ORIGINAL ARTICLE

Facilitators and Barriers to Naloxone Kit Use Among Opioid-Dependent Patients Enrolled in Medication Assisted Therapy Clinics in North Carolina

Prasana Khatiwoda, Rae Jean Proeschold-Bell, Christina S. Meade, Lawrence P. Park, Scott Proescholdbell

BACKGROUND Naloxone—an opioid antagonist that reverses the effects of opioids—is increasingly being distributed in non-medical settings. We sought to identify the facilitators of, and barriers to, opioid users using naloxone kits in North Carolina.

METHODS In 2015, we administered a 15-item survey to a convenience sample of 100 treatment seekers at 4 methadone/buprenorphine Medication Assisted Therapy (MAT) clinics in North Carolina.

RESULTS Seventy-four percent of participants reported having ever gotten a naloxone kit; this percentage was higher for females (81%) than males (63%) (P = .06). The primary reason given for not having a kit was not knowing where to get one. Only 6% had heard of kits from the media and only 5% received one from a medical provider. Among kit recipients, 56% of both females and males reported mostly or sometimes carrying the kit, with additional participants reporting always. Reasons for not carrying a kit were no longer being around drugs, forgetting it, and the kit being too large. Men discussed the difficulties of carrying the naloxone kits, which are currently too large to fit in a pocket. Ninety-four percent of naloxone users reported intending to call emergency services in case of an overdose emergency.

LIMITATIONS Study limitations included a small sample, participants limited to MAT clinics, and a predominantly white sample.

CONCLUSIONS MAT treatment seekers reported a willingness to carry and use naloxone kits. Education, outreach, media, and medical providers need to promote naloxone kits. A smaller kit may increase the likelihood of men carrying one.

Naloxone is an opioid-antagonist drug that can be administered to persons experiencing opioid overdose in order to reverse the overdose and save lives. Naloxone was developed in 1961 and has been widely used around the world by medical professionals, especially Emergency Medical Services (EMS). It is increasingly being administered by community members as a harm reduction strategy. The idea of distributing naloxone directly to community members rather than medical providers was first suggested in 1992 [1], and in 1995, Germany and England became the first countries to distribute naloxone to opioid users and their friends and family members [2]. Naloxone distribution is an innovative harm reduction strategy as it acknowledges the important role that friends and family play in overdose prevention. The current study focuses on naloxone use in the state of North Carolina and the factors that influence people's decisions to obtain and carry a naloxone kit.

Overdose

The Centers for Disease Control and Prevention (CDC) has reported drug overdose as the leading cause of injury related deaths in the United States, with more than 64,000 drug overdose deaths. The majority of these deaths are opioid-related, accounting for 42,000 in 2016 alone [3]. The rate of drug overdose deaths from opioids varies across states. In 2015, West Virginia had the highest drug overdose death rate (41.5 per 100,000 population), and Nebraska had the lowest rate (6.9 per 100,000) [4]. In North Carolina, in 2015, the overdose death rate was 15.8 per 100,000 people [4] and from 1999 to 2016, more than 12,000 people died in North Carolina due to opioid-related overdose [5].

Risk factors for opioid overdose deaths, other than large drug dosage, include intravenous administration, poly drug use, and drug impurity [6, 7]. In addition, abstinence for even brief periods of time (eg, due to incarceration or hospitalization) and then returning to use increases the risk of overdose [7]. The CDC recommends strategies to mitigate risk, including offering naloxone, for patients at elevated risk of overdose [8].

Naloxone

In the United States, naloxone was approved by the Food and Drug Administration in 1971 and became the drug of choice to reverse overdoses in hospital settings [9]. Naloxone is highly effective [10], safe to use, has no potential for abuse or effects on individuals who have not taken opioids [11], and requires minimal training to use [12]. Because

Electronically published May 7, 2018.

Address correspondence to Rae Jean Proeschold-Bell, Duke Global Health Institute, Box 90392, Durham, NC 27708 (Rae.jean@duke.edu).

N C Med J. 2018;79(3):149-155.
0029-2559/2018/79302

many overdoses take place in the company of others [1] with sufficient time to act, the morbidity and mortality associated with opioid overdose is largely preventable with the timely administration of naloxone, followed by seeking emergency medical care.

