Community Based Naloxone Kits: Using Design methods to transform complex user needs into innovative community partnerships

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doi: 10.33114/adim.2019.c01.161

The opioid crisis in Alberta is a public health crisis. In 2016, more people died from an opioid poisoning than from motor vehicle crashes. Naloxone is an opioid antagonist which means that it can reverse an opioid overdose for a period of 30–60 minutes, at which point, the overdose may return. In December 2015, the Take Home Naloxone (THN) Program was rolled out in response to the opioid crisis. Under the renamed the Community Based Naloxone Kit Program (CBNP), naloxone kits are now available free of cost at many pharmacies and community clinics around Alberta. The wide availability has led to a new challenge—that the kits may be used by people who have received little to no training. Some may encounter the kit instructions for the first time when there is an emergency in which they need to administer an injection urgently to someone who has passed out. Studies have found that most overdoses occur in the presence of another person—this provides an opportunity for someone to intervene. People often die from witnessed opioid poisonings because other people do not know what to do to help. A pilot study conducted through community partnerships involved 30 participants in two different urban centres (Edmonton and Calgary) who self identified as either experienced in substance use or friends/family of people with lived experience has revealed some interesting findings. Qualitative observations and data collected in the initial pilot work show that end users are experiencing unique challenges in accessing opioid education and have challenges using instructions on how to administer naloxone in an overdose setting. User testing and observation of user behavior has great potential to support educational material for opioid awareness. Human-centred design approaches that gather information with and about people using antidote kits are urgently needed in order to mitigate risk and ensure successful administration of first aid and naloxone in an emergency.

Keywords: design research, visual communication design, user centred design, information design, typography, human centred design

Introduction

The opioid crisis in Alberta, Canada is a public health crisis. In 2016 more people died from an opioid poisoning than from motor vehicle crashes. Naloxone (trade name Narcan) is that antidote to an opioid poisoning. Naloxone is an opioid antagonist. This means that it can reverse an opioid overdose for a period of 30 to 60 minutes while medical help arrives. In December of 2015 the Take Home Naloxone (THN) Program was rolled out in response to the opioid crisis. During the first year of the program 9,572 kits were distributed by over
900 sites across Alberta and 973 overdose reversals were reported. Now renamed the Community Based Naloxone (CBN) Program, 83, 286 kits have been distributed by 16,70 registered sites, and 4,505 reversals have been reported. While we usually hear about the overdoses that are due to the use of recreational/street drugs it is important to realize that anyone has the potential to be a victim of an opioid overdose. Studies have found that most overdoses occur in the presence of another person; this provides an opportunity for someone to intervene (Freeman et al., 2017; Davidson, Ochoa, Hahn, Evans, & Moss, 2002; Strang et al, 1999). In an effort to prevent mortality rates due to overdose, Naloxone kits are available at many pharmacies and community clinics around the province. Anyone is able to obtain a kit free of charge and with no questions asked. The person providing the kit (pharmacist, nurse, community support worker, etc.) is expected to provide some basic kit training however it is possible that training may be refused or may be forgotten when it comes time to use the kit. As a result, people are often left to rely solely on the instructions included in the kit.

**Context & problem/opportunity area**

Health agencies have begun distributing antidote kits widely which has led to a new challenge – that antidote kits may be used by people who have received little or no training. Some may encounter the instructions for the first time when there is an emergency and they need to give an injection urgently to someone who has passed out. Another factor adding to the complexity of the design challenge is the fact that current educational messages for Community Based Naloxone Kits have historically been designed (or “undesigned”) by healthcare professionals for healthcare professionals, without asking people who use drugs or their support networks what information is important for them to have when they or their family/friends experience an opioid poisoning.

In an effort to address the opioid crisis and improve communications strategies around emergency overdose response, we designed, administered and analyzed a pilot study involving 30 participants in Edmonton and Calgary who self-identified as either experienced in substance use, friends/family of people with lived experience or opioid naive participants. Observations gleaned from the initial pilot work demonstrate that end users are experiencing unique challenges in accessing education and using instructions on how to administer naloxone in an overdose setting. The central message of this case study is that, based on our unique and innovative experience, additional human-centred design approaches that gather information with and about people using antidote kits are urgently needed in order to mitigate risk and ensure successful administration of first aid and naloxone in an emergency.

This project is notable because it aims to include individuals and communities affected by opioid poisoning using principles of human centred design in the evaluation of the prototypes. Using a method developed by the Communications Research Institute (CRI), it strives to answer the following research question: What are the perceived barriers to appropriate first aid and naloxone administration in an opioid poisoning and how can the educational and instructional materials surrounding the delivery of the Community Based Naloxone Program improve the end user experience with the aim to reduce deaths from opioid poisoning?

