Drug and Alcohol Dependence 179 (2017) 124–130

Contents lists available at ScienceDirect

Drug and Alcohol Dependence

journal homepage: www.elsevier.com/locate/drugalcdep

Full length article

Naloxone use among overdose prevention trainees in New York City: A longitudinal cohort study

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ARTICLE INFO

Keywords:
Overdose
Prevention
Naloxone
Opioid
Opiate
Morbidity

ABSTRACT

Background: Providing naloxone to laypersons who are likely to witness an opioid overdose is now a widespread public health response to the national opioid overdose epidemic. Estimating the proportion of individuals who use naloxone can define its potential impact to reduce overdose deaths at a population level. We determined the proportion of study participants who used naloxone within 12 months following training and factors associated with witnessing overdose and naloxone use.

Methods: We conducted a prospective, observational study of individuals completing overdose prevention training (OPT) between June and September 2013. Participants were recruited from New York City's six largest overdose prevention programs, all operated by syringe exchange programs. Questionnaires were administered at four time points over 12 months. Main outcomes were witnessing or experiencing overdose, and naloxone administration.

Results: Of 675 individuals completing OPT, 429 (64%) were approached and 351 (52%) were enrolled. Overall, 299 (85%) study participants completed at least one follow-up survey; 128 (36%) witnessed at least one overdose. Of 312 witnessed opioid overdoses, naloxone was administered in 241 events (77%); 188 (60%) by the OPT study participant. Eighty-six (25%) study participants administered naloxone at least once. Over one third of study participants (30, 35%) used naloxone 6 or more months after training.

Conclusions: Witnessing an overdose and naloxone use was common among this study cohort of OPT trainees. Training individuals at high risk for witnessing overdoses may reduce opioid overdose mortality at a population level if sufficient numbers of potential responders are equipped with naloxone.

1. Introduction

Nearly half a million Americans died from drug overdose from 2000 to 2014, and during that time the rate of overdose deaths involving opioids tripled (Rudd et al., 2016). In 2014, there were 797 unintentional drug overdose deaths in New York City, making it the third leading cause of premature death after cancer and heart disease (Paone et al., 2015; Zimmerman et al., 2015). Between 2010 and 2014, NYC saw a 42% increase in unintentional overdose mortality, from a rate of 8.2–11.7 per 100,000 residents (Paone et al., 2015).

In response to this growing epidemic, naloxone distribution programs are now legal in all 50 states (Davis et al., 2017). The programs typically permit layperson use of naloxone to reverse opioid overdoses following overdose prevention training (OPT). OPTs target laypeople at risk of overdose and their social networks. OPTs offer information on reducing overdose risk, recognizing the signs of opioid overdose, and responding by calling 911 and administering naloxone, an opioid antagonist that reverses the effects of opioids. OPT results in recognition of opioid overdose and use of naloxone to reverse overdoses, and reduction in opioid overdose mortality (Behar et al., 2015; Gaston et al., 2009; Sherman et al., 2008; Strang et al., 2008; Tobin et al., 2009; Wagner et al., 2010; Walley et al., 2013; Bird et al., 2016). Nationally, overdose prevention programs have distributed naloxone to over 150,000 people and have reported over 26,000 overdose rescues since

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http://dx.doi.org/10.1016/j.drugalcdep.2017.06.029
Received 6 April 2016; Received in revised form 26 June 2017; Accepted 26 June 2017
Available online 24 July 2017

1996 (Wheeler et al., 2015). Underreporting of rescues and uncertainty about naloxone use rates following training, however, limit effective public health planning in scaling up naloxone distribution to achieve population-level impact. In New York State, OPTs prepare reports of overdose rescues when participants return to the OPT and report using naloxone. However, OPT reporting rates vary widely, and many OPTs do not have regular contact with the individuals who they have trained and would not be aware of their naloxone utilization unless they returned to the program.

The few studies that prospectively examine rates of naloxone use among trainees have examined short-term use rates. A recent meta-analysis found that 9%–19% of trainees use naloxone within three months of receiving OPT (McAuley et al., 2010). At six months, three studies found that up to 11% of trainees use naloxone (Gaston et al., 2009; McAuley et al., 2010; Tobin et al., 2009). To our knowledge, only one prior study has followed participants for longer than six months, but a low follow-up rate of 30% limited the reliability of its findings (Dong et al., 2012). To identify the impact of a naloxone distribution program, we sought to determine naloxone use rates at 12 months in a larger sample with more complete follow-up. With the recent national expansion of overdose education and naloxone distribution, there is a pressing need to estimate the proportion of trainees who use naloxone in order to understand the potential population impact and ideal distribution rates for naloxone. To further understand the impact of naloxone distribution, we also determined factors associated with witnessing an overdose, and among those who witness an overdose, factors associated with naloxone use.