In 2013, North Carolina passed Senate Bill 20, which came into effect in April 2013, and Senate Bill 154, which came into effect in 2015. These bills encompassed both a 911 Good Samaritan Law and a Naloxone Access Law. Senate Bill 20 allows medical providers in North Carolina to prescribe naloxone to a person to use on others, and also provides immunity from prosecution for possession of small amounts of drugs and drug paraphernalia for those who seek medical care for a person who is overdosing, as well as for the person overdosing. Senate Bill 154 further expanded protections for 911 callers to include protection from having their probation or parole violated and included pharmacists on the lists of groups immune from civil or criminal liability for dispensing naloxone [13].

In June 2016, the state health director of North Carolina signed a standing order for naloxone to authorize any pharmacist in the state and licensed by the North Carolina Board of Pharmacy to dispense naloxone to any person who voluntarily requests naloxone and is: at risk of experiencing opiate-related overdose, or is a family member or friend of a person at risk of experiencing opiate-related overdose and is in the position to assist them [14]. Currently in North Carolina, more than 64% of retail pharmacies (over 1,600) are participating [14].

North Carolina Harm Reduction Coalition: Overdose Prevention Project

The North Carolina Harm Reduction Coalition (NCHRC) Overdose Prevention Project began in August 2013, and by 2016 had over 700 volunteer contractors who helped dispense free naloxone kits at various locations across North Carolina. As of March 28, 2018, it had distributed 62,000 free naloxone kits, leading to the reversal of 10,369 community reported overdoses [15]. The overdose prevention data are based on the reports of people who inform NCHRC staff about their experiences using the kit, usually when asking for a replacement kit or through outreach activities, and thus may underestimate the actual number of reversals.

A NCHRC naloxone kit contains 2 1-mL single-doses of naloxone in 2 separate vials placed inside a small, clear, UV-protected plastic pouch, 2 3-mL 23 gauge intramuscular (IM) syringes, a brochure explaining how to recognize overdose and how to load and administer naloxone, and contact information and information about the 911 Good Samaritan and Naloxone Access Law (2013's SB20 and 2015's SB154). It also contains a label with the prescribing physician's name, the date of prescription, and the serial number. Little research has been done on the actual use of naloxone kits in the field, and the current literature is limited in reporting what encourages people to get and carry a naloxone kit.

The current study sought to identify the facilitators of, and barriers to, using naloxone kits among opioid users enrolled in Medication Assisted Therapy (MAT) clinics. It aimed to identify: 1) how opioid users on methadone/buprenorphine treatment at MAT clinics hear about naloxone kits and what factors relate to them getting the kit for themselves; and 2) perceived facilitators of, and barriers to, carrying the kit, using it, and calling 911 when witnessing an overdose or a near overdose.

Methods

Recruitment and Data Collection

The sampling procedure was purely convenience sampling. We recruited participants between June and August 2015 at 4 MAT clinics where the NCHRC was performing outreach activities in 3 North Carolina cities: Hickory, Asheville, and Durham. We visited a single clinic on a single day, only approaching the clients who were there for treatment on that particular day. We did not return to the same clinic, but rather waited a few weeks and visited another clinic in a different city. This likely prevented repeating the survey with the same respondent twice.

Eligibility criteria included: age over 18 years, English fluency, and familiarity with naloxone. Eligible individuals were asked to participate in an anonymous survey about naloxone. We did not track the number of individuals who declined to respond. We approached each MAT clinic client that day while they were waiting in line and first asked if they had ever heard of naloxone and then whether they were interested in participating in a survey on naloxone kits. Because the NCHRC had been conducting naloxone kit outreach in these clinics, nearly all clients indicated having heard of naloxone. Those who elected to participate in the survey were verbally consented. Following the verbal consent, participants were handed a 15-item paper survey to complete with pen or pencil. For those with limited reading capability, we read the questions aloud in private. As compensation for their time, we provided light refreshments (eg, donuts). All procedures were approved by the Duke University Arts & Sciences Institutional Review Board.

Survey Items

We drafted survey items and reviewed them with 3 NCHRC staff members who were knowledgeable about naloxone kit distribution programs in North Carolina and individuals who use opioids. We then piloted the survey with 10 MAT clinic clients (their data was not included in this study). Based on questions from these pilot participants, we refined the items for clarity and flow, and included additional response options.

Analysis

We conducted univariate frequencies to characterize the sample on gender, race, receipt of a kit, carrying the kit, using the kit, witnessing overdose, receiving training on kit

use, confidence level with kit use, desire for changes in the law, and willingness to call 911. These data are presented as counts and percentages.

