

Semester Project Report: **Tackling Communication Challenges at the Charles River Center**

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1. Introduction

The Charles River Center (CRC) in Needham, Massachusetts, is a day habilitation center that supports individuals with developmental and intellectual disabilities. The Center serves nearly 150 residents and is staffed by over 60 professionals, organized into three key departments:

1) Residential Staff – Manage residents' daily living needs, including sleep routines, morning and evening meals, and medication schedules.

2) Rehabilitation Staff – Support residents in engaging with activities such as laundry, cooking, games, Zumba, karaoke, and community outings.

3) Leadership Team – Oversee organizational strategy, task coordination, and operational management.



Together, these teams aim to foster an environment that prioritizes well-being, dignity, and independence for every resident.

2. Our Focus

As human factors engineering and engineering psychology students, we aim to enhance user experience and safety by eliciting knowledge from and about target users, identifying systemic inefficiencies, and designing thoughtful, human-centered solutions. Through our initial research, we decided to focus our project on problems related to healthcare delivery and interpersonal communication within the context of disability support services at CRC. We identified the following key challenges related to this problem space:

- **Lack of consistent communication** between Residential, Rehabilitation, and Leadership staff teams
- **Limited accountability** on daily task completion
- **Cumbersome, inefficient processes** in emergency response situations
- **Insufficient onboarding support** for new staff
- **Limited resident engagement**, with many staff viewing their role as task-oriented caregiving

Motivated by these gaps, we set out to understand the risks, errors, and root causes of these communication breakdowns. Our goal was to design a solution that not only streamlines communication and task management but also promotes inclusive practices and better documentation of resident participation, engagement, and progress.

3. User Research

Objective - We aimed to identify the challenges that staff members at CRC face when coordinating care, communicating across roles, and supporting residents with intellectual and developmental disabilities in their daily routines.

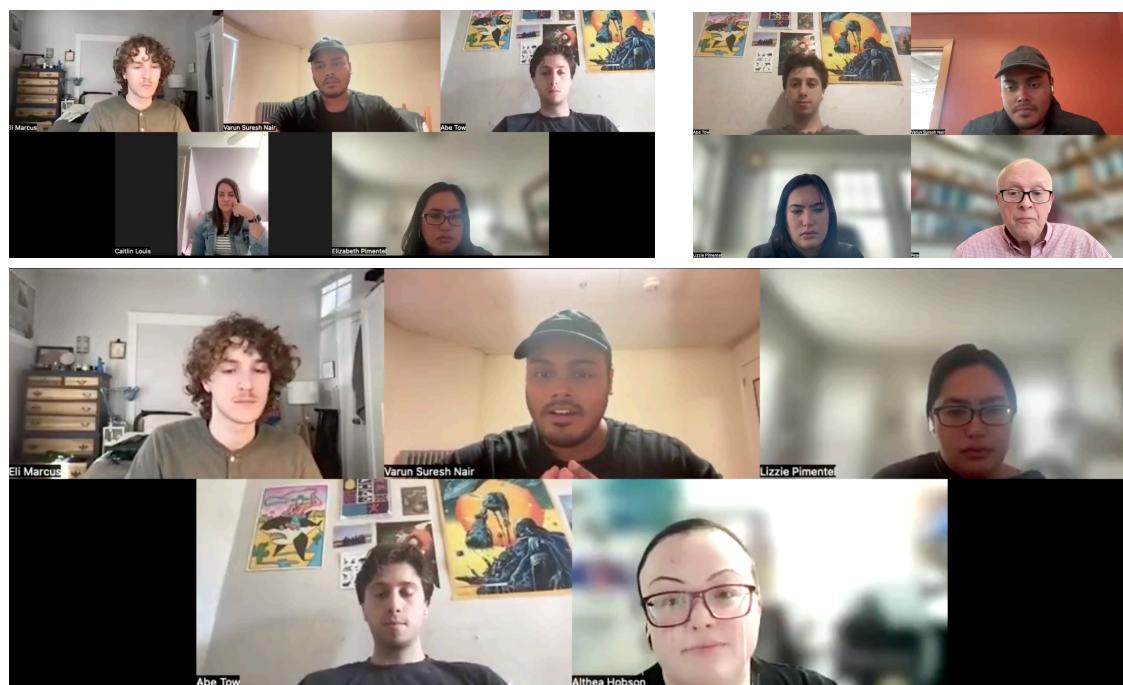
Research Approach - To explore this question, we adopted a human-centered, ethnographic approach grounded in human factors research. Our methods included:

1. **Site Visits and Ethnographic Observation** - Multiple visits to CRC allowed us to observe staff in their work environments, including real-time coordination, interruptions, and how emergencies were handled.

