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Short Communication

# No evidence of compensatory drug use risk behavior among heroin users after receiving take-home naloxone

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## HIGHLIGHTS

- Participation in naloxone/overdose training did not alter severity of drug use among heroin users.
- Active heroin users and users in agonist maintenance decreased heroin and polydrug use after training.
- The Addiction Severity Index drug composite score also decreased at 1 and 3-month follow up.

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## ABSTRACT

*Introduction:* Some fear that distribution of naloxone to persons at risk of experiencing an opioid overdose may reduce the perceived negative consequences of drug use, leading to riskier patterns of use. This study assessed whether participation in naloxone/overdose training altered drug use frequency, quantity or severity among heroin users in and out of treatment.
*Methods:* Clinical interviews were performed assessing patterns of heroin and other drug use prior to, and at multiple timepoints after overdose education and naloxone training. This study compared baseline drug use to that at 1 and 3 months post training.
*Results:* Both current heroin users ($n = 61$) and former users in agonist maintenance ($n = 69$) typically showed decreases in heroin and polydrug use at both 1 and 3 months after training. The Addiction Severity Index drug composite score also decreased at follow up.
*Conclusions:* This analysis found no evidence of compensatory drug use following naloxone/overdose training among two groups of heroin users. These findings support the acceptance and expansion of naloxone distribution to at-risk populations and may assist in allaying concerns about the potential for unintended negative consequences on drug use.



## 1. Introduction

In response to the growing public health epidemic of illicit opioid use and overdose, several states have passed legislation intended to increase access to the opioid antagonist, naloxone (NLX; Centers for Disease Control and Prevention (2015)). Peer-based distribution of NLX has been steadily increasing as a harm reduction tool with over 42 state and local jurisdictions passing laws that allow access to NLX for those at risk of opioid overdose (Prescription Drug Abuse Policy System (PDAS), 2016). While educating drug users about risk factors associated with overdose is not controversial, equipping them with the medication to intervene has been the subject of debate.

One immediate concern with prescribing naloxone to drug users is that if it reduces the perceived negative consequences of drug use, riskier patterns of use may emerge. Concerns about compensatory drug use behavior are a common response to new harm reduction efforts (i.e., needle-exchange; Guydish et al., 1993; Paone et al., 1994). Although prospective studies are rare, drug users in survey studies have indicated that changes in drug use behavior are likely (Seal et al., 2003).

The possibility of compensatory drug use behavior can significantly undermine support for such programs among the public and medical professionals. Therefore, it is important that we empirically assess for changes in illicit drug use among users who receive naloxone. The current study assessed changes in drug use behavior among heroin users prior to, and repeatedly after, training in opioid overdose education and naloxone training. If no evidence of increasing drug use risk behavior is found, these data will help to reduce public resistance to the adoption of these programs. If evidence of riskier drug use behavior is found,

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these data will identify an important unintentional adverse consequence of these programs that should be studied further.

## 2. Methods

Current and former heroin users were recruited within the New York City (NYC) metropolitan area using print and online advertisements, from needle-exchange sites, and through word-of-mouth. Following a brief telephone interview, potential participants who met preliminary study criteria were scheduled for in-person screening visits at the New York State Psychiatric Institute (NYSPI). In-person screening consisted of both self-report and clinical interviews administered by a team of a research assistants, psychologists, nurses, and physicians. In order to be enrolled, participants must have met DSM-IV criteria for opioid dependence within the past 6 months, be able to provide informed consent and comply with study procedures. Participants were excluded from participation if they had an active psychiatric disorder that might interfere with participation or make participation hazardous, (e.g., DSM-IV organic mental disorder, psychotic disorder, or bipolar disorder with mania), or had previous training in opioid overdose prevention. Participants were compensated $25 for screening and $50 for each follow-up visit.

These data were collected as a part of a larger, ongoing study investigating the risks and benefits of overdose training and distribution of naloxone to various opioid-using populations. This prospective study follows individuals for one year after overdose training and receiving naloxone. The training curriculum was based on the standard New York State Department of Health requirements for all naloxone distribution sites, and covered the following topics:

- risks factors for opioid overdose,
- how to recognize an opioid overdose, and
- how to medically intervene, including the use of naloxone.

