Guardian

COS 436: Human-Computer Interface Technology
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Project Description

Every day millions of people commute to work or head outside for a run. But they don't feel safe. Guardian changes that. The goal of Guardian is to understand the perceptions of safety for pedestrians in an outdoor environment and design a system to increase feelings of safety. Personal security for people in an outdoor environment is an issue that many have attempted to solve over time. There are infrastructures, such as the police department or "blue light" system, or products, such as alert mobile apps, that attempt to improve security for people, but these are not foolproof. Slow response times and product functionality barriers prevent pedestrians and runners from feeling safe. Thus in order to develop an effective product, Guardian seeks to understand behaviors in all outdoor environments ranging from running to hiking to buying coffee on the way to work to walking home at night. Through user research, personal safety and traffic safety were identified as two major causes of concern for users. Guardian focuses on improving personal safety and the system is comprised of a mobile application and wearable component. Capabilities of the system include a discrete way for users to alert preset contacts in case of emergency, through an immediate mode and a wake up mode, as well as GPS tracking.

Requirements Summary

Our system has several requirements that are necessary for it to be functional for our users and problem space. First, people need to be able to access it quickly. The situations that our system will be designed to handle will be fast-moving scenarios that won't leave a lot of time to work with a system. Our system also needs to be able to be accessed under duress, ideally without requiring users to perform any high cognitive tasks. Again the problem space that our system is operating in could potentially be very threatening and alarming, so we need to make sure that users can use our system under these conditions. On that same note, our system needs to be able to be accessed discreetly to protect the safety of our users. Furthermore the system needs to be able to operate in an outdoor environment, where many factors such as weather, lighting, and noise can vary. Our users will frequently be outside with our system and we need to make sure it's equipped to handle any such condition. Another key requirement is that our system needs to be mobile, where it can be carried while users are commuting, exercising, or engaging in other variable activities. Similarly, our system will need to be able to be used for long periods of time as our users could be at work for eight or nine hours between commutes or could go outside to exercise for a few hours. Therefore we need to make sure that our system can handle being away from electricity for long periods of time.

Prototype Revisions

Overview

Our prototype consisted of two parts: a computer generated wireframe, created with software called Indigo Studio, and two Nike Fuelbands (similar to FitBit watches) to serve as stand-ins for our wearable prototype. The wireframes allow the user to interact with the settings of the system; they allow them to set up their emergency contacts, the emergency contact message, change the default timer setting, and "sync" the wearable with the application. The wearable (with a little imagination) gives the user an idea of what exactly would be syncing to the application and makes them aware of the activation and deactivation button.

Prototype Revisions

Header: The Guardian header of the application which is featured on each screen now includes an information button that provides information about the general purpose and functionality of the app, as seen in Figure 1. It also introduces relevant material about the creation process and the developers, and provides a link that takes the user to the official Guardian website.

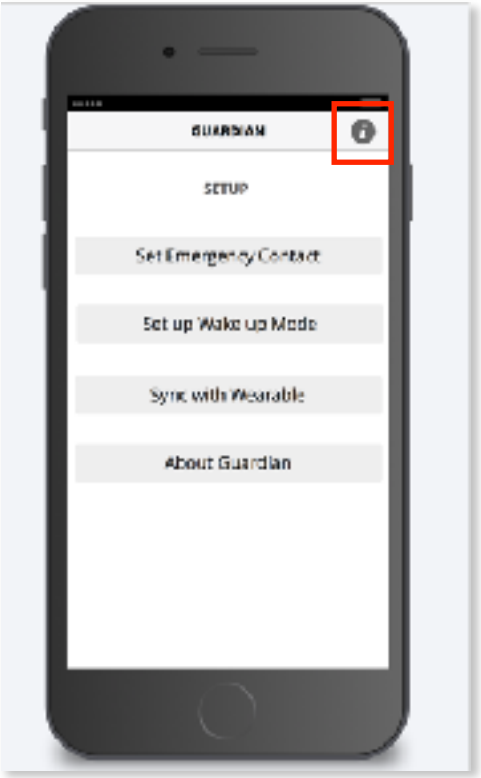


Figure 1: Screenshot of Header Update

Set Emergency Contact Information: Our testers told us that the total number of allowed emergency contacts was not clear. Thus, we incorporated a placeholder box for each possible contact that can be stored. Additionally, we originally did not have a default emergency message for the user. We added a personalized default emergency message so that could be immediately utilized by the user. Both of these updates are shown in Figure 2.