Academic insights came in the form of design methodology and experience from the design experts. Public health nurses and an emergency physician provided real world experience and data, while human factors representatives designed a protocol that tested end user performance measures that were relevant to both the design and public health messaging. Community partners and students relayed important information about the lived experience of opioid overdoses and responding to emergency situations with little preparation or education.

**The narrative:**

In November 2018 a research team made up of designers, nurse educators, students from the University of Alberta, emergency medicine physicians, a human factors team from Alberta Health Services (AHS) and community partners identified a communication challenge: the instructions included in a life-saving naloxone kit were not easily understood by the general public. This resulted in, at best, confusion and, at worst, a failed attempt to prevent an opioid related death. The research team came to a consensus that the goal of a naloxone kit was to provide specific information to users in an emergency overdose scenario. Through consultation with medical experts we were able to define performance specifications. These performance specifications are goals of the instructions that isolate information that we would like to test with users. User testing allowed us to access what is not working with the designs, set some benchmark goals and then revise
and retest to achieve our desired level of performance. We were able to identify these performance measures/tasks that the instructions in the kit must perform:

1. Define an overdose (OD) (identify what an OD looks like: slow breathing or no breathing at all, unresponsive to voice, lips or nails appear blue, gurgling or snoring sounds, choking or vomiting, cold/clammy skin, constricted pupils, seizure like movement)
2. Know when to call 911 (after an OD has been identified)
3. Know how to do a safety check (assess for hazards)
4. Know how to perform rescue breathing (gloves, mask, airway, rescue breaths, recovery)
5. Know how to inject naloxone
6. Know what to do after administering naloxone

We structured our testing to include 2 days in Calgary, Alberta and 2 days of testing in Edmonton, Alberta, both large urban centers. This allowed us to recruit from two sites, one in each city, that provide care and treatment for people with a history of drug abuse in the community. Both of these sites were stakeholders in the pilot project work. In Calgary we tested 20 participants and in Edmonton we tested 13 participants. We structured each day to reflect a time slot of one hour for each participant. We based our timing on an initial run through to determine how long the protocol would take. There were 4 members of the research team present for each interview: a nurse educator, an information designer, a human factors specialist and a research assistant. When participants arrived they were given information on background to the study, they were given instructions about what they would be asked to do, and they were asked to fill out a consent form. A nurse educator or research assistant went through a pre-questionnaire with them that included demographic information such as:

- Age
- Sex
- Highest level of education
- Occupation
- Can you speak / understand / read English
- Have you used opioids in the past
- Have you seen a naloxone kit
- Have you ever received training on how to use a naloxone kit
- Have you ever administered a dose of naloxone

As the facilitator started the scenario, the observation criteria was noted on a sheet. This sheet contained observation criteria such as:

- Did the participant try to wake their friend (how?)
- Did the participant provide rescue breaths
- Did the participant call 911?
- Did the participant check their friends’ airway?
  - Did the participant tilt head back, plug nose, and breath 1 breath every second for 2 minutes
- Did the participant reassess their friend?

After we ran through the scenario, we asked participants several questions about their knowledge of the procedure. For example, we asked questions like:

- Were you able to identify all of the contents in the kit?
- What factors would you look for to determine if your friend was experiencing an overdose?
- Did you know how to provide rescue breaths?
- What will happen if you provide Naloxone to someone who is not experiencing an opioid overdose?

We also asked some subjective questions such as:

- Did you find any of the pictures or terminology in the brochure to be confusing?
- What was your impression of the pictures or terminology overall?
- And finally how could the instructions be improved?
We determined through the use of testing, participation and surveying that recording and thematically coding the results that would inform changes to the design work of the insert. Through observation and testing in this way, it allowed us to determine the design strategy and implementation of the following work.

Figure 1: Testing materials

Figure 2: The torso mannequin for simulation of the procedure

**Testing Protocol**

In order to evaluate the effectiveness and usefulness of the naloxone kit instructions we had participants from the three different user groups take part in a simulated scenario. Upon arrival at the testing locations, the facilitator reviewed the informed consent form with the participant as well as a pre-questionnaire which asked a combination of demographic questions as well as questions about their experience with opioids and naloxone kits. Prior to the beginning of the simulated scenario a standardized verbal protocol was read aloud to participants which outlined what was expected of them. They were asked to imagine that they had entered the room to find their friend collapsed on the floor. Their friend (represented by a torso mannequin) was non-
responsive and was suspected to have overdose. Participants were instructed to use the naloxone kit and the instructions included to help their friend (Figure 1 and Figure 2).

