

# Opioid overdose response and health information complexities: A pilot study on Naloxone kit design

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**SUMMARY**

Between 2016 and 2018, more than 11,000 Canadians and 136,000 Americans died from accidental opioid overdoses—triple the number of deaths caused by motor vehicle accidents. This public health crisis is so severe that by 2017, Canadian life expectancy stopped increasing for the first time in four decades. The distribution of Naloxone kits (emergency first aid for opioid overdoses) has revealed the need for alternative ways to get training, kits, and education to audiences who are at risk of overdose. We report on an interdisciplinary study designed to better understand the barriers to adopting and using Naloxone kits for opioid overdoses. Data from the pilot phase of our research suggest that several opportunities exist in which design methods can help identify and address these barriers.

**Key Words**

Opioid response kits; Naloxone kits; design for emergency; information design; health communication; visual communication design

## ABSTRACT

### Background

We report on an interdisciplinary study designed to better understand the barriers to adopting and using Naloxone kits (emergency first aid for opioid overdoses). Data from the pilot phase of our research suggest that several opportunities exist in which design methods can help identify and address these barriers. Accordingly, we present the themes identified during data collection and articulate how design methods can address these issues. We reflect on the importance of including lay people as experts in interdisciplinary health design research.

### Aims

This research aims to identify and present opportunities in which design can provide insights for improving public health education, reducing stigma, and enhancing clarity in health messaging to influence the uptake of Naloxone kits among men who have experienced or encountered an opioid overdose scenario. It further examines the use of design methods and how they can be effective in creating health tools for specific populations.

### Method

To guide our interviews with participants about Naloxone kit use, we adopted a co-design framework in which participants most affected by the outcomes of research are considered content experts in the design of interventions. Participants included 20 males between 18–40 years with a history of drug use and past or current enrolment in drug rehabilitation programs. In a 1-hour semi-structured interview conducted online, we asked participants a series of open-ended questions relating to their experiences with opioid overdose. We used thematic analysis to analyse the interview responses.

### Conclusion

This study highlights the importance of including participants as content experts in an interdisciplinary health design project. It also shows that design methods may be a helpful tool to inform the development of interventions from research.

### BACKGROUND

Between 2016 and 2018, more than 11,000 Canadians and 136,000 Americans died from accidental opioid overdoses, constituting triple the number of deaths caused by motor vehicle accidents.<sup>1</sup> This public health crisis is so severe that by 2017, Canadian life expectancy stopped increasing for the first time in four decades.<sup>2</sup> Exacerbated by the COVID-19 pandemic, from March 2020 onwards, overdoses began to reach “record levels not previously seen, in conjunction with a decrease in the utilization of treatment and harm reduction services”.<sup>3</sup> Over the past five years, the Government of Canada has been engaged in efforts to increase access to a life-saving overdose response tool—the Take Home Naloxone Kit (THNK). Naloxone, an opioid antagonist used to temporarily reverse the effects of an overdose,<sup>4</sup> is made available to the public through kits from pharmacies, physicians’ offices, and community health centres. This kit contains three vials of Naloxone (branded as Narcan) three injectable needles, gloves, masks, and a face shield, as well as instructions on how to administer Naloxone. Naloxone kits are designed to be used by a wide range of users, including first responders and medical professionals, people familiar with drugs and drug overdoses, and community members with no medical training or knowledge about overdoses.

A recent review of deaths due to opioid overdoses in the Canadian province of Alberta<sup>1</sup> indicates that the highest incidence of accidental overdose deaths was found to be among males who work in trades, transport, and equipment operator jobs.<sup>4</sup> In 10 per cent of overdose scenarios there is a Naloxone kit nearby, and in these cases it is used correctly 44 per cent of the time and used incorrectly 13 per cent of the time.<sup>4</sup> Several attempts have been made to enhance the usability of emergency overdose kits with respect to how well the instructions provided are understood; for example, by using graphical representations of information.<sup>5,6</sup> Yet, given the widespread stigma associated with addiction, people who use opioids and those who have witnessed an overdose are often unwilling to consider harm reduction techniques, such as carrying the kits on their person or familiarising themselves with the kits in advance of an overdose event.<sup>7</sup>