Figure 2: Screenshot of Set Emergency Contact Information Update

Set Wake Up Mode: Our in-class evaluations showed that the wake up mode was confusing for all our users. To remedy this problem, we incorporated an information button at the top of the screen that explains the reasoning behind the feature to clarify the usage of this mode. In addition, we expanded the possible alarm time from only minutes and seconds to hours, minutes, and seconds, as seen in Figure 3. This way, an alarm could be 30 seconds, 45 minutes or 3 hours. We adjusted the labeling accordingly to make the interface easier to understand.

Sync Your Wearable: The wearable settings were adapted to incorporate a list of current synced wearables as the same settings can apply to multiple devices, shown in Figure 4. In addition, the information button in the header describes the purpose and the functions that can be performed on this screen. We also incorporated two feedback mechanisms. The first occurs upon pressing the "Find Wearable" button which then displays a loading icon to inform the user that the app is currently searching for nearby devices. The second feedback mechanism occurs when the user presses the (+) button to add a nearby wearable. The phone will either vibrate or make a notification sound to signify a wearable has been added, while also displaying the name of the newly synced wearable under the heading "Synced Wearable".

Figure 3: Screenshot of Set Wake Up Mode Update

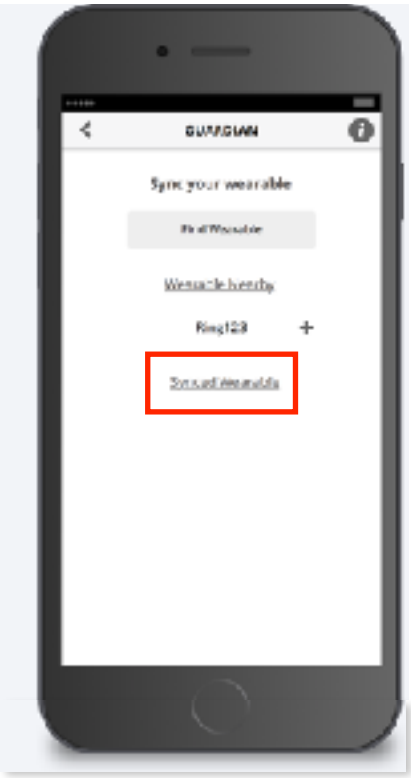


Figure 4: Screenshot of Sync Wearable Update

Design Rationale

We decided to make these changes to our prototype in order to build a product that is as close to user requirements as possible. While we collected data prior to the prototyping stage in the form of surveys and interviews, the responses we received in the in-class evaluation session gave us direct feedback on the latest iteration of our design. With a tangible and interactive product in their hands, users were able to provide comments with greater detail than before. Similarly, our team was also able to use research techniques that were previously unfeasible without a prototype; we passively observed users interacting with our product, used contextual inquiry to gain insight into the users' thoughts while using Guardian, and let them give constructive criticism with the prototype in hand.

We chose to implement the specific changes above as they address the specific problems and issues that users pointed out in our in-class evaluation session. We believe that these changes in particular provide the greatest improvement to Guardian's user experience. Some features, such as a header with an information button, were directly suggested to us by the testers, who identified an issue and recommended a solution that would resolve it. Our group built on this idea, and added other information such as an introduction to Guardian's developers, as well as a link to the official website.