2. **Stakeholder Interviews**

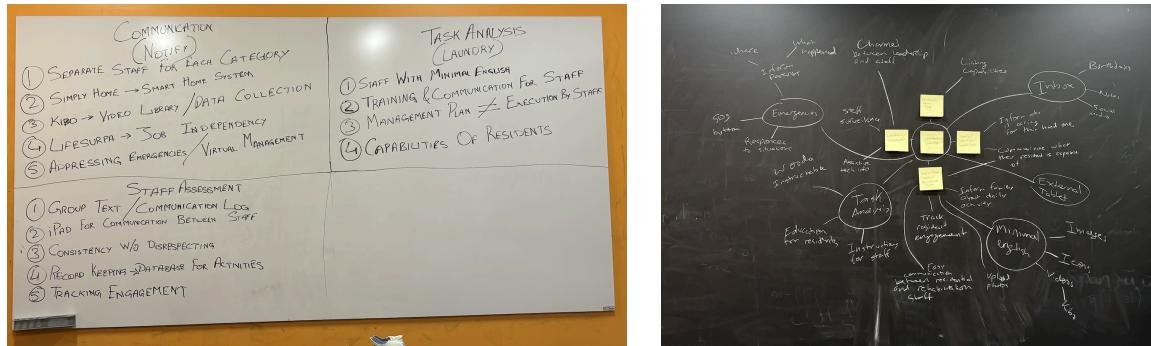
We conducted semi-structured interviews with a diverse set of stakeholders:

- Kevin Salera, Chief Operating Officer (Leadership)
- Caitlin Louis, Head Nurse (Residential Staff)
- Althea Hobson, Co-Assistant Program Director (Rehabilitation Staff)
- Peter Dedon, Parent of Resident



Each interview was tailored with role-specific questions to surface nuanced insights. This allowed us to understand not just *what* wasn't working, but *why* it was difficult for each group in their context.

3. Whiteboard Ideation and Mind Mapping



After our initial fieldwork and interviews, we held a whiteboard ideation session to map key findings and start clustering them into themes. This helped us see where problems overlapped across staff categories (e.g., onboarding, task tracking, resident-specific knowledge gaps). We made a mind map to visually group concerns and organize our ideas with CRC's communication gaps, allowing patterns to emerge organically and guiding our solution design process.

Research Questions - As part of our user research at CRC, we conducted semi-structured interviews with key stakeholders across residential, rehabilitation, leadership staff, and a family member of a resident. Each interview was tailored to the participant's role, with questions focused on daily workflows, communication challenges, emergency handling, onboarding practices, and perceptions of resident engagement. Included below is the question guide for our interviews with residential staff. The complete list of interview questions, along with detailed notes from each session, can be accessed [here](#).

Residential Staff Question Guide

1. How long have you been working at the Charles River Center?
2. How proficient are you in speaking English?
3. How many residents do you work with on a daily basis?
4. What tasks do you do with residents?
5. Do you feel supported doing your day to day tasks?
6. How do you communicate with other staff members?
 - a. Do you communicate with day rehabilitation staff members? If so, how?
7. How do you communicate with leadership?
8. How do you communicate with families/loved ones of residents?

9. What information is reported to you about the residents you care for?
 - a. What additional information would be beneficial for you to know about them?
10. What are some communication challenges you experience?
 - a. How, if applicable, do you mitigate them?
11. How do you log information about the residents, and what do you keep track of?
12. How do you raise concerns or signal an emergency, if such a situation arises?

