Untrained Bystanders Administering Drone-Delivered Naloxone: An Exploratory Study

Substance Abuse: Research and Treatment
Volume 17: 1–6
© The Author(s) 2023
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/11782218231211830

Nicole Adams[1], Nan Kong[2], Renran Tian[3], Christelle Altidor[1] and Shen Chang[2]

[1]Purdue University School of Nursing, West Lafayette, IN, USA. [2]Purdue University Weldon School of Biomedical Engineering, West Lafayette, IN, USA. [3]Purdue University Indianapolis (PUI), Purdue School of Engineering & Technology, Indianapolis, IN, USA.

ABSTRACT

INTRODUCTION: Opioid overdose deaths continue to climb in the United States. Administering naloxone to an overdose victim can save their life, but rapid access to naloxone remains a barrier. Delivering naloxone to a bystander using a drone has potential to increase naloxone availability but there are still many uncertainties about this mode of delivery. Can an untrained bystander to an opioid overdose successfully administer drone delivered naloxone after viewing video instructions on the drone and how long does it take?

METHODS: This mixed-methods observational study, conducted in a controlled outdoor environment, simulated an opioid overdose using a mannequin (overdose victim) and panicked bystander. Untrained and medically naïve participants were instructed to call for help, move the drone from the landing spot to the mannequin, and follow the instructions provided by the drone to administer naloxone. Data was collected using video recordings, interviews, and an online survey. Time stamp data was extracted from the video for 2 time points: time for removing the naloxone from the drone and time to administer the naloxone. Interviews were audio recorded and analyzed using an inductive concept analysis approach. One interview question was coded as a binary response of anxiety/no anxiety and added to the demographic data.

RESULTS: The average time to remove and administer naloxone was 62 seconds. Anxiety during the activity was reported by 59% of the participants but there was no correlation between anxiety and time. The design of our drone and instructional video can be improved.

CONCLUSIONS: We have established baseline times for completing steps in administering naloxone delivered by drone. We were able to successfully induce anxiety and have a baseline measure for what percentage of untrained bystanders may experience anxiety when involved with an emergency situation. Design of instructional materials and drone construction can contribute to anxiety and successful administration of naloxone.

KEYWORDS: Opioid, Narcan, naloxone, drone, UAV, bystanders, untrained, overdose

RECEIVED: June 14, 2023. **ACCEPTED:** October 16, 2023.

TYPE: Original Research

FUNDING: The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This study was funded by an internal Purdue College of Engineering Purdue Engineering Initiatives (PEI) seed fund. A portion of this funding supported the material cost of creating the drone used in the study and participant incentives for the study.

DECLARATION OF CONFLICTING INTERESTS: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

CORRESPONDING AUTHOR: Nicole Adams, Purdue University School of Nursing, Johnson Hall of Nursing Rm 246, 502 N. University St., West Lafayette, IN 47907, USA. Email: adams417@purdue.edu

Introduction

Opioid overdose mortality in the United States (US) continues to rise, with nearly 77 000 predicted deaths due to opioid overdose in 2022.[1] Administering naloxone (name brand Narcan) to someone experiencing an opioid overdose will reverse the effects of the opioid and can save their life. It is safe and easy to administer, especially in the nasal spray formulation.[2] However, naloxone can only be effectively administered if a bystander witnessing the overdose has it to give. Improving the availability of naloxone continues to be a challenge, especially in rural areas.[3] Naloxone can also be administered by emergency medical services (EMS) via ambulance, however the median response time in rural areas is 13 minutes, with 10% of patients waiting for almost half an hour.[4] If a person experiences an overdose and respirations cease, death can occur in as little as 6 minutes. Providing naloxone via drone may be a viable intervention to reverse the overdose and provide the necessary time for the arrival of EMS via ambulance.

The concept of delivering medical care via drone is of interest for several medical conditions such as out of hospital cardiac arrest (OCHA), epileptic seizures, anaphylaxis, and opioid overdose.[5] At this time, there are no published studies of drones delivering naloxone in real life[6] and very few simulation studies with human-drone interaction and naloxone. Ornato et al[7] conducted a simulation study to assess perceptions of retrieving naloxone from a drone. In this study, all participants were patients with opioid use disorder (OUD) and were actively enrolled in a medication-assisted treatment program. Several participants had medical training or had administered naloxone before, which was found to significantly improve their response times. The participants were provided instructions via 2-way radio simulating a 9-1-1 dispatcher and only total time from 911 contact to administration of naloxone was reported.