Other changes to the prototype were made as a result of group discussions focusing on the problems raised by our users during testing that didn't have a clear solution. In these discussions we brainstormed ideas for each problem individually, before collectively deciding on the optimal solution that would solve the problem the most effectively. In the decision process, we took into account each idea's simplicity of use, as well as how well the solution exemplified Norman's Principles of Design. For example, when users informed us that the number of emergency contacts allotted was unclear, we opted to incorporate a placeholder box for each possible emergency contact slot, rather than simply displaying the maximum number as text.

By prioritizing the testers' feedback and advice in deciding which changes to make to our prototypes, we are able to employ a truly user-centric design process. Only through understanding user requirements and evaluating the feedback we receive, our group can decide on the feature improvements that bring the greatest impact to our users, and provide the functionality that they desire.

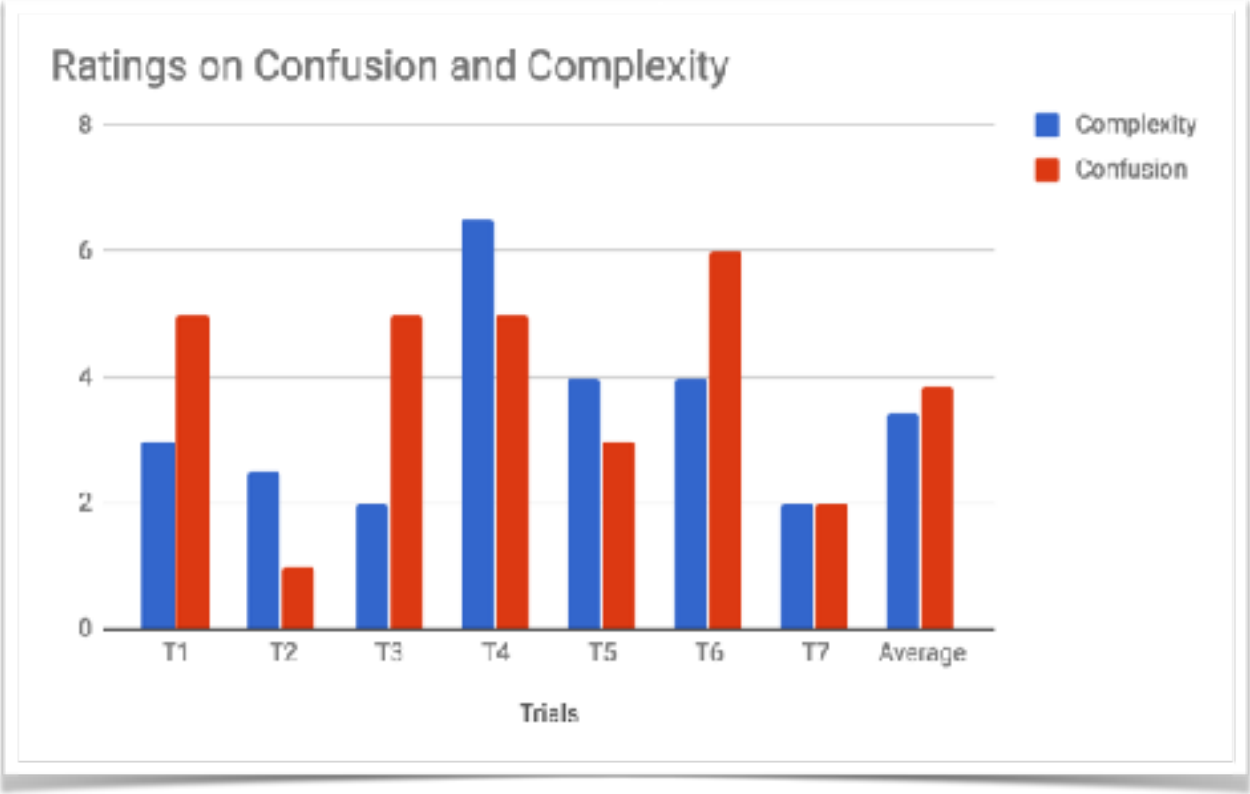
Evaluation with Users

Evaluation Techniques

We had two criteria for our initial evaluation: ease-of-use and ease-of-understanding. We chose these criteria over other criteria because we knew that our product would mainly be used in crisis situations. People in crisis situations often forget key