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From Peers to Lay Bystanders: Findings from a Decade of Naloxone Distribution in Pittsburgh, PA

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ABSTRACT

Distribution of the opioid overdose reversal drug naloxone has been central to efforts to combat the ongoing opioid epidemic in the United States. This report presents data from Prevention Point Pittsburgh (PPP), a public health advocacy and direct service organization that has operated an overdose prevention program (OPP) with naloxone distribution since 2005. The program initially provided naloxone training and distribution only to people who use opioids (PWUO). In 2015, a change to state law enabled PPP to provide naloxone to anyone in a position to respond to an opioid-related overdose. This report examines the characteristics and naloxone-related experiences of 1330 PWUO trained in overdose prevention and naloxone administration by PPP between January 1, 2006, and December 31, 2015, and compares rates of return for a naloxone refill by PWUO and the 619 non-users trained between January 1, 2015, and December 31, 2015. While larger numbers of individuals obtained naloxone after state law changed, PWUO—especially heroin users—were significantly more likely to reverse an overdose and return to PPP for a naloxone refill. Based on these findings, we recommend that resource-limited, community-based organizations prioritize the distribution of naloxone to PWUO.

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Background

During 2015, more than 50,000 Americans died from overdose, two-thirds (63.1%) of whom were killed by opioids or opioids in combination with other drugs (Rudd 2016). In response, the number of opioid overdose (OD) prevention programs offering naloxone has ballooned (U.S. Food and Drug Administration 2015). Although the misuse of prescription opioids (POs) remained relatively constant from 2007–2012, the number of people reporting past-year heroin use in the United States (US) nearly doubled, from 373,000 to 669,000 (Substance Abuse and Mental Health Services Administration (SAMHSA) 2013). Recent studies have shown that many current heroin users in the US used POs non-medically prior to initiating heroin use. Heroin carries a potentially greater risk for OD for PWUO, and the number of fatal heroin overdoses more than tripled between 2010 and 2013 (Cicero et al. 2014; Hedegaard, Chen, and Warner 2015; Jones 2013; Mars et al. 2014; Mateu-Gelabert et al. 2015; Novak et al. 2015). More recently, a surge in the availability of illicitly manufactured synthetic opioids, particularly fentanyl, appears to be driving a significant increase in opioid overdose deaths (Green and Gilbert 2016).

Beginning in the late 1990s, community-based organizations and state and local health departments built on the work of Chicago Recovery Alliance (CRA), and efforts in Vancouver, to develop overdose prevention programs (OPP) in response to increasing overdose fatalities across the US (Centers for Disease Control and Prevention 2012; Kinner et al. 2012; Wheeler et al. 2015). Since then, programs aimed at preventing opioid-related overdose have grown considerably. While details vary by state and program, these initiatives provide naloxone to PWUO, and often to their peers and families. Some programs also provide overdose training and naloxone to staff at drug treatment programs, as well as first responders, including law enforcement and fire department personnel (Clark, Wilder, and Winstanley 2014; Compton et al. 2013; Kim, Irwin, and Khoshnood 2009; Oliva 2014; Rando et al. 2015; Walley et al. 2013; Wheeler et al. 2012). These efforts have resulted in greater access to

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naloxone for many individuals who might not otherwise have access to the medication (Compton et al. 2013; Lenton et al. 2009; Maxwell et al. 2006; Prescription Drug Abuse Policy System (PDAPS) 2016; Sherman et al. 2008). Several recent systematic reviews of take-home naloxone programs found that they reduced OD mortality with few adverse events (Clark, Wilder, and Winstanley 2014; Giglio, Li, and DiMaggio 2015; McAuley, Aucott, and Matheson 2015; McDonald and Strang 2016).

To date, little research has addressed differences in naloxone use between PWUO and other potential bystanders, such as friends and family members. We analyzed data collected from Prevention Point Pittsburgh's (PPP) OPP between January 1, 2006, and December 31, 2015. We report on the characteristics of 1330 people who use opioids (PWUO) and received training and naloxone from PPP, as well as their reports of using naloxone to reverse an overdose and events of returning for a refill between January 1, 2006, and December 31, 2015. These data are compared with those of 619 non-PWUO trained between January 1, 2015, and December 31, 2015. In 2015, ACT 139 allowed non-PWUO (e.g., family and friends) to receive naloxone in Pennsylvania. Therefore, the implementation of ACT 139 and resulting policy change have allowed us to make this comparison.