As a part of this study, participants complete a clinical interview (Cicero, Ellis, Surratt, & Kurtz, 2012) and the Addiction Severity Index (ASI; McLellan, Alterman, Cacciola, Metzger, & O'Brien, 1992) to assess their patterns of heroin and other drug use over the year-long duration of the study. Our primary method of maintaining contact with the participants was a locator form that indicates names, addresses and phone numbers of family members and close friends likely to know the participants' whereabouts, along with permission to contact them in the future. The primary objective of the current secondary analysis was to assess whether participation in naloxone/overdose training alters the pattern and frequency of heroin and non-opioid drug use among non-treatment-seeking heroin users, and heroin users in agonist maintenance therapy (methadone or buprenorphine). These populations were chosen for the current secondary analysis because they are likely to be in close proximity to those who are at risk of opioid overdose, and overdose themselves (CDC, 2015; Darke & Zador, 1996). Though agonist maintenance is protective against overdose, continued illicit drug use is common during agonist treatment, allowing for residual overdose risk (Stancliff et al., 2014).

For the two target populations, data from the assessment batteries above were examined at baseline (BSL; pre-naloxone/overdose training), 1 and 3 months post naloxone/overdose training using repeated-measures analysis of variance (ANOVA). Drug use behaviors known to be risk factors for overdose that would undermine the goals of this harm reduction practice were targeted (Darke & Zador, 1996). More specifically, we compared: quantity of heroin use (bags per day), frequency of polysubstance abuse (mean number of days in the past 30), and ASI Drug Composite Score, an indicator of impairment from drug use. All study procedures were approved by the New York State Psychiatric Institute Institutional Review Board.

## 3. Results

The group of heroin users not in treatment consisted of equivalent numbers of African-Americans (30%), Hispanic/Latinos (37%) and Caucasians (25%) with Asians, multiracial and unidentified individuals comprising the remaining ethnic/racial demographics. Males made up the majority of participants in this group (78%), who had been using heroin for an average of 16.8 years (±10.6). Former heroin users in opioid agonist maintenance also were primarily male (67%) and had used heroin for an average of 18.5 years (±10.7). This group consisted of slightly more African-Americans (36%) and Hispanic/Latinos (41%), in comparison to Caucasians (17%). Our retention rate was 92.5% at 1-month follow up, and 89.9% at 3 months.

Among active heroin users, daily heroin use, quantified in bags per day, decreased slightly at 1 and 3 months in comparison to BSL (Omnibus ANOVA, $p = 0.07$; Fig. 1). Heroin users in agonist maintenance reported significantly less daily heroin use in comparison to active users ($p = 0.02$), but no significant change at 1 and 3 months ($p = 0.11$). Similarly, self-reported recent (previous 30 days) use of "more than one substance" also decreased at each follow-up time point ($p = 0.08$). ASI Drug Composite Score showed a significant overall decrease ($p = 0.002$). Reports of polysubstance use ($p = 0.56$) and ASI drug composite scores ($p = 0.96$) both showed a non-statistically significant decrease.

Alcohol use was relatively low among this sample, with subjects reporting drinking an average of 3–4 days within the past month. These values did not significantly differ between active and maintained groups, and did not significantly change at follow up. Among both groups marijuana, cocaine and benzodiazepines (BZD) were the most commonly used concomitant drugs and their use did not significantly vary across the time points assessed. Among active heroin users 52% reported marijuana (MJ) use within the past 30 days (at BSL), which decreased to 37% and 30% at 1 and 3 month follow-up, respectively. Thirty-three percent of active users reported use of cocaine within the past 30 days, 29% at 1 month and 33% at 3 months. BZD use also failed to change significantly among BSL (22%), 1 month (19%) and 3 months (15%). A similar pattern of 30-day use of these drugs was reported among agonist-maintained participants (Cocaine: BSL = 33%, 1 month = 26%, 3 months = 27%; MJ: BSL = 23%, 1 month = 17%, 3 months = 14%; BZD: BSL = 17%, 1 month = 19%, 3 months = 17%).