details and have difficulty operating complicated interfaces. Therefore, our interface must be as easy and as intuitive as possible. We considered other criteria, such as aesthetic beauty, but we ultimately decided that ease and speed of use were the most important. In order to test our criteria we gave users a minimal overview of how the product works and then asked them to play with the prototyping materials without interference. We asked testers to discuss what they liked, disliked, and what they found confusing. At the end, we asked them to rate how confusing (ease-of-understanding) and how complex (ease-of-use) the interface was on a scale from 1 to 10. After recording their responses through video and shorthand notes, we processed our results to understand what we did well and where we can improve.

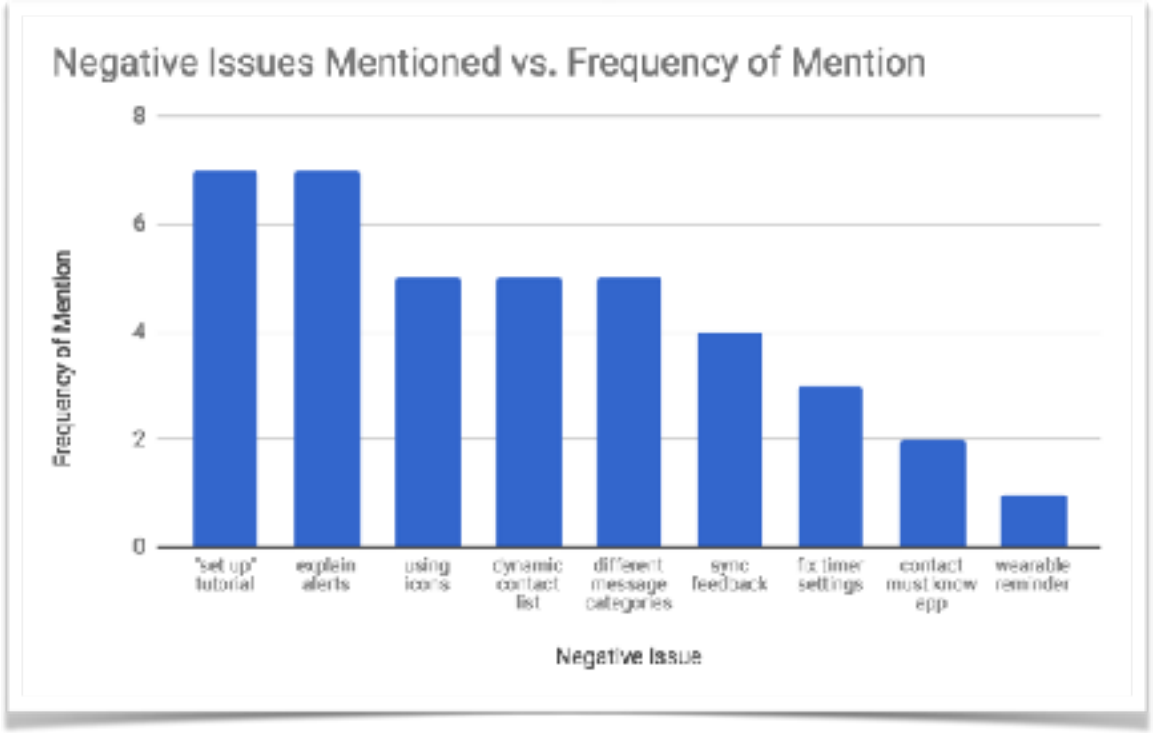
Evaluation Results

There was pretty high variation in ratings between users. However, on average we received a 3.42 in complexity and a 3.85 in confusion on a scale of 1 to 10 (lower is better), as seen in Graph 1. High raters on complexity stated they found the naming of different features confusing. Interestingly, even users that liked the simple interface would rarely rate lower than a two. Users gave high confusion ratings almost always because they had difficulty building a mental model of the product without assistance, especially regarding the delayed action SOS timer mechanism or wake up mode.