Methods

Intervention

After reviewing procedures and protocols established by national experts and consulting with other similar organizations, PPP developed an OPP curriculum, targeting individuals at risk of opioid overdose. Trainings were conducted at the syringe exchange program (SEP) in the Oakland area of Pittsburgh (Bennett et al. 2011).

Program participants were offered the OPP intervention on their initial visit and on each subsequent visit to the SEP. For those who chose to participate, PPP staff trained in data collection and service delivery conducted OPP trainings, which lasted approximately 20 minutes. In most cases, trainings consisted of an 11-minute video with time for questions and hands-on demonstration if needed, although in some cases training was verbal with hands-on demonstration and time for questions. In all cases, participants were also provided with print materials. Trainings were conducted in English. A Spanish-language version of the video is available, but Allegheny County has only 2% of the population who report speaking English "less than well," and there was no need for training in another language. Between 2005 and 2014, volunteer physicians prescribed naloxone (generic, injectable 0.4 mg/ml) to individuals who completed the training, and naloxone was provided on-site and without cost immediately following the training. A medical record was opened for each participant prior to the training in accordance with clinical practice care standards. In December 2014, new state legislation allowed third-party naloxone prescription and standing-order prescription of naloxone, which permitted the medication to be dispensed to people who were not themselves at risk of overdose, and without a prescriber being on-site. Implementation of this law (Act 139) made it possible for trained staff to offer broader distribution of naloxone, to laypersons other than PWUO, in non-SEP venues, as well as at mobile SEP sites in other communities in Pittsburgh without on-site access to a prescriber.

Sample

We report on data collected between January 1, 2006, and December 31, 2015. Between 2006 and 2014, participants in the OPP were SEP clients who expressed interest in attending an overdose prevention training and receiving naloxone. In that timeframe, the majority of SEP clients were active injection drug users who live in Allegheny County and the surrounding area (see Table 1). During the period 2006–2014, a total of 1,085 individuals participated in the OPP andreceived naloxone. Beginning in January 2015, the implementation of Act 139 allowed for third-party distribution of naloxone such that SEP staff could train and distribute naloxone to friends and family members of at-risk opioid users. During 2015, 245 PWUO and 619 non-opioid-using persons were trained and provided with naloxone. Of these 619, 15% reported past-six-month use of alcohol, 3% reported past-six-month use of benzodiazepines, 1% reported past-six-month use of stimulants (methamphetamine and/prescription stimulants), and 1% reported past-six-month use of cocaine); 4% reported that they had themselves overdosed at some time in their lives.

Measures

Data presented here are collected from two sources: (1) a medical history form completed by participants prior to the OPP training; (2) a naloxone refill questionnaire completed by participants when they return to refill their naloxone prescription (Bennett et al. 2011).

Medical history form

Prior to conducting a training, PPP staff ask that interested clients fill out a paper medical history form. Staff assist

Table 1. Number trained and participant characteristics by year (N = 1,949).[a]

Training Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2015 Non-PWUO
N	121	123	123	104	107	107	139	136	125	245	619
% Male	62	72	68	60	72	69	66	60	61	52	33
% Under 40	73	68	75	79	68	58	57	54	62	55	31
Race/ethnicity											
% White	88	91	93	97	80	91	85	84	90	86	93
% Black	5	7	3	2	17	5	13	13	9	12	5
% Other	7	3	3	1	3	4	2	3	2	3	2
% Ever refill2	28	33	28	31	38	30	27	33	22	11	1
% Refilled within 1 year[b]	16	19	20	16	23	19	23	23	20	11	1
Total number of uses (average per trainee)[c]	191 (1.6)	159 (1.3)	147 (1.2)	99 (1.0)	214 (2.0)	102 (1.0)	151 (1.1)	120 (0.9)	59 (0.5)	32 (0.1)	7 (0.01)
% Ever witnessed an overdose	68	74	70	61	80	80	73	71	73	71	35
% Witnessed overdose death	11	16	14	13	16	21	14	13	18	19	8
% Experienced overdose	37	42	41	37	42	39	46	46	39	42	4
% Used heroin	92	95	96	91	94	91	89	93	92	79	0
% Used prescription opioids	77	72	76	73	69	68	58	60	60	57	0
% Used heroin and prescription opioids[d]	69	68	72	64	63	59	47	53	52	37	0
% Used alcohol	52	57	59	52	45	40	39	41	38	41	15
% Used benzodiazepines	19	14	14	11	11	13	9	9	10	49	3
% Used cocaine	64	56	42	45	51	44	27	36	42	35	1
% Used stimulants	1	1	3	0	0	1	0	0	1	10	1
% Poly-drug use[e]	69	62	47	47	52	47	32	39	46	7162	0