To examine the relation between the outcome variables (getting the kit, carrying the kit, and using the kit) and selected predictor variables, we conducted cross tabulation analysis and report the frequency and percentages. We used Fisher's Exact Test to assess the strength of the statistical associations between variables. All statistical analyses were conducted with SPSS version 22.

We analyzed open-ended survey questions through qualitative content analysis of the responses. We listed and coded responses with definitions and provided examples. The first author assigned each participant response a code. A collaborator then independently coded all responses. In a few cases, the 2 coders assigned different codes, in which case they discussed them until they reached agreement on the same code.

Results

A total of 100 participants from MAT clinics in Hickory (N = 36), Durham (N = 38), and Asheville (N = 26) took the survey. Gender was missing for 1 participant and race for 2 participants. The sample was 58% (N = 58) female and predominantly white (90.8%, N = 89), with 7.1% (N = 7) identifying as black or African American, and 2% (N = 2) as "other."

Facilitators and Barriers to Hearing About and Getting the Naloxone Kit

Most participants (75%, N = 75) reported ever having heard about naloxone kits from the NCHRC or MAT; a few reported having heard about them from family and friends (19%, N = 19), and only 6% (N = 6) reported ever having heard about naloxone kits from the media.

Overall, 74% (N = 74) of participants reported having ever gotten a naloxone kit (see Table 1); this percentage was higher for females (81%, N = 47) than males (63%, N = 26) (P = .06). A majority of kit recipients reported receiving a kit from the NCHRC (68%, N = 50) or from a harm reduction coalition other than the NCHRC (14%, N = 10); 13% (N = 10) indicated receiving one from a friend or family member and only 5% (N = 4) indicated receiving one from a doctor or paramedic. In terms of training, 62% (N = 36) of female participants and 46% (N = 19) of male participants reported that they had received training on using naloxone kits.

Among those who had never gotten a kit (26%, N = 26), the primary reported barrier was not knowing where to get one (50%, N = 13), followed by not perceiving a personal risk of overdose (15%, N = 4), not knowing it was available (12%, N = 3), no specific reason (12%, N = 3), concern that their children would get ahold of the kit (8%, N = 2), and fear of discrimination or prosecution by the police (4%, N = 1).

Facilitators and Barriers to Carrying the Naloxone Kit

Of the 74 participants who had gotten a kit, potentially interesting gender differences emerged, although they were not statistically significant. A higher percentage of females (24%, N = 11) than males (12%, N = 3) reported always carrying the kit, and correspondingly, a higher percentage of males (32%, N = 8) than females (20%, N = 9) reported never carrying the kit (see Table 2). Higher percentages of participants who had friends or family members with naloxone kits reported that they themselves always carried a kit, although again, these differences were not statistically significant.

Fifty-eight participants reported having received a kit but not always carrying it. Figure 1 depicts the primary reported reason. High frequency responses were no longer being around drugs, the kit being too large, and forgetting to carry it. Among the 41 participants who responded that they sometimes or mostly carry a kit, 61% (N = 25) said they sometimes or mostly carry it when they go out to a place such as a club, party, or festival where they think people might need it. As one female participant stated in the survey: "When I go places, big parties, when I know a person might need a kit." On the survey, men described the kit as too large and awkward to carry, stating it cannot fit in a pocket. As a male participant stated in the survey: "It's too big to carry in my pocket, so I leave it in my backpack and often times I just forget it in my car."

Facilitators and Barriers to Using the Kit

Of the 72 participants who had witnessed an overdose, 29% (N = 21) reported being in possession of a naloxone kit at the time. Among those who had a kit with them, 86% (N = 18) reported using it. The survey included an open-ended question asking participants who did not use the kit why they did not use it. Three participants had not used the kit, and each indicated that they did not know how to use it.

Willingness to Call 911 and Opinions on Current Law

In response to the question, "Would you ever call 911 after witnessing an overdose or a near overdose?", 94% (N = 94) of all participants stated that they would. The most common reasons reported for not calling were not trusting the police and preferring to take action by oneself.

Despite the vast majority indicating willingness to call 911 themselves, 68% (N = 68) of participants reported wanting changes in current laws to make it easier for people to call 911 when they witness an overdose or near overdose. The most frequently cited concern was the need for greater protection for callers to ensure that police do not charge them for being present at the scene.