Creative Commons Non Commercial CC BY-NC: This article is distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 License (https://creativecommons.org/licenses/by-nc/4.0/) which permits non-commercial use, reproduction and distribution of the work without further permission provided the original work is attributed as specified on the SAGE and Open Access pages (https://us.sagepub.com/en-us/nam/open-access-at-sage).

A primary benefit of delivering medical interventions via drone is to reduce time to treatment in time sensitive conditions. Simulation studies have been conducted to assess the flight time of the drone,[8,9] but not to establish the time required for removing the intervention from the drone and administering the intervention to the victim. Our study provides initial baseline data for the time it takes an untrained bystander to remove and deliver naloxone to an overdose victim. Times are divided by each step in the process to establish a baseline for comparison when improving different components of the delivery systems. We wanted to assess the interaction of the bystander with the drone in a situation where the drone carries the naloxone and provides the administration instructions. We sought end-user feedback on our drone design and the instructions provided for a bystander to administer naloxone to an overdose victim without additional human intervention. Several studies have been conducted to evaluate the efficacy of different naloxone delivery training methods[10-14]; however none have considered training in the moment of crisis. We also wanted to create anxiety and stress in our simulated environment to mimic what a bystander might experience as it is likely that overdoses are witnessed by family or friends who may panic or experience anxiety.[14,15] As there are no studies identifying the best strategies to teach a skill for immediate use during a crisis moment, the assessment of the influence of stress has also not been established. Our primary question is: can an untrained bystander to an opioid overdose successfully administer drone-delivered naloxone after viewing video instructions on the drone and how long does it take while under simulated stress?

Methods

Study design

Both qualitative and quantitative data were collected during this mixed-methods exploratory observational study. Quantitative data consists of time stamp data extracted from video recordings of participants during the activity and from Qualtrics demographic surveys. Qualitative data was collected via the post-activity interviews. In the interviews the participants were asked if they were anxious during the activity which was coded as a binary response of anxiety/no anxiety and added to the demographic data.

Setting

The study was conducted on a baseball field at a large University in the Midwest during the fall semester of 2022. Participants were recruited by posting advertisements around the campus to participate in a single day activity. Undergraduate research assistants and student volunteers from nursing and engineering distributed the recruitment flyers and were on-site for the study to guide participants from one location to the next. The drone was built by aeronautical engineering students and operated on site by students with drone pilot licenses. Participants were gathered in a closed room at the stadium and consented for participation. They were given a slip of paper with a 4-digit identifier for use throughout the activity so that data could be linked while protecting anonymity.

Participants

We sought to enroll 20 participants to ensure data saturation in the qualitative portion of our study based on a previous drone interaction study.[16] There were four one-hour times the participant could select from to complete the activity at the baseball field on a single day. We sought to enroll participants who were naïve to medical interventions and also to protect participants from potential re-traumatization from previous experiences. They were pre-screened for eligibility over the phone, and we were ultimately able to recruit 17 eligible participants. Inclusion criteria included being able to walk 100 feet, the ability to bend and kneel, and 18 years of age or older. Excluded from the study were participants who had formal education in health sciences, had taken a CPR or first aid class, had been in an ambulance, had called 911, had interacted with paramedics in an emergency situation, had a close friend or family member overdose, and had been involved in a medical emergency. The screening also included 9 questions that were unrelated to the study in order to disguise the nature of the task the participants were going to be asked to complete. We provided incomplete disclosure (IRB-2022-462) to the participants so that they would be unprepared for the activity. Participants were only told that they would be interacting with a drone and they were unable to view the field or the activity while other participants were on the field.