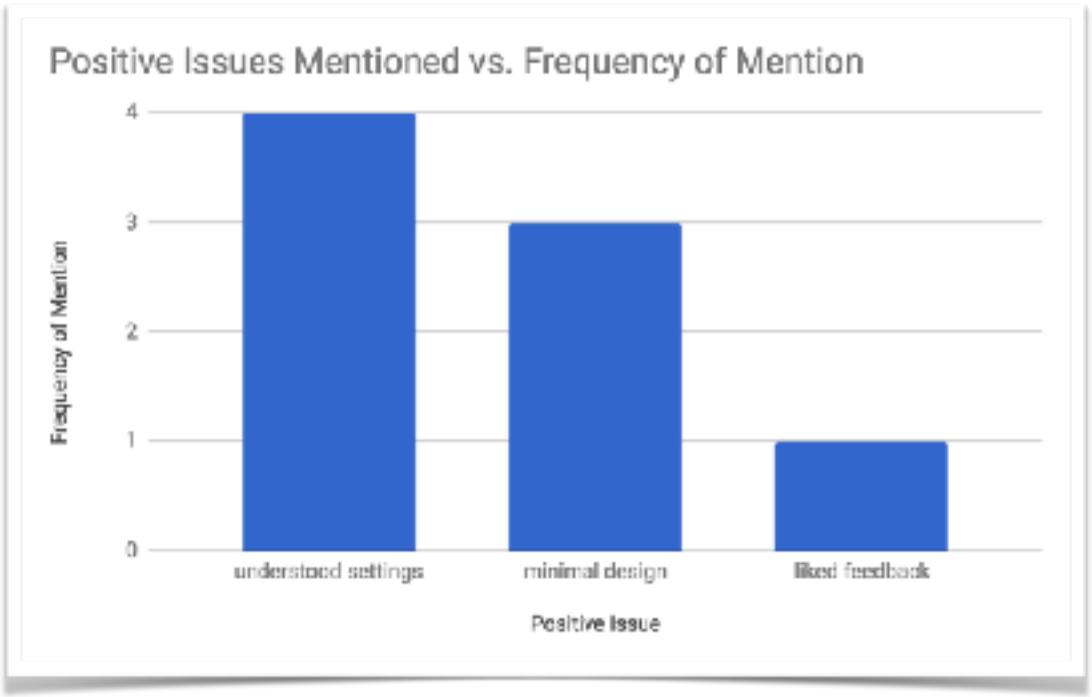
Graph 1: Ratings on Confusion and Complexity

All seven of our potential users mentioned needing a "set up" tutorial explaining the basic features of the wearable and phone application, as seen in Graph 2. Also, all users found the distinction between wake up mode and immediate mode confusing - many had different ideas of use cases. Other recommendations included using icons over text and making the contact list dynamic. A feature that people asked for was the ability to send different messages to different contacts depending on the type of emergency. We think people needed the tutorial because the scope of the design is not clear from the user interface. One can change the settings, but it is unclear what the settings allow and don't allow. Most users understood that the SOS message gets sent to the contact list, but they had trouble understanding the wake up mode (delayed action) and immediate mode (immediate action) timer settings. This is something that we will need to experiment with the design. It might be because the wearable we used in testing was a simple bracelet and so its features might not be apparent to the user.



Graph 2: Negative Issues Mentioned vs. Frequency of Mention

Most users understood how to open and change the settings and liked the minimalist design of the interface, as seen in Graph 3. Typically the only setting they had significant trouble with was the mode setting.