Discussion

Death due to overdose has become a major public health problem in the United States. With the drug naloxone, mor-

TABLE 1.
Experience with Overdose and Naloxone Kits by Gender

	All participants, N = 100 % (N)	Male, N = 41 % (N)	Female, N = 58 % (N)
Have you ever gotten a kit?			
Yes	74.0 (74)	63.4 (26)	81.0 (47)
No	26.0 (26)	36.6 (15)	19.0 (11)
Have you ever been trained in using a naloxone kit?			
Yes	56.0 (56)	46.3 (19)	62.1 (36)
No	44.0 (44)	53.7 (22)	37.9 (22)
How confident are you that you can use a naloxone kit right now?			
Not at all confident	4.0 (4)	7.3 (3)	1.7 (1)
Slightly confident	7.0 (7)	4.9 (2)	8.6 (5)
Moderately confident	16.0 (16)	19.5 (8)	13.8 (8)
Very confident	35.0 (35)	36.6 (15)	32.8 (19)
Extremely confident	38.0 (38)	31.7 (13)	43.1 (25)
Have you ever witnessed an overdose?			
Yes	72.0 (72)	78.0 (32)	67.2 (39)
No	28.0 (28)	22.0 (9)	32.8 (19)
Have you ever used the kit? (N = 21)			
Yes	85.7 (18)	90.9 (10)	80.0 (8)
No	14.3 (3)	9.1 (1)	20.0 (2)
Would you call 911 after witnessing an overdose?			
Yes	94.0 (94)	90.2 (37)	96.6 (56)
No	6.0 (6)	9.8 (4)	3.4 (2)
Do you think there needs to be a change in the law?			
Yes	68.0 (68)	65.9 (27)	69.0 (40)
No	32.0 (32)	34.1 (14)	31.0 (18)
Do you have one or more friends who carry naloxone/Narcan kit?			
Yes	51.0 (51)	39.0 (16)	60.3 (35)
No	49.0 (49)	61.0 (25)	39.7 (23)
Do you have one or more family members who carry naloxone/ Narcan kit?			
Yes	26.0 (26)	19.5 (8)	31.0 (18)
No	74.0 (74)	80.5 (33)	69.0 (40)

Note. Total N for "Have you ever used the kit?" is 21, but it is 100 for the other questions.

bidity and mortality due to opioid overdose is largely preventable. Although naloxone has been used for many years by the medical community, with the prevalence of overdose increasing, strategies beyond first responders are needed. Because overdose often occurs in the company of others, it is important to find ways for non-medical bystanders to respond quickly with naloxone. Despite numerous efforts to expand naloxone kit distribution [16], naloxone often remains unavailable at the time and place where it is needed.

Prior research has asked naloxone kit distribution staff about the facilitators of, and barriers to, expanding naloxone access to laypersons [17]. The current study adds to this literature by focusing on identifying the barriers that prevent people who are themselves dependent on opioid drugs from getting a naloxone kit, carrying it, and using it to counter overdose. This study also highlights the potential facilitators that encourage people to obtain and use the kit.

Half of the participants who did not have a kit reported that they lacked one due to not knowing where to get one. More education and outreach highlighting the value of naloxone and where to get a kit is needed. In addition, medical providers should make kits more available.

The majority of participants who had gotten a kit had learned about it or received it from the NCHRC or through a MAT clinic where the NCHRC does outreach work. Given how we recruited our sample, this finding is not surprising but does highlight the important role of grassroots harm reduction agencies in distributing kits among opioid users.

Additional research is needed to learn about naloxone use from opioid users who are not under methadone/buprenorphine treatment.

Of the participants who had gotten kits, only 19% reported that they always carried it. However, participants who said they sometimes or mostly carried the kit did so when attending parties, clubs, or festivals, suggesting that they take the kit with them when they think they are more likely to encounter overdose. In fact, one reason given for not carrying a kit was anticipating not being around drugs. While some prevention efforts have focused on carrying naloxone to events or parties, recent studies have found that some deaths occur in isolation (eg, isolated bedrooms, bathrooms) [18]. In these places, deaths may not be witnessed. However, if additional messaging is given by prevention organizations to people willing to carry naloxone kits, then if there are people in the house, they may find a way to be vigilant and prevent overdose deaths.