Overall, while people may want to use THINKs, they may encounter several challenges—including unclear kit instructions, stigma associated with opioid use, and discomfort with medical procedures when using a kit. These factors, and others, warrant further implementation research in—and development of interventions for—managing the overdose epidemic.<sup>8</sup> We report our findings from a small-scale pilot investigation to improve Naloxone kit instructions and uncover broader issues that hinder kit use. This preliminary study was designed to inform a larger project titled “Information

Design to Save Lives: Co-Design for Complex Health Communications” (funded by the Kule Institute for Advanced Study [KIAS], University of Alberta, Canada).

## METHOD

### Conceptual Approach and Procedures

This study formed the first phase of a larger project that aims to employ a co-design framework in improving health communication for opioid overdose management and prevention. In health research, co-design is defined as “the meaningful involvement of end-users in research”.<sup>9</sup> In the field of design studies, co-design is frequently used in the early stages of prototype development to better understand participant experiences and user needs. However, Sanders and Stappers<sup>10</sup> expand this definition to include the creative capacities of people not trained in design, who may be involved with designers in the design development process. In designing for complex healthcare problems, it is often unclear whether end-outcomes will take the form of a product, service, interface, building, etc.<sup>10</sup> Accordingly, co-design strategies—which can draw upon a spectrum of methods—are particularly useful for refining design directions as they emerge over the course of intervention research.

The methodology employed in this pilot study was originally planned to include small, collaborative workshops, with the aim of generating preliminary insights to guide the subsequent phases of our research. In light of COVID-19 restrictions, we reconstructed our previously planned protocols to transition to online interviews in place of in-person workshops. One reason for this change was that we were not able to drop off workshop activity books with the participants without a quarantine period, and viewing the workshop materials through Zoom was too technologically challenging for participants who only had access to their mobile devices. Therefore, we collected data using qualitative, semi-structured, online interviews, with the user testing of interventions planned when in-person activities resume. During these 1-hour interviews, we asked participants a series of open-ended questions to gauge their health literacy—in terms of how they received, understood, and applied the instructions within a Naloxone kit before, during, or after witnessing an overdose. We analysed and applied their responses towards prototyping design interventions that could potentially be used to improve the usability of Naloxone kits.

### Participants

Recognising them as “experts” of their own experience,<sup>9</sup> we worked with participants in interdisciplinary teams of researchers and designers to develop new health communication for Naloxone kits. Teams comprised researchers from multiple fields (communication design, rehabilitation medicine, public health, nursing, emergency medicine, risk management); healthcare staff from provincial harm reduction programs; and study participants. We recruited 20 male participants between 18–40 years with a history of drug use and past or current enrolment in drug rehabilitation programs. In Western Canadian jurisdictions, more men are dying from opioid overdoses than women (approximately 4:1),<sup>2</sup> and therefore, we focused on males in our pilot. We specifically included participants who had had prior experiences with overdose-related scenarios, or were more likely to encounter/experience overdoses (with increased likelihood of overdose experience having been assessed through our literature analysis of overdose prevalence in Alberta). We did not require participants to have used a Naloxone kit previously to meet our inclusion criteria. We excluded participants from the study if they had never witnessed or experienced a drug overdose.

### Recruitment

We recruited participants from one community health centre in Alberta, Canada, that runs a drug treatment and recovery program. In partnership with the Harm Reduction division of the provincial

health agency (Alberta Health Services), we worked with healthcare staff (eg, nurse educators) who had prior experience working in long-term drug and alcohol recovery facilities. We sent participants a recruitment poster and an email describing the study protocol, through which they were informed of the study objectives and methods, and asked to email the researchers if they were interested in participating. After obtaining consent, we asked participants to provide a first name, as well as a phone number or an email address, so that they could be contacted for an interview later. Those who participated received \$30 gift cards as compensation for their time after the completion of data collection.