[a]Sample includes 1330 people who use opioids (PWUO) trained during 2006–2015, and 619 people who do not use opioids (non-PWUO) trained during 2015.
[b]Refilled naloxone prescription after original prescription was used on person experiencing opioid overdose.
[c]Number of uses on a person calculated by year of training.
[d]For combined use of heroin and prescription opioids, missing data on either drug was treated as non-use (in contrast, for "used heroin" and for "used prescription opioids" non-response was treated as missing data).
[e]Poly-drug use was defined as use of opioids and use of one or more of stimulants, cocaine, alcohol, or benzodiazepines.

participants with literacy or other cognitive impairments with completing the form. Participants report their age, race/ethnicity, and gender; current and past-six-month drug use (type of drugs, amount, and frequency of use); number of times they have overdosed; as well as information about overdoses they had witnessed.

Naloxone refill questionnaire

Staff collect data from clients who used the previouslyprescribed naloxone and returned to the site for a refill. At the time of the initial training, staff encourage all participants to return for a free refill of naloxone as soon as the medication is used, given away through their social networks, lost, expired, or confiscated by police. When participants return for a refill, they are asked about their overdose experiences, including details about the date of naloxone use, amount used, body site of naloxone injection, whether 911 was called, whether rescue breathing was used, overdose symptoms witnessed, the drugs involved, and the overdose victim's status at the end of the event (e.g., "person okay," "went to ER," "died"). The overall proportion refilling a naloxone prescription after the original dose was administered on a suspected overdose victim and the proportion refilling within one year of training were tabulated by training year.

Analysis

Data analyses consist of descriptive statistics and bivariate logistic regressions reporting returning for a refill after use on a person by characteristic. SPSS v. 17 was used for analysis.

Results

Participant characteristics

Between 2006 and 2014, PPP annually provided between 104 and 139 PWUO with overdose response training and overdose reversal kits containing naloxone (see Table 1). In 2015, 245 PWUO and 619 non-opioid users were trained, for a total of 864 people trained that year. The majority of PWUO trained were men, but most non-opioid users trained were women. The average age for PWUO was 46.9 (standard deviation [SD] = 14.12), while the average age for non-PWUO was 37.0 (SD = 13.04). The majority of trainees were White PWUO who used heroin or POs and between 37% and 72% used both. The percentage of PWUO reporting PO ranged between 57% and 77%. The percentage reporting heroin use ranged from 89% to 96% in years 2006–2014 and dropped to 79% in 2015. The percentage reporting using other drugs and alcohol varied across time, with smaller percentages reported among non-users. Very small numbers of PWUO reported use of stimulants; however, this number increased to 10% in 2015. Polysubstance use (defined as past-six–month use of opioids plus one or more of stimulants, cocaine, alcohol, or benzodiazepines) ranged from 47% to 69% across the study period.

Tables 1 and 2 show the proportion of people returning for a refill of naloxone after the original kit was used on a person experiencing a suspected opioid overdose by training and participant characteristics. The proportion of naloxone refills generally increases over time as more naloxone doses are used; however, the proportions of ever returning for a naloxone dose refill are similar across years 2006–2014. The refill proportion within approximately one year after training was between 11% and 23% for PWUO. Participants who were male or who reported using alcohol were significantly more likely to return for a naloxone refill.

Table 2. Percentage of PWUO returning for a refill after use of provided naloxone and bivariate odds ratios predicting returning for a refill, 2006–2015. $N = 1330$.