Experimental activity

Participants were instructed immediately prior to walking onto the field that they should wave to the side of the field if they encountered any emergency situation. Upon being called to the field, participants encountered an overdose victim (mannequin) and a panicked bystander who was yelling for help, and they followed the instruction to wave to the side of the field. The bystander continued to make emotional statements about the overdose victim throughout the activity. The drone was launched from behind the baseball field outfield wall and landed approximately 10 feet from the participant and mannequin and the participant was instructed by the bystander to retrieve the drone. The drone was equipped with a video screen (3.25 in by 2.15 in) and speakers which began to play instructions for removing the naloxone and administering it as soon as the drone landed which repeated on a loop. The naloxone box was created using 3-D printing and gray material and was anchored on the bottom of the drone to enable the video screen to sit on the top of the drone and not to interfere with flight balance. There was a small "Narcan" label on the front of the box. The audio instructed participants to remove the naloxone from the box on the drone and then provided details on the administration of naloxone accompanied by video demonstrations. The activity ended when they had successfully placed the naloxone device in the mannequin's nose and depressed the plunger to administer the naloxone. Participants were debriefed after the activity due to incomplete disclosure and asked to sign an additional consent form. They were briefly interviewed for their perceptions about the activity which was audio recorded. They were then provided a QR code linked to a brief demographic survey and a separate linked survey to receive a $60-dollar Amazon gift card for their participation. None of the participants chose to withdraw their data and all completed the interview and demographic survey. The video data, interviews, and the demographic survey all used the 4-digit code the participant was assigned as the identifier.

Variables

Timestamped data was used to calculate the time from drone landing to the time that the participant had the drone next to the victim (Landing to Victim), the time from arriving with the drone to removing the naloxone (Narcan Removed), and the time from removing the naloxone to administering the naloxone (Narcan Administered). Demographic data collected included age range, college within the university, gender identity, racial identity, year in school.

Data analysis

Interviews were transcribed using temi.com and analyzed using a deductive approach to content analysis approach by the primary researcher.[17] Statements from the interviews were grouped into 6 categories based on the interview questions: thoughts about the experience, being nervous or anxious, not being nervous or anxious, thoughts about the instructions, feelings about administering naloxone, and could they do this for a real person. Based on the data within each category, they were simplified into the following concepts: thoughts on experience, created anxiety, reduced anxiety, drone improvements, administering naloxone, and in real life. Although many statements were aligned with the interview question that was asked, there were also many which were off topic from the question and were placed into a different category. Transcripts were reviewed again 1 week after initial analysis to compare against the key information found in these categories and there were many similar responses from different participants, suggesting that we achieved data saturation for this population. We used the 4-digit number assigned to each participant to link the presence or absence of anxiety with their demographic information and activity times. Descriptive statistics were calculated for the timestamped data and the demographics. Independent sample t-tests were conducted to determine if the time was related to anxiety or nervousness. Pearson correlation coefficient was computed to assess the relationship between time to remove and time to administer naloxone.

Results

Participant characteristics

The demographics of the sample are reflective of the recruitment efforts on the college campus. A majority of the participants were between the ages of 18 and 20 years old (59%), Engineering majors (65%), female (59%), White (41%) and freshman (35%). When asked if they were nervous or anxious during the activity, 59% reported anxiety. Demographic variables are presented in Table 1.

Table 1. Demographics n = 17.

Gender Identification	
Female	58.8%
Male	35.3%
Non-binary/third gender	5.9%
Age	
18-20 y	58.8%
20-22 y	23.5%
22-26 y	5.9%
26-30 y	5.9%
>30 y	5.9%
Racial Identity	
White	41.2%
Asian	29.4%
Black or African American	11.8%
Hispanic, Latino, Latinx	5.9%
Prefer not to answer	11.8%
College	
Engineering	64.7%
Liberal Arts	17.6%
Agriculture	11.8%
Science	5.9%
Year in School	
Freshman	35.3%
Sophomore	29.4%
Junior	5.9%
Senior	11.8%
Graduate student	17.6%

Table 2. Time measurements in seconds n = 17.

ACTIVITY	MINIMUM	MAXIMUM	MEAN	ST. DEVIATION	MEDIAN
Narcan Removed	6	55	18.76	13.21	17
Narcan Administered	13	131	43.88	30.42	39
Total Time	22	177	62.65	36.99	57

Table 3. Relationship between time and anxiety (yes) or gender (male).