The other leading reasons for not carrying a kit were practical: forgetting it at home or it being inconvenient to carry, especially for men. For men, one of the reported barriers to carrying the kit was that it was too large to carry in their pockets. Yet, slightly higher percentages of men than women (although not statistically significant) reported having witnessed an overdose (78% versus 67%) and having used naloxone to counter an overdose (91% versus 80%). These findings highlight the need to design a kit that men will carry; it likely needs to be small enough to fit in a pocket.

TABLE 2.
Factors and Experiences Related to the Frequency of Carrying a Kit by People Who Have Ever Gotten a Kit for Themselves (N = 74)

	"How often do you carry a kit with you?"			Fishers Exact Test, 2-tailed
Variables	Never %	Sometimes/ mostly %	Always %	
Gender (N = 71)				
Male	32.0	56.0	12.0	0.35
Female	19.6	56.5	23.9	
Ever witnessed an overdose? (N = 72)				
Yes	20.0	62.0	18.0	0.42
No	31.8	45.5	22.7	
Friend has ever gotten a kit (N = 72)				
Yes	20.0	55.0	25.0	0.40
No	28.1	59.4	12.5	
Family member has ever gotten a kit (N = 72)				
Yes	26.1	47.8	26.1	0.45
No	22.4	61.2	16.3	

Note. Although 74 participants indicated that they had ever gotten a kit, 2 of those participants skipped the items depicted in the table and 1 additional participant did not report gender.

In our study, women were more likely than men to report having received naloxone training (62% versus 46%) and women had similar or greater confidence in using the kit. Women also reported having more friends and family members with a kit than men. These findings suggest that for women, kit distribution penetrates their networks. Paired with the finding that men are more likely to witness overdoses, kit distribution to men should be augmented in terms of distributing to their peer network (friends and family members). Overall confidence in using naloxone was high, but of 24 participants who witnessed an overdose and had a kit with them, 3 participants did not use naloxone because they did not know how. For these participants, perhaps additional guidance, such as short video clips or other social media, would have allowed for immediate reference. Additionally, with newer products coming to the market (ie, more nasal Narcan), ease of use issues might be mitigated.

Thus, the main factors related to bystanders not administering naloxone were not having the kit with them in the first place, followed by not knowing how to use it. Taken together, these findings suggest that to increase bystander response to overdose, one should focus on informing people who spend time with opioid users about the existence of naloxone kits and the importance of carrying kits with them at all times.

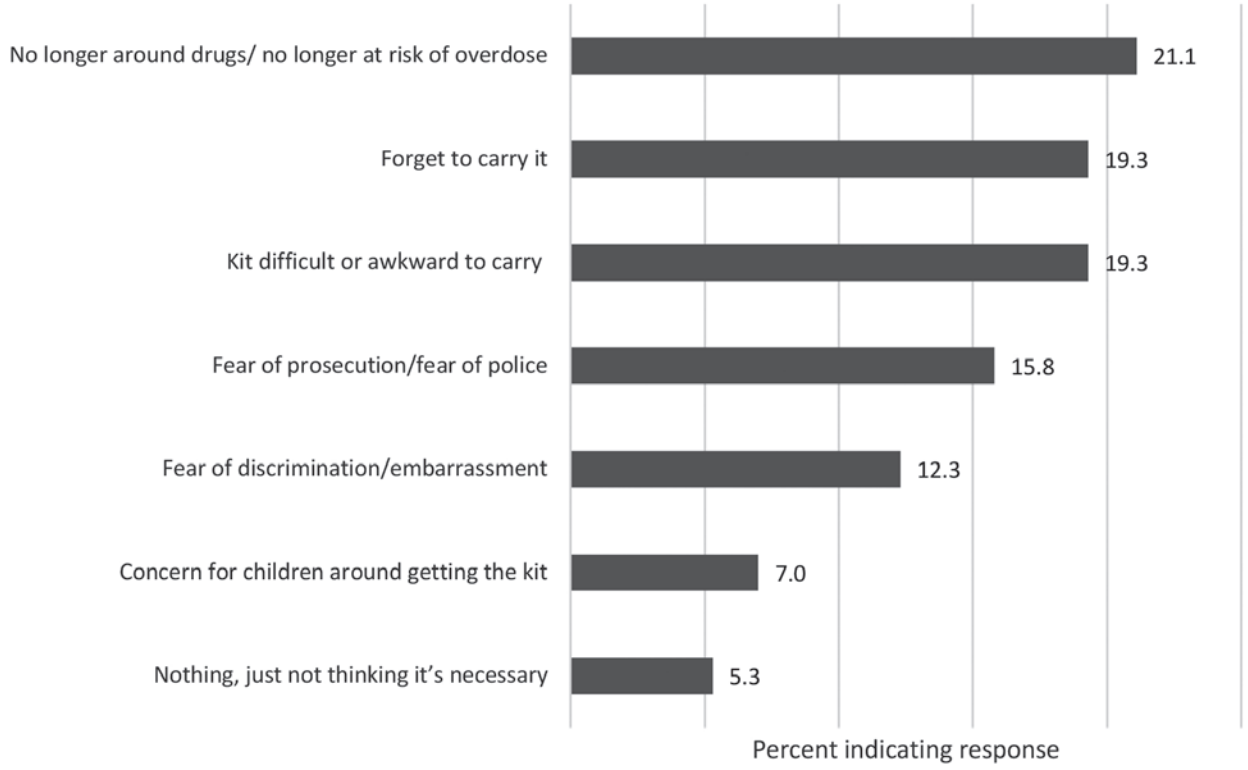
Opponents of the expansion of naloxone distribution programs in the United States have expressed concern that having a naloxone kit may decrease people's willingness to call 911 for overdose emergencies, thereby risking physical harm because they may not seek appropriate medical care. We found that out of 100 participants, 94 indicated that they would call 911, suggesting that policymakers may not need to be concerned about lack of seeking medical care. Although knowledge of the need to seek medical care following an overdose reversal appears widespread, naloxone kit distributers should continue to give this message.