## 4. Conclusions

This study sought to describe changes in drug use behavior that may be attributed to receiving training and distribution of NLX, an opioid overdose-reversing medication. Concerns regarding the potential for increases in risk behavior are common in response to harm reduction approaches that encourage safe drug use instead of promoting abstinence. However, as in the current study, these concerns of increased or "compensatory" risk behavior are often unfounded. The current investigation targeted two groups of opioid users: heroin users not in treatment, and individuals in opioid agonist maintenance. Because these two groups are the most at risk of experiencing and/or encountering an opioid overdose, they are the primary target of take-home naloxone programs (Clark, Wilder, & Winstanley, 2014).

Among active heroin users we found that heroin and polydrug use decreased at 1- and 3-month post training. These changes in drug use either approached statistical significance (polydrug use) or were statically significant (heroin use). However, these decreases may be clinically significant as they were accompanied by a significant decrease in ASI Drug Composite score, a measure of impairment resulting from drug use.

As in other studies, we found residual heroin use among those in agonist maintenance treatment (Stancliff et al., 2014). Receiving naloxone/overdose education did not result in changes in heroin and other drug use that might suggest that this intervention would affect efforts to abstain from drug use. Like the self-report measures, slight post-training decreases in ASI score were found. ASI drug composite scores for both groups were qualitatively similar to those reported by other studies (Feelemyer, Des Jarlais, Arasteh, Phillips, & Hagan, 2014).

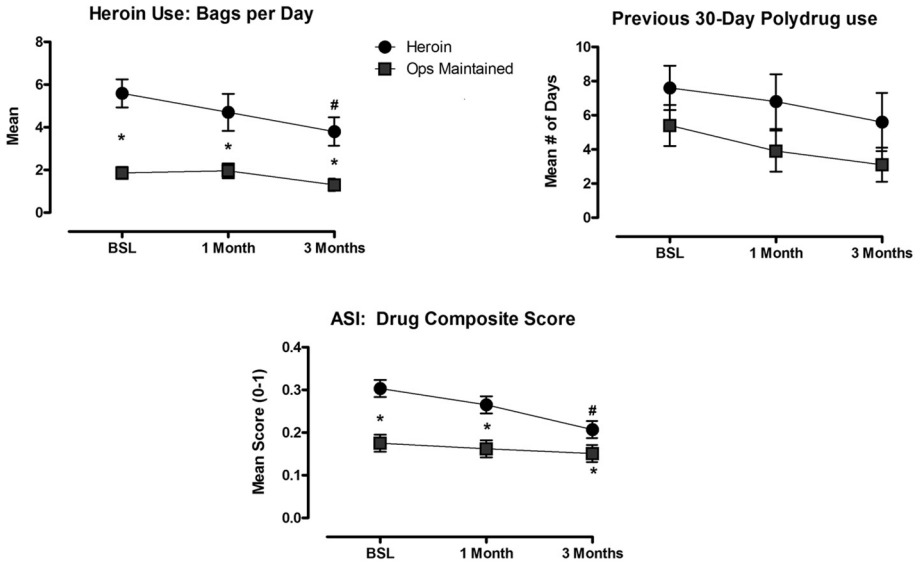


**Fig. 1.** Heroin use, polydrug use, and ASI drug composite score prior to, and 1 and 3 months following naloxone and overdose training. * Indicates a significance difference between active users and those in agonist maintenance at $p < 0.05$. # indicates significant difference from baseline assessment.

The current data do not support the hypothesis that overdose training and naloxone distribution increase drug risk behavior. The decreases in the quantity, frequency, and level of impairment observed in this study, actually support the idea that any clinical contact may be beneficial, particularly for those not engaged in treatment. The authors do urge caution in making causal inferences with this correlational study, as drug use can naturally fluctuate due to a number of individual and environmental factors (e.g., perceived stress, drug quality; Cicero et al., 2012).

An additional limitation of this investigation is its reliance on self-reported measures. Though it is made clear to participants that information concerning their drug use will not affect their participation in the study nor be shared with anyone outside of research staff, it has been shown that users may misrepresent drug use, even when there are no perceived adverse consequences (Jones, Atchison, Madera, Metz, & Comer, 2015). Despite these limitations, the data are encouraging given the staggering increases in opioid overdoses across the county. With evidence growing of the influence of NLX distribution programs to reduce rates of opioid overdose mortality, the current study should attenuate worries about one of its major possible unintentional consequences (Clark et al., 2014).

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