Characteristic	*N*	(%)	% Refilled	OR (95% CI)
Training Year**				
2006	121	(9.1)	28.1	–
2007	123	(9.3)	32.5	1.2 (0.7, 2.1)
2008	123	(9.3)	27.6	1.0 (0.6, 1.7)
2009	104	(7.8)	30.8	1.1 (0.6, 2.0)
2010	107	(8.1)	38.3	1.6 (0.9, 2.8)
2011	107	(8.1)	29.9	1.1 (0.6, 1.9)
2012	139	(10.5)	27.3	1.0 (0.6, 1.7)
2013	136	(10.2)	33.1	1.3 (0.7, 2.2)
2014	125	(9.4)	22.4	0.7 (0.4, 1.3)
2015	245	(18.4)	11.1	0.3 (0.2, 0.6)
Sex**				
Male	832	(62.6)	29.4	–
Female	492	(37.0)	21.3	0.6 (0.5, 0.8)
Racial/ethnic category				
White	1128	(88.1)	26.9	–
Black	116	(9.1)	20.7	0.7 (0.4, 1.1)
Other	37	(2.9)	21.6	0.7 (0.3, 1.6)
Age group				
Under 40	838	(63.1)	26.8	–
40 and older	481	(36.2)	24.9	0.9 (0.7, 1.2)
Ever witnessed an overdose				
No	371	(27.9)	24.8	–
Yes	958	(72.1)	27.0	1.1 (0.9, 1.5)
Ever witnessed an overdose death				
No	1122	(84.4)	26.4	–
Yes	207	(15.6)	26.6	1.0 (0.7, 1.4)
Ever experienced an overdose				
No	780	(58.7)	25.5	–
Yes	549	(41.3)	27.7	1.1 (0.9, 1.4)
Used heroin*				
No	131	(9.9)	17.6	–
Yes	1198	(90.1)	27.4	1.8 (1.1, 2.8)
Used POs				
No	456	(34.3)	25.7	–
Yes	873	(65.7)	26.8	1.1 (0.8, 1.4)
Used heroin and POs				
No	587	(44.2)	23.9	–
Yes	7492	(55.8)	28.4	1.3 (1.0, 1.6)
Used alcohol**				
No	720	(54.2)	23.5	–
Yes	608	(45.8)	29.9	1.4 (1.1, 1.8)
Used benzodiazepines				
No	1076	(81.0)	27.0	–
Yes	252	(19.0)	24.2	0.9 (0.6, 1.2)
Used cocaine				
No	757	(57.0)	25.1	–
Yes	572	(43.0)	28.1	1.2 (0.9, 1.5)
Used stimulants				
No	1297	(97.6)	26.7	–
Yes	32	(2.4)	15.6	0.5 (0.2, 1.3)
Poly-substance use				
No	652	(49.1)	26.4	–
Yes	677	(50.9)	26.4	1.0 (0.8, 1.3)

Note. OR = Odds ratio, CI = confidence interval. Sample sizes differ due to missing data. * $p < 0.05$, ** $p < 0.01$, as indicated by Wald tests.

Most PWUO had witnessed an overdose at some time in their lives, while a minority of non-users had. The percentage reporting ever witnessing an overdose death ranged from 11% to 21% across time for PWUO and was 8% for non-users. From 37% to 46% of PWUO in each year reported ever experiencing an overdose themselves, while 4% of (current) non-users had. The average number of uses on a person ranged from 0.9 to 2.0 per participant from 2006–2013, and was 0.5 in 2014 and 0.1 in 2015.

For 2015, the proportion returning for a refill among PWUO was 11.0%, while that for non-users was only 1%, a statistically significant difference (odds ratio = 25.4, 95% confidence interval = 7.6, 84.7). Indeed, out of 619 non-PWUO trained in 2015, only a single one returned for a naloxone refill after using naloxone on a suspected overdose.

Discussion

From 2006–2014, PPP trained and provided naloxone exclusively to people who reported using opioids themselves and documented a very high ratio of overdose reversals to the number of individuals who received naloxone rescue kits. The ratio of trainings to reversals was roughly 1:1—for every person trained each year over the cumulative first 10 years of the program, there was approximately one overdose reversal reported. Many people reversed multiple overdoses of others (see Tables 1 and 2). At the end of 2014, Pennsylvania enacted Act 139, which allowed third-party prescribing of naloxone and distribution of naloxone by standing order. PPP was able to provide naloxone to a dramatically increased number of people after this change went into effect (in 2014, 157 new people received naloxone from the OPP, not including refills, and in 2015, 864 new people received naloxone). Less than a third of the trainees who received naloxone from PPP in 2015 reported opioid use themselves, compared to 100% in previous years. In 2015, trainees who did not use opioids themselves reported that they had friends or family members who they felt were at risk or worked with people who might be at risk of overdose and so wanted to have naloxone in case of emergency.