It was stressed to each participant that the goal of the project was not to evaluate their individual performance but instead to evaluate the usefulness of the instructions provided in the kit. Participants were asked to pretend that they were alone in the room and to avoid asking the facilitator any questions. They were also encouraged to talk-a-loud and say whatever came to their mind so that this information could be captured. At this time the facilitator informed the participant that the scenario was about to start. The facilitator read the following line with a sense of urgency: “Please someone help, my friend is lying on the floor, I think they’ve overdosed.”

The participant was expected to use the naloxone kit and the instructions provided to attempt to help their friend. Facilitators used a standardized observation form to record predefined performance specifications. Once the participant had completed the task (used the instructions to provide a dose of naloxone) the facilitator ended the session by informing the participant that “the ambulance had arrived and the paramedics will take over.” If participants were unable to complete the task or appeared to be too overwhelmed or stressed out the facilitator ended the scenario repeating the same line.

A debrief was administered which asked a series of questions about the kit (i.e. were you able to identify all of the contents in the kit?), the task (i.e. did you know where to inject the Naloxone in your friend’s body?) and the design and usefulness of the instructions (i.e. were there any words/pictures provided in the instructions that you did not understand?). Any questions or concerns the participant had were addressed and additional education was provided by a nurse to those who were interested. Participants were thanked and a $20.00 gift card was provided in order to compensate them for their time.

The key learnings:

Many key learnings came from this initial pilot study. These ranged from task uncertainty to product unfamiliarity, compounded by the stress of needing to act in a timely, efficient manner.

First, it is not clear to many what opioids are. Many of our participants, when asked if they had used opioids in the past or if they had responded to an opioid overdose, responded that they did not know what an overdose was. Most participants had knew to refer to these drugs from their “street” names: meth, fentanyl, etc. In the message strategy going forward, we limited the mention of the word “opioid”.

Secondly, we discovered that there were similarities between the target groups that we tested. In particular we found that both used previous knowledge more than the instructions to accurately administer 1 ml of Naloxone. Participants were not able to understand that the package was designed to help in an emergency situation.

Text, Illustration and Layout

There were many differences between the target group as well. In particular, the participants read the pictures and the text equally in the non-experienced group. In the experienced group, however, participants only read the pictures, and rarely read the text.

Through the testing we concluded that it important to use illustration as a way to relate to what the reader already knows. It becomes essential to show what readers expect and recognize. Barnard and Marcel say that when people recognize pictures, “the visual form of objects is related to and invokes spatial, semantic, and other real-world knowledge” (Barnard & Marcel, 1984 p. 44). Pictures need to be able to provide the reader with new information but also need to be able to remind them of the real thing. For example, in the prototype, the illustrations that we used represented how a rescuer and casualty might look if performing artificial respiration. In this step, the rescuer is demonstrating how to clear the airway by performing a “head tilt, chin lift” (Figure 3).
We depicted representational, rather than abstract illustrations of people performing Artificial Respiration. Images in these procedural instructions are intended to provide visual information to the reader. This is different than in other publications where they are used to provide pleasure or visual stimulation. How realistic do images have to be? Goldsmith says that “semantic unity requires recognition of the image, and representation adequate for this purpose relies not on slavish imitation of an object, but on the clarity of distinguishing features which give relevant information” (Goldsmith 1980, pg. 207). “The number of distinguishing features that any object possesses controls the extent to which its image can be distorted” (Goldsmith 1980, p. 207). In other words, it may not be necessary to exaggerate every detail of a hand for the reader to recognize it as a hand. In the case of the CBNK instructions, it was important to indicate that the needle should be inserted partly into the vial containing the medication and that it was important to pull down on the syringe to push extra air out of the needle. It was also important to indicate the correct administration of the injection—in particular what the needle would look like when depressed and which place the on the thigh the syringe should be injected.
Evelyn Goldsmith’s analysis of how people read illustrations is similar to Marcel and Bernard’s analysis of how people relate to instruction. She proposes more of an analytical model that involves three levels of comprehension: syntactic, semantic, and pragmatic. One of the levels of comprehension that is important to these instructions is semantic knowledge – this is the knowledge that involves providing a frame or reference to show size or scale. In these illustrations, hands are an example of a tool that relate the viewer’s size of semantic knowledge. The size of the hands shown in the illustrations is an important reference point because not only does it show how to prepare the plunger for injection, but it also provides a visual link to what the user knows, making it easier to explain the procedure of using a needle.

**Layout and comprehension**

In the participant testing, there was confusion over what to do if the person was discovered to be not breathing. This may have been because the options were not shown side by side in the layout (Figure 4). An alternative presentation to the layout was designed (Figure 5) which depicted the action in a tree diagram or linear branching configuration (Twyman, 1985).