We found that, despite legislation giving immunity to drug users when they call for assistance with overdose, and despite participants claiming that they would call 911, participants were concerned about being arrested when they call police for help. The new law does not provide protection from being arrested (only from being prosecuted), but it does add protection from probation and parole violations, which might encourage some people who are on probation or parole to call 911. It is important to inform the population about the existing law and to ensure that the police adhere to this law. Engaging and training law enforcement personnel on the law is essential.

Limitations

This study had several limitations, most notably selection bias. The small sample was limited to MAT clinic patients who were mostly white and seeking treatment. A larger and more diverse sample would have provided greater statisti-

FIGURE 1.
Primary Barrier Reported to Carrying a Kit Among Participants Who Had Ever Gotten a Kit but Did Not Always (ie, Never/ Sometimes/Mostly) Carry It (N = 58)



cal power to detect potential gender differences and allowed us to understand the use of naloxone kits and willingness to call 911 among drug users with different ethnic backgrounds and experiences. In addition, we did not track non-response, so it is possible that our findings are only reflective of certain kinds of MAT clinic clients, such as those who are more outgoing, have better mental health, or are less suspicious of research. Also, by recruiting just MAT clinic patients, we only heard from a subset of the people for whom having naloxone kits would be beneficial. Ideally, naloxone kits would be carried by any opioid user and the people who may find them during an overdose. Further, this survey only informs about MAT clinic clients' willingness to call 911 in case of an overdose emergency. A study involving active drug users not in treatment could produce a different finding. Future researchers may consider collecting data from active drug users in order to identify more fully the facilitators of, and barriers to, naloxone kit usage.

This study also had information limitations. We used a very brief, and thus limited, survey in order to increase participation. The study would have benefited from knowing participants' age, duration of opioid use, and type of opioid used (ie, prescription versus heroin). The survey also did not assess whether participants who had witnessed an overdose did so before or after getting a naloxone kit; we therefore cannot infer whether witnessing an overdose influences a person to get a kit. Also, in the time that has elapsed since data collection in 2015, media attention to opioid overdose and naloxone has increased; this media attention combined with additional education and outreach efforts and any new North Carolina statutes could change the findings if the study were repeated today.

Conclusion

In conclusion, opioid users are at risk of overdose and overdose-related death. We found that opioid users who know about naloxone kits are willing to carry and use them, as well as to seek medical attention following their use, giving them a vital tool for safe and effective overdose reversal. This tool could contribute even further to overdose reversal if naloxone kits could be made smaller and if their awareness and distribution could be promoted through education, outreach, media, and medical providers. NCMJ

Prasana Khatiwoda, MSc Duke Global Health Institute, Durham, North Carolina.
Rae Jean Proeschold-Bell, PhD associate research professor, Duke Global Health Institute, Duke Center for Health Policy & Inequalities Research, Durham, North Carolina.
Christina S. Meade, PhD associate professor, Duke University School of Medicine, Duke Global Health Institute, Durham, North Carolina.
Lawrence P. Park, PhD associate professor, Duke University School of

Medicine, Duke Global Health Institute, Durham, North Carolina.
Scott Proescholdbell, MPH epidemiologist, Injury and Violence Prevention Branch, North Carolina Division of Public Health, Raleigh, North Carolina.