## RESULTS

We used thematic analysis to analyse all interview data. Thematic analysis is an interpretive strategy for identifying, analysing, and reporting patterns (themes) within a dataset.<sup>11</sup> Due to the inductiveness of this approach, it is considered particularly suitable for analysing rich, complex, qualitative material. First, we compiled and organised all the data collected, and manually recorded key findings from each interview into a single spreadsheet. This information included challenges that participants identified as negatively impacting their ability to use a Naloxone kit in an emergency situation. Two research team members read and coded interview transcripts independently, and two other research team members recorded significant responses using an open coding process during the first round of reading. In a second round of reading, code groups were refined to further map their significance to the research question, followed by the identification of major and minor themes. Clusters of emergent themes were then labelled to organise participant comments and researcher observations. The research team produced a final summary of themes with accompanying quotations (Table 1).

Our data analysis resulted in the identification of four key findings:

1. Medically untrained persons were unfamiliar, and therefore, uncomfortable with needle-based administration of Naloxone.
2. Participants indicated that they did not know why they were using the kit, or what to do after using the kit.
3. Stigma was identified as a barrier in almost all of the participants' responses, with participants noting that they do not want to be associated with drug overdoses for fear of judgement from others.
4. The design of the information contained within the kit was found to be critical for accurate and timely Naloxone administration.

**Table 1: Identified themes (20 participants)**

Topic	Theme	Number of Times Identified	Description	Participant Quotes
Training	Technical aspects of injecting	10	Technical difficulties with needle preparation and administration process.	"Pre-filled syringes. It would take away the panic of filling the syringe properly/fully."

Training	Lack of confidence	13	Administering Naloxone is difficult with no training on needles	More of an actual course, “an hour or something, some more insight.”
Training	Lack of training or inconsistent training	16	Individuals expressed that they had no training, but have seen people administer the procedure many times.	Only explained how, didn't actually show it “until it was necessary.”
Pre-injection information	Lack of information	13	Not understanding procedures makes people uncomfortable.	More info for kit users. “Can I get sick from this?” “Can needles transmit illness to me?” Some people brought out of an overdose could become violent, what then? All the “ifs, ands, and buts” must be accounted for. Also, calling 911 can be dangerous (police violence, stigma, cost of ambulances, etc.).
Kit experience	Stigma	15	Insufficient support measures in their personal life.  Participants did not want to admit that there is a stigma even within recovery addicts about carrying a kit.	“They are ashamed because they don't want people to know they're sick.” “Remove all barriers, no questions asked.” “If I ask for a kit, is it on my health record? Am I in the system now?” “People jump to conclusions based on appearances. People might think I'm using drugs, there's a stigma.”
Clarity in messaging	Communication design	18	Messages with primarily pictures and fewer words are most effective.	“Lots of information and pictures aid in relaying information.”

## DISCUSSION

Our analysis of the interview data suggested that several complex issues surrounding emergency overdose events affect the usability of Naloxone kits. Some themes from our findings indicated a need for design methods to be used in collaboration with government health authorities and health communication experts involved in opioid crisis management. Therefore, we used the study results

described above to propose design interventions that could potentially be used to this end. These interventions can be grouped into two categories: training tools and awareness toolkit.

### Category 1: Training Tools

For the first intervention category, we developed a design solution based on interview responses that related to the theme of training—ie, learning how to use Naloxone kits. In the interviews, participants noted that they often have difficulty with needle preparation and injection. For example, one participant noted that “administering Naloxone is difficult with no training on needles”. They believed that it was their lack of medical knowledge and unfamiliarity with Naloxone kits that increased their apprehensions with using them and made the kits appear more intimidating. To address similar concerns in other healthcare contexts, games have been used successfully to improve performance and knowledge for users of complex procedures by creating an engaging and memorable learning experience.<sup>13</sup>

While we developed the *Know Your Naloxone* prototype (Figures 1a, 1b, and 1c) in response to lay user needs as determined from interview data, we devised it to be adaptable for several purposes, contexts, and user types (including the lay public, drug users, first responders, healthcare professionals). Additionally, we designed the prototype to replace or work alongside existing models of overdose response training. Our training solution aims to make learning about overdose management easier, accessible, and repeatable, while including the same or more information in training materials and formats currently used in Canada. The advantage of taking a game-based approach is that game play reinforces knowledge gained through personal experiences, enables sharing with peers, and facilitates small group discussions that encourage problem solving<sup>13</sup>—all of which build knowledge application in real world scenarios. We designed the game prototype to fit the players’ experience level and expand their practical and theoretical knowledge pertaining to the administration of Naloxone.