	F	SIG.	*T*	DF	ONE-SIDED P	TWO-SIDED P	MEAN DIFFERENCE	STD. ERROR DIFFERENCE	95% CONFIDENCE INTERVAL OF THE DIFFERENCE LOWER	UPPER
Anxiety Y/N										
Narcan Removed	0.265	0.614	–.060	15	.477	.953	–.400	6.721	–14.726	13.926
Narcan Administered	1.092	0.313	1.348	15	.099	.198	19.714	14.624	–11.456	50.858
Total Time	1.413	0.253	1.064	15	.152	.304	19.314	18.153	–19.378	58.006
Gender M/F										
Narcan Removed	2.439	0.139	–.560	15	.292	.583	–3.729	6.653	–17.909	10.452
Narcan Administered	0.431	0.521	0.233	15	.409	.819	3.6	15.457	–29.345	36.545
Total Time	0.355	0.560	–.007	15	.497	.995	–.12857	18.825	–40.255	39.997

Time measurements

The mean times of the 3 activities of interest, Narcan Removed, Narcan Administered, and Total Time were 18.76, 43.88, and 62.65 seconds respectively and the Total Time ranged from 22 to 177 seconds (Table 2). Using Pearson's correlation coefficient, there was no significant correlation between the Narcan Removed and Narcan Administered, $r(17) = 0.334$, $P = .191$. There was no significant relationship between anxiety and the length of time for Narcan Removed, Narcan Administered, or Total Time as seen in Table 3.

Qualitative Analysis

Overall experience

Regarding the overall experiences, participants reported not being prepared for having a new experience, using words like "innovative," "unique," and "interesting." They were very aware that this was a simulation and part of an experiment. Some participants did use terms describing discomfort to the unforeseen event, such as "unexpected," "surprising," "shocking," and even "alarming," particularly related to seeing a body on the field.

Created anxiety

There were several components of the experiment that created anxiety for the participants, several mentioned that the panicked bystander made them anxious although one participant stated that the sense of urgency created by the bystander helped them overcome their own fear. Other factors included having time pressure, witnessing a medical emergency, and challenges with the instructions or finding the naloxone on the drone increased their anxiety. One participant stated that they were "intimidated" by the drone, and it created fear and anxiety. One participant denied being anxious but did state that they "felt bad" for being slow in their actions. Several participants commented throughout their interviews about a perceived slowness in their response and completion of tasks.

Reduced anxiety

When asked what would reduce their anxiety, one participant stated that they became less anxious when they realized they were in a mock scenario and recognized that the victim was a mannequin. Other participants reported that anxiety could be reduced in this situation by personality traits, more information in advance, and more medical training in advance.

Drone improvements

Many participants struggled with the drone instructions on retrieving the naloxone, and they recommended that the audio needed to be louder and the video screen larger and glare resistant. Several participants disliked the instructions on loop and having to wait to go back to the beginning, suggesting that the instructions have manual controls on the drone or sensors to measure when tasks were completed, and the participant was ready for the next step. Some participants felt the instructions were too fast, but some of the same participants also disliked the long time waiting for the instructions to restart. The location of the naloxone was also mentioned as a problem and suggestions were to make it more obvious, potentially with "flashing lights."

Administering naloxone

When asked about their feelings following administering the naloxone, participants reported feeling good, relieved, and proud, "I did that." Several reported feeling "fine" or "nothing." One participant was surprised by how quickly the task was completed and another felt "awkward."

In real life

Most participants stated that they believed they could administer naloxone to an overdosing person in real life. Some participants acknowledged that they would feel more anxiety, and another stated they thought they might have a "mental block" if it were a real person. More than one participant feared they would be too slow, and another thought they would likely look for someone else to intervene.

Discussion

The time study shows that for an untrained bystander it takes an average of just over 1 minute (62 seconds) to learn from drone delivered audio/video instructions and then administer naloxone to an overdose victim. This is an important time point to establish when designing drone delivery of naloxone to add onto the flight time when determining the location of drone stations and the requisite speed of arrival of the drone. Although we did also measure the time from landing to having the drone next to the victim, it is not discussed here as it is not a realistic value when compared to collecting a drone from outside of a building and then moving inside which will also be highly variable depending on the type of building and the distance from the building for the landing. Ornato et al[7] found the time from first contact with 9-1-1 (simulated) to administration of naloxone was 122 seconds with simulated dispatcher provided voice instructions. However, this time included retrieving the drone from outside of the building and moving it to a room approximately 25 m from the front door. Because they only reported total time, we cannot compare the time from acquiring the drone to the administration to our findings. Additionally, the participants in the Ornato et al study[7] were all people in recovery from opioid use disorder with most having witnessed an overdose (73%) or having experience with naloxone either through being treated with it (23%), being trained to administer it (20%), or having administered it previously (27%).