Graph 3: Positive Issues Mentioned vs. Frequency of Mention

Proposed Changes to System

Feedback: Currently, users of Guardian have no way to communicate system failures back to the Guardian team. As system malfunction is bound to occur, we need to incorporate logs that can record the cause of the problem and can send the information back to us to improve the product. Another feedback method can be a comment section, added in Figure 5, where people would rate the app and give us ideas on how to improve the app. This method would allow us to understand users better through first-hand ratings beyond data analytics.

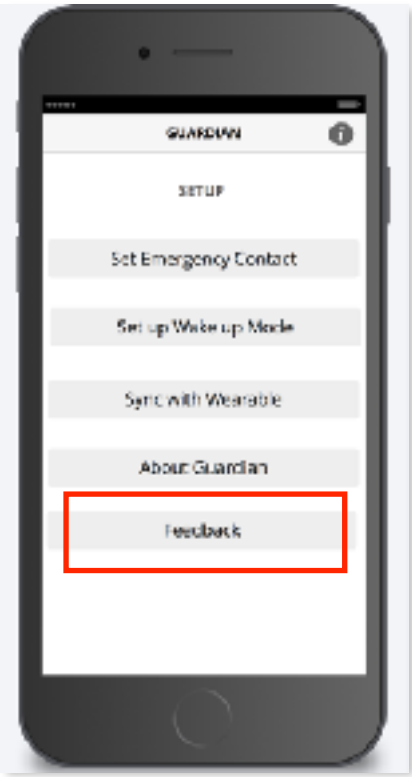


Figure 5: Screenshot of Proposed Feedback Update

Interaction with emergency contacts: Guardian right now does not have a way to edit emergency contacts. Our update, as seen in Figure 6, would allow each emergency contact to be edited from within the app, even though the information was obtained from the phone's contact list. In addition, the contacts can be deleted, locally, so the user can change emergency contacts easily.

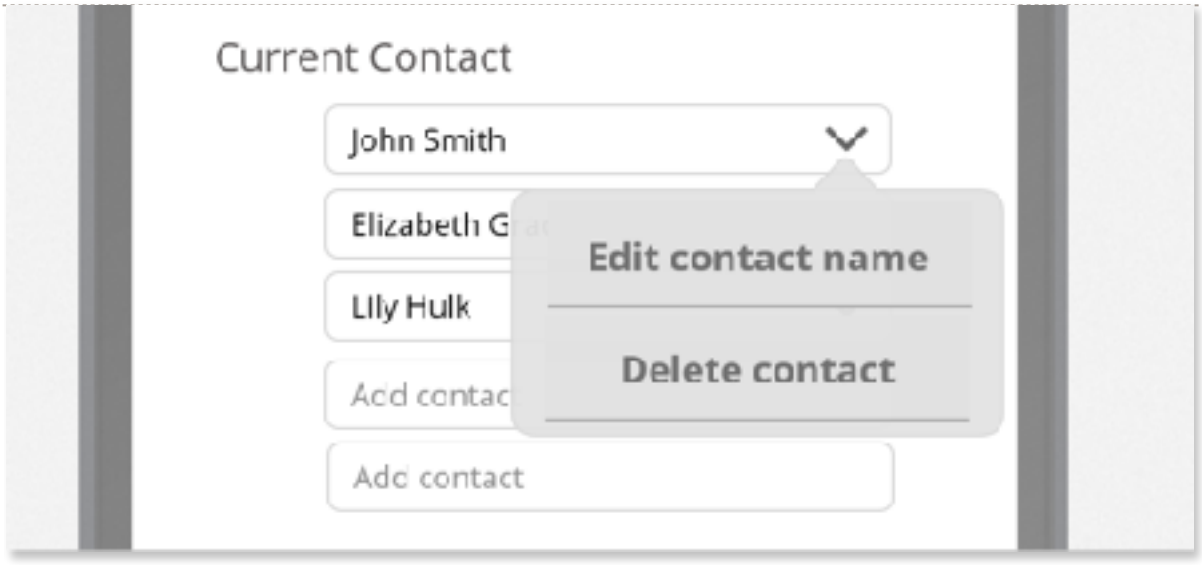


Figure 6: Screenshot of Proposed Emergency Contact Update

Adapt response to different situations: It would be useful to differentiate the level of emergency the user is in so the recipient understands the severity of the situation. We would add two colored alerts: a yellow alert for emergencies without imminent danger like a sprained ankle, and a red alert for emergencies with imminent danger such as a potential assault. The wearable would have two different buttons with different textures so the user can easily identify which button to press for situations of varying severity.