2. Materials and methods

2.1. Study design

We conducted a prospective, observational study of individuals completing OPT. Interviewers administered closed-ended questionnaires at four timepoints: immediately following OPT, three, six, and 12 months post-OPT (see Supplementary materials 1 and 2). We attempted to reach participants in person, by mail, phone, and text message up to three months after the 12-month date of the last participant enrolled. For surveys administered after 12 months, outcomes were included only if they occurred within two weeks of the participant's 12-month follow-up date. The institutional review board at NYC Department of Health and Mental Hygiene approved the study protocol. Participants provided written informed consent. NYC Department of Health and Mental Hygiene provided funding for the study.

2.2. Study population

Study participants were recruited using convenience sampling from NYC's six largest overdose prevention programs between June and September 2013. Programs were housed within syringe exchange programs (SEPs) and provided OPT to SEP and non-SEP clients in groups and individually. OPTs were conducted both inside the SEPs and outdoors, typically on the sidewalk as part of syringe exchange outreach; these OPTs were available to the public and not solely to participants using syringe exchange services. OPTs provided intranasal and/or intramuscular formulations of naloxone, free-of-charge, to all OPT participants. To recruit study participants, interviewers approached individuals immediately following OPT. Not all OPTs that occurred during the study period were attended by interviewers; when multiple OPTs occurred simultaneously at different sites, interviewers recruited study participants at the OPT with the highest expected number of trainees. Inclusion criteria were: completion of OPT and receipt of naloxone, age 18 or older, able to complete a survey orally in Spanish or English, and ability to give contact information for future follow-up. For this report, study participants were defined as individuals consenting to participation and completing a baseline survey. Participants were given a gift card worth $5 to $50, increasing over time, at the completion of each questionnaire.

2.3. Outcomes

2.3.1. Witnessing and experiencing drug overdose

Participants were asked at each data collection point if they had witnessed or experienced any drug overdoses since the last data collection point. An overdose was defined as "unresponsive or unable to be woken up, collapsing, having blue skin color, having difficulty breathing, losing consciousness or dying while using drugs." For each witnessed overdose, we inquired about overdose setting (categorized as private; semi-private including shooting gallery, drug treatment program, SEP, shelter; and public), relationship to victim, outcome of the victim, and responses − including naloxone use, 911 calling, rescue breathing and sternal rub. Similar information was collected for overdoses experienced by study participants themselves.

2.3.2. Naloxone administration

For each overdose witnessed following OPT, participants were asked about naloxone administration at the event, and whether the study participant or another bystander had administered naloxone. In order to assess any negative effects of naloxone administrations, we asked the participant to describe responses such as nausea or vomiting experienced by the overdose victim. For overdoses without naloxone administration, the main reason for non-administration was elicited. Participants who experienced an overdose were asked whether naloxone was administered to them by a non-medically trained bystander. Non opioid-related overdoses and events where information about overdose response was missing were excluded.

2.3.2. Independent variables

Independent variables included participant age, gender, race/ethnicity (White, Black/African American, Hispanic/Latino, other), education (less than high school, high school or General Educational Development diploma, some college or college graduate), drug services utilization (SEP participation, methadone maintenance participation only, no SEP or methadone maintenance participation), housing status (stable permanent, temporary, unstable), criminal justice involvement, receipt of public benefits, health insurance, primary care physician, and employment status. Substance use variables included previous 30-day use of: heroin, cocaine/crack, alcohol, and past year injection drug use. Prescription drug use variables included previous 30-day use of prescription painkillers, benzodiazepines, methadone, and buprenorphine, but did not distinguish whether medication use was prescribed or illicit. Overdose experience measures included: lifetime witnessing of an overdose and in the three months prior to OPT; lifetime experiencing of an overdose and in the three months prior to OPT.

2.4. Data analysis and statistics

We conducted descriptive analyses of the study sample and of overdose events. We also conducted bivariable and multivariable analyses to determine factors associated with witnessing an overdose and naloxone administration. The total number of overdoses witnessed, experienced, and naloxone administrations were calculated at each follow-up interval and summed for each study participant and for the total study population. We dichotomized each of these variables to create three study outcomes: witnessing at least one overdose in the 12 months following OPT; experiencing at least one overdose during the study period; and, among study participants who witnessed an overdose, naloxone administration. Naloxone administrations were categorized as occurring at or before 6 months, or between 6 and 12 months. We estimated rates of witnessed overdoses and naloxone administrations.

Using logistic regression, we calculated odds ratios, 95% confidence