The cards are divided into three skill levels from beginner to advanced, with a questionnaire on the back of the cards to help users to determine their experience level. We developed several card types to help with the game play: *sequence cards*, *myth cards*, *assistance cards*, *checklist cards*, and *action cards*, colour coded to differentiate them from each other. The game tests players’ theoretical and practical knowledge of opioid addiction, overdose events, and overdose reversal using the Naloxone kit. The first part of the game tests their theoretical knowledge using *Sequence* and *Fact or Myth Cards*. Through game play, players must organise the steps listed on the *Sequence Card* in the right order. As an example, a *Sequence Card* might read, “In what order should you complete the following steps?: a) Sanitise injection site, b) Sanitise the top of the vial, c) Put on gloves”. Next, players must organise the steps listed on the *Sequence Card* in the right order. On a *Myth Card*, players must decide if the sentence on the card is a fact or a myth.

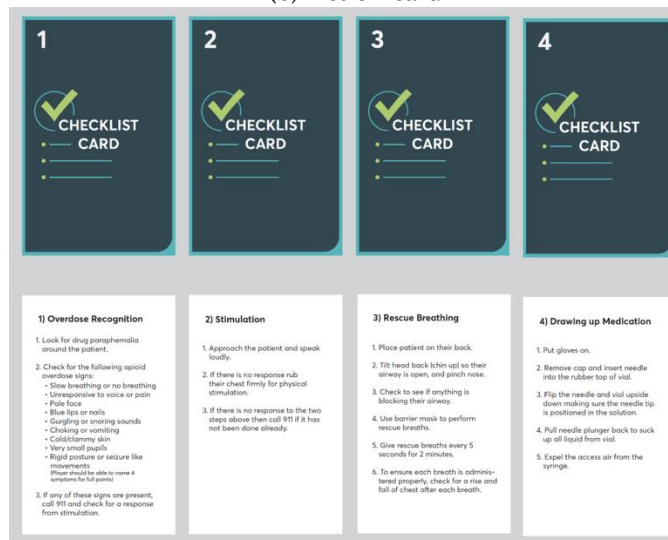
The second part of the game tests users’ practical skills by using the *Action* and *Checklist cards*. *Checklist Cards* must be used after an *Action Card* is completed to verify an action, and *Action Cards* must be completed with game props (syringes, gloves, mask—items currently included in standard Naloxone kits). Once a player has completed their *Action Card*, the corresponding *Checklist Card* must be checked to ensure whether they have completed the steps correctly. The player can simply refer to the *Checklist Card* themselves; however, if the action performed using an *Action Card* is not performed correctly, other players can contest it. The player, then, must wait for it to be checked by the player

who contested it. The game ends when all the Action Cards are completed, and the player with the most points wins.



(a) Assistance card

(b) Action card



(c) Checklist cards

**Figure 1: Know Your Naloxone game card prototypes: assistance card, action card, and checklist cards**

### Category 2: Awareness Toolkit

Our second design prototype (Figure 2) is a public education toolkit that we designed as a resource for pharmacies, health educators, and users of Naloxone kits. The *Understanding Your Naloxone Kit* is divided into three sections. In the first section, information graphics explain when kits should be employed (ie, defining opioid poisoning, understanding the use of syringes, learning how to help after injecting Naloxone). We created graphics in response to interview data, where participants agreed that kits are very useful, but they were not necessarily able to explain how and when to use them. The second section includes activities that offer users a chance to practice what they have learned (eg, design your own kit, test your understanding, etc.). The third section contains additional community resources on substance use (eg, addiction hotline, mental health hotline, Drugsafe.ca).