Furthermore, we would enable the user to personalize the Guardian emergency response by selecting which contacts will be called based on the emergency level and what message will be sent, as seen in Figure 7. For example, a user could select family members to be contacted during a red alert but only friends for yellow alerts. Contacts would be labeled with red, yellow, or both tags depending on the preferences set by the user. In addition, instead of having one emergency message, the user would have the flexibility to create a specific message for each of the selected emergency contacts.

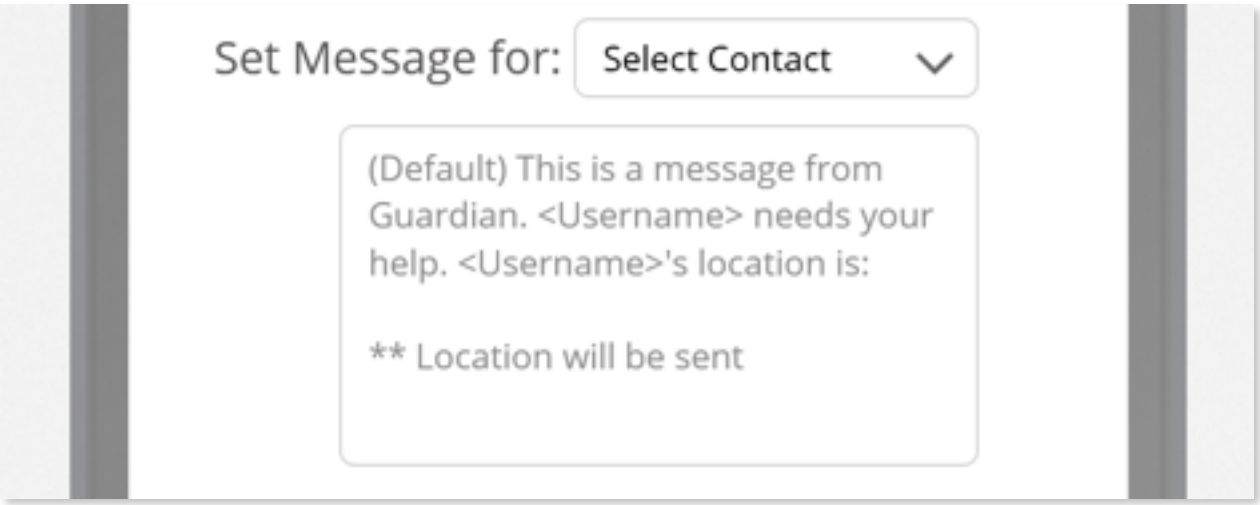


Figure 7: Screenshot of Proposed Message Update

Future Changes to Design and Evaluation Techniques

In general, the users liked the minimalist design of the interface but had trouble creating a mental model of the product. In future iterations, we will need to focus on making the mental model more intuitive, especially clarifying the difference between the wake up mode and immediate mode. In further prototypes we plan to add a Setup Tutorial and explain the alert system in more detail. We think our evaluation criteria of ease-of-use and ease-of-understanding were appropriate, but our procedure could be improved. We would want to measure how long it takes users to update their settings, how many clicks they need, and how quickly (in milliseconds) the service responds and sends a distress signal after either a time-out or the user's direct input. We might also add "reliability" as an evaluation criteria. Once we build a hi-fi prototype, we would want to test the reliability using stress testing to make sure it can work consistently under a variety of situations.