquiring Suboxone® on the street to be reasonable.

This case of overdose reversal with IV Suboxone® strongly suggests the need for broader distribution of naloxone among opioid users. The lay responder stated that he would have used intramuscular naloxone to reverse this overdose if it was available to him at the time of the overdose. As pure naloxone was not available, the lay responder used Suboxone® previously obtained on the street.

Although IV injection of Suboxone® was technically a misuse of the medication, the lay responder's actions successfully reversed the overdose and likely saved the victim's life. However, given the risks of IV administration of buprenorphine/naloxone sublingual tablets, we do not advocate for such an approach to be used by other drug users or their acquaintances. Indeed, IV administration of buprenorphine/naloxone introduced more opioids to the victim's body and put the victim at risk for complications from the non-sterile injection of a medication that is intended for sublingual administration. Additionally, if the overdose victim had been under the influence of any other central nervous system depressants, such as benzodiazepines, the addition of buprenorphine to the patient's system could have exacerbated the overdose event.²¹

Physicians and other healthcare professionals should be aware of the "street" chemistry knowledge of drug users. There are many reports of drug users devising chemical and mechanical methods to extract desirable portions of medications. In this instance, although the lay responder did not convey his knowledge in biomedical terms, he knew about the different components of Suboxone® and also knew the relative bioavailability of each component for different routes of administration. This concept of street-level knowledge of pharmaceuticals has been documented elsewhere.²² A notable example was the widespread abuse of Oxycontin®. Drug users on the street devised methods to extract the opioid portion of the medication from pills, allowing for inhalation or parenteral administration.

Ultimately, concerns about Oxycontin® misuse and abuse resulted in a recent reformulation to create a product that is more tamper resistant.²³ In light of such reports of street chemistry knowledge among drug users, it is possible that other IDUs may consider using buprenorphine/naloxone intravenously to reverse an opioid overdose.

Although no other reports have been published to our knowledge, the IV administration of buprenorphine/naloxone to reverse opioid overdoses may be occurring among other IDUs. Indeed, anecdotal evidence from subsequent overdose prevention training classes suggests that other opioid users may be sublingually or intravenously administering buprenorphine/naloxone to their peers in cases of opioid overdose. Consequently, buprenorphine/naloxone prescribers, as well as pharmacists who dispense the medication, should warn buprenorphine/naloxone patients of the hazards of injecting this medication and should advise their patients about the proper procedure for dealing with an opioid overdose, which includes assessing the overdose victim, summoning emergency medical services, performing rescue breathing, and administering pure sterile naloxone, if available and appropriate. Physicians could consider prescribing naloxone to patients who receive buprenorphine/naloxone or other prescription opioids. Healthcare professionals should also consider referring opioid-using patients to existing naloxone distribution programs, if such programs exist in their communities.

This incident also indicates the important role of community-based overdose prevention and naloxone distribution programs for IDUs to decrease opioid overdose-associated morbidity and mortality. These programs have distributed naloxone to tens of thousands of individuals and saved thousands of lives, with few to no adverse events reported.⁵ Consequently, these programs have demonstrated that providing naloxone to nonmedical personnel is a feasible, safe, effective, and potentially cost-effective measure to reduce opioid-related mortality.^{5,6,8,9} Program participants demonstrate notable increases in overdose symptom recognition and response, including appropriate naloxone administration. Community-based naloxone programs promote dissemination of knowledge through peer networks, increase the number of emergency 911 calls made during overdose events, and potentially reduce heroin use among participants.^{6,8,10,11}

CONCLUSIONS

The work of overdose prevention/naloxone distribution programs needs to be highlighted in their communities and expanded. Additionally, given that prescription opioid users constitute a major and growing demographic in the overdose epidemic,²⁴ it is critical that policy makers consider expanding the availability of naloxone to prescription opioid users and their friends and families.²⁵

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