Figure 2: Sample pages from the *Understanding Your Naloxone Toolkit* (information graphics explain signs and symptoms of overdose and timely response in an emergency)

The awareness toolkit uses information graphics to make life-saving health messaging more accessible to all levels of reading comprehension, given the diverse audience it attempts to reach. Information graphics are an engaging and universal format for communicating complex health information to all categories of users owing to their ability to present information quickly, clearly, and in a way that can be easily accessed, digested, and absorbed.<sup>14</sup> Accordingly, in this toolkit we employed communication design principles for developing information graphics that maximise user comprehension and retention of information.<sup>14</sup> The content communicated through these information graphics was informed by our data analysis, as well as findings from field literature. For example, this prototype also incorporated content from a provincial curriculum guide for nurse and harm reduction educators in Alberta<sup>15</sup>—considering how people understand overdose-related risks, risk communication practices, public perceptions about drug addiction, and the effectiveness of public health messaging in general.

These design prototypes will undergo user testing in the next co-design phase of our research. This will involve testing for user perception, cognition, information retention, and knowledge application, in addition to validating the effectiveness of the proposed designed solutions—with people who use drugs, harm reduction educators, and other relevant participant groups. Future research may also investigate the development of resources to train healthcare designers to develop more effective harm reduction educational materials for overdose management.

## LIMITATIONS

We have identified several limitations in this pilot study. First, our study sample is limited in terms of participant numbers, sex, and location. We recruited 20 participants from a single community clinic in a large urban city in Western Canada. We prioritised the inclusion of single males who work in trades, transport, and equipment operator jobs and are stably housed, as they are most likely to encounter or experience overdoses in Alberta; however, this is not the only demographic affected by drug use. The aim of this pilot study was to interview a small population segment in order to identify broad themes affecting Naloxone kit use and to inform our methodological considerations for a larger investigation. Accordingly, these sample limitations will be addressed in our future studies by collecting data from larger and more diverse participant groups, where we will additionally focus on sex and gender variables (eg, previous research indicates that women who use opioids may be at greater risk of negative health outcomes when compared to men). A second limitation is that the design interventions we proposed have not yet been validated for efficacy with people who currently use drugs or with harm reduction educators—these groups will be involved in subsequent evaluations



of our design prototypes over the next phases of our research, before we can report on their efficacy. Thirdly, COVID-19 pandemic restrictions forced us to pivot research methods, as all in-person research was halted. Originally planned as a face to face co-design workshop, our methods had to be adapted for online data collection, which may have limited participants in their ability to engage with researchers freely, owing to technological issues or other unknown factors.

## CONCLUSION

While communication design will not directly save people's lives in the event of an overdose, well-designed health information is likely to do two things: 1) re-position harm reduction messaging for broader audience reach, and 2) improve the usability of Naloxone kits in case of an emergency. Further, design methods, by engaging people who are most affected by overdoses (ie, drug users and people likely to witness an overdose event), may be useful for identifying and resolving barriers in the uptake of Naloxone kits, and by extension, aiding the overall management of the opioid crisis. This pilot study uncovered some less-understood user concerns with accessing, carrying, and using Naloxone kits, generating insights for healthcare designers and public health experts to address these needs moving forward. It also allowed us to test the appropriateness of design methods for understanding social stigmas underlying particular health conditions, related issues surrounding public hesitancy towards Naloxone kits, and cognitive barriers in overdose reversal instructions—more generally, emergency health response instructions aimed at the public. Our findings indicate that peoples' lived experiences equip them with legitimate "expertise", which researchers should draw upon in the development of public health interventions. Design-led research (including participatory processes such as co-design) and design-based solutions (including intervention research foci such as health emergency instructions) have particular potential for harnessing user knowledge for addressing complex public health challenges.

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### PEER REVIEW

Not commissioned. Externally peer reviewed.

### CONFLICTS OF INTEREST

The authors declare that they have no competing interests.

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### ETHICS COMMITTEE APPROVAL

This study was approved by the Research Ethics Board at The University of Alberta, Canada: Pro00084520.