However, we did not choose to test this option because it was felt by the stakeholder team that the layout was too cluttered and that the large steps and headings in the original design helped to provide more of a mental map of the procedure. The layout also meant that we would need to print on a larger sheets of paper, causing additional costs to an already small budget.

As Hartley writes “consistent spacing aids readers' perception of the structure of the document as a whole and thus helps them to understand its organization and structure” (Hartley 1985, p. 27). To this point, Anderson and Armbruster (1985) agree that “visual display, diagrams, and charts can facilitate comprehension presumably because of their ability to portray the ‘big picture’” (Anderson & Armbruster 1985, p. 168). In this
insert, all of the steps are labelled consistently on the margin on the left hand side and the decision was made to keep the steps the same height, if possible, as the insert was unfolded.

The design of the insert into a flow chart or tree diagram did not help the reader to see comparisons within the text. As Hartley points out, “psychologists maintain that consistent spacing helps readers to see redundancies in the text, and thus to read faster” (Hartley 1985, p. 27). The use of a grid allows the designer to present ideas so that readers will expect how ideas will be organized (Anderson & Armbruster, 1985). It also “enables comparisons to be made between work produced in different places and at different times; and it leads to an overall approach to the structuring of information which makes it possible to deduce meaning through content and treatment in much the same way that meaning is frequently deduced in verbal language” (Twyman 1975, p. 11). A structured grid, emphasized by the folds of the insert directed the reader’s attention and allow the reader to make comparisons between one frame and the next.

**Word choice and order of action**

The instructions were designed to reflect the way that people would perform the action of the instructions (Figure 5). For example, in order to start rescue breathing, it is essential to put on gloves, then mask, then give one breath every 5 seconds. It would have been possible to phase this operation as “give rescue breathing for 2 minutes by every 5 seconds giving one breath and do not forget to put on your gloves and mask”. However, in long instructional sequences, it is helpful to have “the order of mention match the order of action” (Wright 1999, p. 58). Wright points out that in English we usually say things in subject-predicate order. An example of this in overdose first would be: “provide rescue breaths by pinching the nose and blowing into the mouth”. However, as Wright points out in the article, when the steps are actually performed, the order becomes reversed: first you need to pinch the nose, then blow into the mouth and then continue providing rescue breaths. This is opposite from the way the instructions are written. Wright suggests that the “writer’s choice of word order can slow comprehension but can have a much bigger impact on the ease of creating action plans” (Wright, 1999, p. 57). This descriptive order becomes especially important for a procedure with many steps (Wright, 1999).

![Figure 6: Indicating the sequence for performing rescue breaths](image)

**Typography**

Short sentences using short phrases with few words and bullets wherever possible were used to aid comprehension. Waller, in his writing about type, emphasizes this point by adding that typography “adds the diagrammatic quality that can make such a structure accessible to the browsing or less committed reader” (Waller 1983, p. 4). Anderson and Armbruster reinforce this point by suggesting that “by simply skimming the text, the reader should be able to determine the author’s specific topics, the purposes the author is addressing with respect to these topics, and the structure of the ensuing text” (p. 165-6). Using this logic, the large numbers, and short subheadings should make the steps in the procedure more obvious and easier to read, providing a “typographic roadmap”. The typographic roadmap in these instructions are emphasized by the steps that are in the same place down the left hand side of the insert and the headings which, when read
alone without the detailed instructions, will allow the reader to understand the procedure. Waller writes that “readers who cannot see the wood for the trees may benefit from a map – that typographic and spatial factors can be used to clarify the longer structural relationships in a text, easing the cognitive burden that long, featureless texts impose on the reader” (Waller 198, p. 3). The texts that he is referring to are most likely continuous prose texts in which there is no typographic distinction between different thoughts or ideas. Hartley also writes about the benefits of other formats over continuous prose text. He says that “research suggests that readers prefer text which has lists or numbered sequences spaced out and separated, rather than run-on in continuous text” (Hartley 1985, p. 51). It has been found that when tasks in an examination situation are made more explicit such as by space or typographic cues ‘students spend more time and effort reading the relevant segments of text, and learning outcomes generally improve’ (Anderson & Armbruster 1985, p. 160).

**Conclusion**

This collaboration between healthcare providers, information designers, human factors specialists and community members represents a novel approach to addressing a situation where clear communication really matters. Designing a coherent communication strategy for an emergency overdose situation identified unique challenges which required unique design solutions. Lastly, there is no substitute for training. These instructions should be part of a larger educational initiative that includes education and explanation, guided instruction and practice.

**References**