In our small sample, we found that anxiety did not affect the time it took to remove or administer naloxone. Although preliminary and in a small sample, this finding suggests that psychological stressors are not necessarily a limiting factor when engaging untrained bystanders in emergency responses and depending on them to complete tasks. This may also be a reflection on the mode of instruction (including both video and audio delivery) or the demographic nature of our participants. More importantly, we were able to simulate an unexpected situation and create anxiety in over half of our participants (59%) during the activity. To our knowledge, this is the first study to attempt to measure anxiety during an emergency response to overdose in the drone-medicine delivery scenario. Although Ornato et al[7] and Abdelal et al[18] both reported that their qualitative data indicated bystanders who administered naloxone in simulated or real overdose events (respectively), neither provided any count statistics to indicate how many people would experience anxiety in this situation. Because several of our participants did state that they recognized this was a simulation and that they would be more anxious in a real-life overdose incident, it is likely that we underestimated the number of people who would be anxious. Similar methodological techniques could be used to create at least some level of anxiety when testing instructional methods for emergency response by untrained bystanders.

We designed a drone to deliver naloxone and instructions using both video and audio delivery. The location of the video screen and naloxone storage box was thought to be adequate and suitable for this application. To eliminate the need for the bystander to also locate a "start button" for the instructions or to read instructions on the drone, we programed the video to begin upon landing and loop continuously. In our pilot study with untrained bystanders, we discovered that our design could be improved. The location of the naloxone must be far more obviously marked and easily identified without the need for instructions. The video screen was not large enough and there was a significant amount of glare limiting the ability of participants to view the instructions. The volume on the video was not adequate for the setting. A much larger video screen with higher volume capability and anti-glare coating are needed. The most significant problem with the design of the instructions was related to the timing of the video instructions. Most participants felt that they would have liked to start and stop the video on their own. Likely a reflection of the engineering students who participated, a high-tech sensing of activity to coordinate the timing of the video was also suggested. This pilot study emphasizes the importance of the drone design related to the delivery of naloxone and the administration instructions. These design flaws contributed to the anxiety of some of the participants, suggesting that better design would reduce the anxiety of bystanders administering naloxone.

Limitations

Although we did not recruit 20 participants, we did feel that for this pilot study and that we reached data saturation for our demographic sample. However, the demographic features of the participants are a concerning limitation to this study. The participants were all students at a large public university in the Midwest and are not representative of the general population. Their youth and high level of education, primarily in engineering, may have influenced their acceptance of learning from the video on the drone. Future studies should include a variety of participants who represent diversity in age, gender, race, and education level. A larger cohort of more diversity would more likely provide information regarding acceptability of the technology and efficacy of the training material consistent with real-world applications and representative to real populations of untrained bystanders.

Additionally, we could not simulate the effects of being under the influence of illicit substances or alcohol on our bystanders, a situation which could exist in real life. Despite these limitations, we have added to the literature supporting the feasibility of drone delivered naloxone for the treatment of opioid overdose with untrained bystanders.

Conclusion

Using drones to deliver naloxone is an exciting and novel use for this technology. Although current regulations do not allow for beyond visual line of site drone flights, we anticipate changes to these regulations in the next few years due to the increasing number of exemptions being granted for pilot studies. By conducting rigorous human subject trials, we can be prepared with the best designs and approaches to engaging bystanders in this life-saving intervention. This pilot study suggests that untrained bystanders can effectively learn to administer naloxone from video instructions and that anxiety is unlikely to affect the time it takes to complete this task and establishes a baseline of how long it takes to remove and administer naloxone. Design features such as placement and labeling of the naloxone on the drone, size and placement of the video screen, and volume of audio instructions are important to consider as they may contribute to bystander anxiety and performance.

Acknowledgements

We would like to acknowledge the undergraduate student volunteers who contributed to the execution of the study and the Purdue Libraries Open Access Fund.

Author Contributions

Nicole Adams: Study design, oversight of data collection, qualitative data collection, data analysis and results interpretation, and manuscript preparation. Nan Kong: Study design, oversight of data collection, data analysis and interpretation, and manuscript preparation. Renran Tian: data collection, analysis, and results interpretation, and manuscript preparation. Christelle Altidor: Data collection, literature search and review. Shen Chang: data collection and video data extraction.