Increasing community-based organizations' naloxone supplies is critical to reducing preventable opioid overdose death—four to eight times as much naloxone as has been distributed to laypersons via community-based programs would need to be distributed for the maximum overdose mortality reduction effect to be achieved (Green and Doe-Simkins 2016). Walley and

colleagues (2013) found a dose-response-type relationship where the more naloxone rescue kits in a community, the larger the reduction in overdose deaths. Bird and colleagues propose that initiatives should aim to issue naloxone rescue kits to at-risk people in quantities 20 times the number of fatal opioid overdoses recorded in the previous year (Bird, Parmar, and Strang 2015).

The change in legislation in Pennsylvania beginning in 2015 resulted in a dramatic increase in the number of people who received overdose education and naloxone overdose reversal kits. The major intent of those legislative efforts was to remove barriers that impeded access to naloxone, resulting in greater rates of overdose reversals. Our study indicates a successful improvement in naloxone access in 2015 compared to previous years, when it was only available to people at risk with an individual prescription. However, the second part of the intention of the legislation—that increased access would result in increased overdose reversals with naloxone—is less clear. The number of overdose reversals increased at a much more gradual rate than the increase in naloxone distributed, comparable to increases in previous years. While many more individuals received naloxone, the reports of using naloxone to reverse an overdose continued to come primarily (90%) from people who reported opioid use themselves. This corresponds with data from other programs in diverse geographical areas (Rowe et al. 2016; Walley et al. 2013), suggesting that most overdose reversals are accomplished by people who use drugs themselves, reversing potentially fatal ODs in their community.

As more communities are beginning to equip law enforcement officers and other first responders with naloxone, research is emerging that suggests that law enforcement and firefighters can increasingly play a role in reducing overdose fatality by administering naloxone when responding to an overdose(Davis et al. 2014; Rando et al. 2015; Ray, O'Donnell, and Kahre 2015). Our work in Allegheny County indicates that although police officers are beginning to carry naloxone and are being trained in overdose reversal techniques, many PWUO in overdose situations remain reluctant to call 911 due to fear of police action (Bennett et al. 2011).

Opioid overdose is at epidemic levels, and anyone who knows or works with a person who uses opioids should have naloxone on hand and be prepared to intervene in the event of an overdose. We found, however, that among individuals who access naloxone at PPP, those who use drugs themselves were much more likely to be present when an overdose occurred. Further, a larger proportion of those who report heroin use and polysubstance use used naloxone during an overdose emergency and returned for a refill, which suggests that people engaged in high-risk drug use are embedded in high-risk networks. This provides a unique opportunity to intervene in overdose emergencies. These and others' findings underscore the need to facilitate and fund low-threshold programs in many community settings, including SEPs, substance use disorder treatment programs, homeless shelters, jails, and free clinics that supply naloxone directly to PWUO.

Limitations

The data used in this analysis are self-reported, and there is potential for social desirability when communicating with program staff; reports of drugs use may be over- or underreported. Non-opioid users may be less likely to report drug overdose events because they were not SEP participants and therefore not returning to the SEP site each week. Even though all individuals trained by PPPs OPP, whether at the SEP or in the community (PWUO or non-users), are encouraged to report an overdose mortality or reversal to PPP staff immediately, underreporting of naloxone use is possible. To minimize this, individuals who received naloxone from PPP were offered a variety of methods for reporting via phone, e-mail, or social media, in addition to in-person reporting at the SEP. Because PWUO in the study were primarily people who use heroin intravenously reached through the syringe exchange program, findings may not be generalizable to other opioid-using populations, including those who receive opioid prescriptions for chronic pain. Another limitation of the study is that we compare two time periods of different lengths—the 10 years prior to ACT 139 with one year after ACT 139.

Conclusions

While recent legal changes have enabled broader distribution of naloxone, our findings reinforce the need to focus naloxone distribution efforts on opioid users themselves, especially in resource-constrained settings (Davis and Carr 2015). This study adds to the growing body of literature demonstrating the salient and continuing relevance and life-saving value of community-based OPPs that equip PWUO with the skills and tools to identify and respond to an opioid-related overdose with naloxone, and suggests that such efforts should take precedence over initiatives aimed at individuals who do not use opioids.

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