Acknowledgments

We thank Robert Childs, Loftin Gregory Wilson, and Hyun Namkoong, together with all of the North Carolina Harm Reduction Coalition staff members, for assisting with recruitment and providing valuable insights. We also show our gratitude to Caesar Lubanga-kene for double-coding the open-ended responses in this study.

Potential conflicts of interest. All authors have no relevant conflicts of interest.

This research was supported by the Duke Global Health Institute.

References

1. Strang J, Darke S, Hall W, Farrell M, Ali R. Heroin overdose: the case for take-home naloxone. BMJ. 1996;312(7044):1435-1436.
2. Dettmer K, Saunders B, Strang J. Take home naloxone and the prevention of deaths from opiate overdose: two pilot schemes. BMJ. 2001;322(7291):895-896.
3. Centers for Disease Control and Prevention. Provisional Drug Overdose Death Counts. CDC website. https://www.cdc.gov/nchs/nvss/vsrr/drug-overdose-data.htm. Accessed October 20, 2017.
4. Centers for Disease Control and Prevention. Drug Overdose Death Data. CDC website. https://www.cdc.gov/drugoverdose/data/statedeaths.html. Accessed October 20, 2017.
5. North Carolina Department of Health and Human Services. Opioid Overdose Factsheet. Raleigh, NC: NC DHHS; 2017. https://files.nc.gov/ncdhhs/Opioid_Overdose_Factsheet_FINAL_06_27_17.pdf. Accessed October 20, 2017.
6. Miller PG. Safe using messages may not be enough to promote behavior change amongst injecting drug users who are ambivalent or indifferent towards death. Harm Reduct J. 2009;6(1):18.
7. Darke S, Hall W. Heroin overdose: research and evidence-based intervention. J Urban Health. 2003;80(2):189-200.
8. Center for Disease Control and Prevention. CDC Guideline for Prescribing Opioids for Chronic Pain. Atlanta, GA: CDC. https://www.cdc.gov/drugoverdose/pdf/guidelines_at-a-glance-a.pdf. Accessed February 27, 2018.
9. Wermeling DP. Opioid harm reduction strategies: focus on expanded access to intranasal naloxone. Pharmacotherapy. 2010;30(7):627-631.
10. Walley AY, Xuan Z, Hackman HH, et al. Opioid overdose rates and implementation of overdose education and nasal naloxone distribution in Massachusetts: interrupted time series analysis. BMJ. 2013;346:f174.
11. Centers for Disease Control and Prevention. Community-Based Opioid Overdose Prevention Programs Providing Naloxone – United States, 2010. MMWR. 2012;60(6):101-105.
12. Doe-Simkins M, Quinn E, Xuan Z, et al. Overdose rescues by trained and untrained participants and change in opioid use among substance-using participants in overdose education and naloxone distribution programs: a retrospective cohort study. BMC Public Health. 2014;14(1):297.
13. 2013-23 NC Sess Laws, SB 20 (2013).
14. North Carolina Department of Health and Human Services. North Carolina's Standing Order for Naloxone. NCDHSS website. http://www.naloxonesaves.org/north-carolinas-standing-order-for-naloxone/. Accessed March 2, 2018.
15. North Carolina Harm Reduction Coalition. NCHRS'S Community Based Overdose Prevention Project. NCHRC website. http://www.nchrc.org/programs-and-services. Accessed March 28, 2018.
16. Wheeler E, Jones TS, Gilbert MK, Davidson PJ. Centers for Disease Control and Prevention. Opioid overdose prevention programs providing naloxone to laypersons—United States, 2014. MMWR. 2015;64(23):631-635.
17. Doyon S, Aks SE, Schaeffer S. Expanding access to naloxone in the United States. J Med Toxicol. 2014;10(4):431-434.
18. Somerville NJ, O'Donnell J, Gladden RM, et al. Characteristics of fentanyl overdose – Massachusetts, 2014-2016. MMWR. 2017;66(14)382-386.