REFERENCES

1. Centers for Disease Control and Prevention (CDC). National Center for Health Statistics Home. Vital Statistics Rapid Release: Provisional Drug Overdose Death Counts. Published 2023. Accessed February 10, 2023. https://www.cdc.gov/nchs/nvss/vsrr/drug-overdose-data.htm
2. U.S Food and Drug Administration (FDA). Naloxone Saves Lives. Access to Naloxone Can Save a Life During an Opioid Overdose. Published 2023. Accessed February 10, 2023. https://www.fda.gov/consumers/consumer-updates/access-naloxone-can-save-life-during-opioid-overdose#:~:text=Anyone cansavealife,ofopioidsduringanoverdose
3. Centers for Disease Control and Prevention (CDC). CDC Newsroom Release. Still Not Enough Naloxone Where It's Most Needed: Despite huge overall increase in prescribing, more needed in rural areas. Published 2019. Accessed June 1, 2023. https://www.cdc.gov/media/releases/2019/p0806-naloxone.html
4. Mell HK, Mumma SN, Hiestand B, et al. Emergency medical services response times in rural, suburban, and urban areas. *JAMA Surg*. 2017;152(10):983-984.
5. Carrillo-Larco RM, Moscoso-Porras M, Taype-Rondan A, Ruiz-Alejos A, Bernabe-Ortiz A. The use of unmanned aerial vehicles for health purposes: a systematic review of experimental studies. *Glob Health Epidemiol Genom*. 2018;3:e13.
6. Roberts NB, Ager E, Leith T, et al. Current summary of the evidence in drone-based emergency medical services care. *Resusc Plus*. 2023;13:1-8.
7. Ornato JP, You AX, McDiarmid G, et al. Feasibility of bystander-administered naloxone delivered by drone to opioid overdose victims. *Am J Emerg Med*. 2020;38(9):1787-1791.
8. Lejeune M, Ma W. Drone-Delivery Network for Opioid Overdose–Nonlinear Integer Queueing-Optimization Models and Methods. *arXiv Prepr arXiv220614340*. Published online 2022.
9. Gao X, Kong N, Griffin P. Dynamic Optimization of Drone Dispatch for Substance Overdose Rescue. *Proc - Winter Simul Conf*; 2020: 830-841. doi:10.1109/WSC48552.2020.9384004
10. Dayton L, Gicquelais RE, Tobin K, et al. More than just availability: who has access and who administers take-home naloxone in Baltimore, MD. *PLoS One*. 2019;14(11):e0224686-NaN12.
11. Williams AV, Marsden J, Strang J. Training family members to manage heroin overdose and administer naloxone: randomized trial of effects on knowledge and attitudes. *Addiction*. 2014;109(2):250-259.
12. Simmons J, Rajan S, Goldsamt LA, Elliott L. Implementation of online opioid prevention, recognition and response trainings for laypeople: Year 1 survey results. *Subst Use Misuse*. 2018;53(12):1997-2002.
13. Bennett AS, Bell A, Doe-Simkins M, et al. From peers to Lay bystanders: findings from a decade of naloxone distribution in pittsburgh, PA. *J Psychoactive Drugs*. 2018;50(3):240-246.
14. Hanson BL, Porter RR, Zöld AL, Terhorst-Miller H. Preventing opioid overdose with peer-administered naloxone: findings from a rural state. *Harm Reduct J*. 2020;17(1):4-10.
15. Neale J, Brown C, Campbell ANC, et al. How competent are people who use opioids at responding to overdoses? Qualitative analyses of actions and decisions taken during overdose emergencies. *Addiction*. 2019;114(4):708-718.
16. Zègre-Hemsey JK, Grewe ME, Johnson AM, et al. Delivery of automated external defibrillators via drones in simulated cardiac arrest: users' experiences and the human-drone interaction. *Resuscitation*. 2020;157:83-88.
17. Elo S, Kyngäs H. The qualitative content analysis process. *J Adv Nurs*. 2008;62(1):107-115.
18. Abdelal R, Raja Banerjee A, Carlberg-Racich S, et al. Real-world study of multiple naloxone administration for opioid overdose reversal among bystanders. *Harm Reduct J*. 2022;19(1):49-10.