Research Insights

- Communication between and within residential, rehabilitation, and leadership staff isn't always smooth. People rely on walkie-talkies, text threads, or paper logs, and things often fall through the cracks, especially during emergencies or shift changes.
- New staff often feel lost during onboarding. There's no simple way to get to know each resident's unique needs, and most learning happens on the job, which can be risky for more medically complex or non-verbal residents.
- Families want to feel more connected. Many told us they hear about issues too late, and would love more regular updates—not just in emergencies, but on the small positive things their loved ones do each day.
- Staff deeply care, but they're stretched thin. Most wish they had more time and support to engage residents in meaningful activities instead of just focusing on basic caregiving.
- Everyone's trying their best, but the current systems make it hard to keep everyone informed, coordinated, and truly centered on the residents' growth and independence.

4. Our Solution

Design Description

To address the communication and coordination challenges uncovered in our research, we designed a tablet-based application: a lightweight, centralized communication and task-tracking platform tailored for the unique environment of CRC. It acts as a digital hub that brings together residential staff, rehabilitation staff, leadership, and family members, each with custom access and permissions based on their role. (Please note that the following images and links reflect the final version of our solution, while later sections in this report discuss the rationale for iteration.)

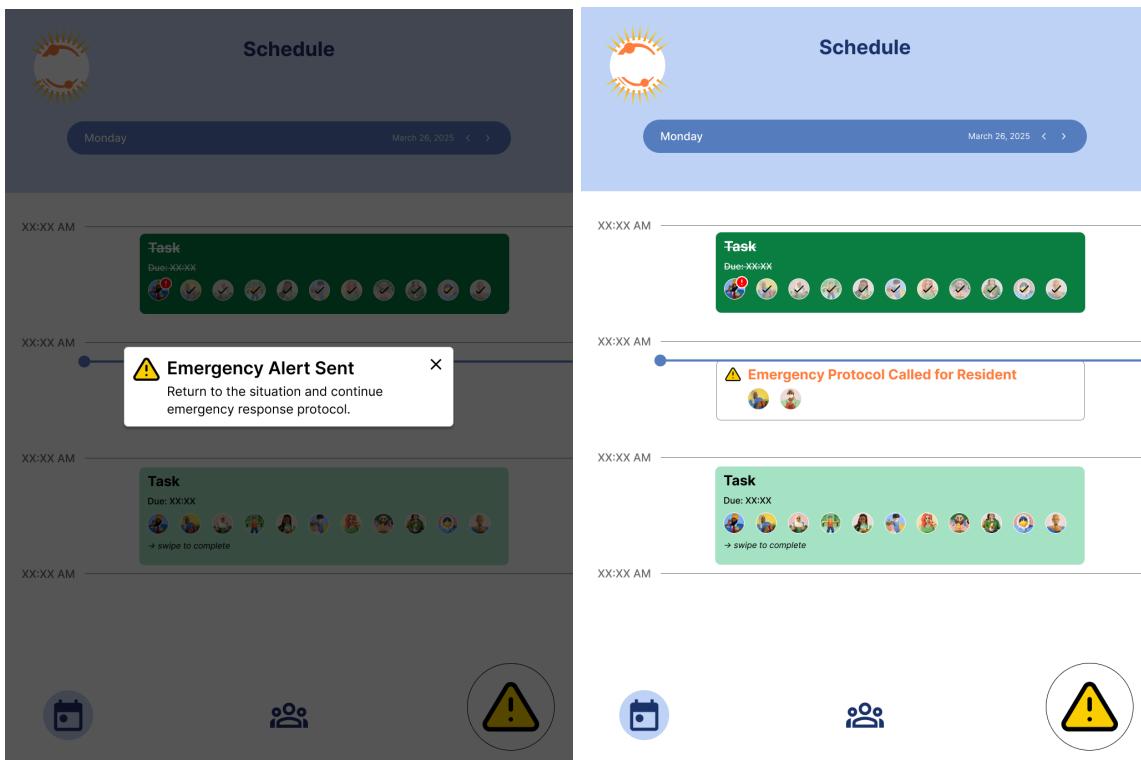
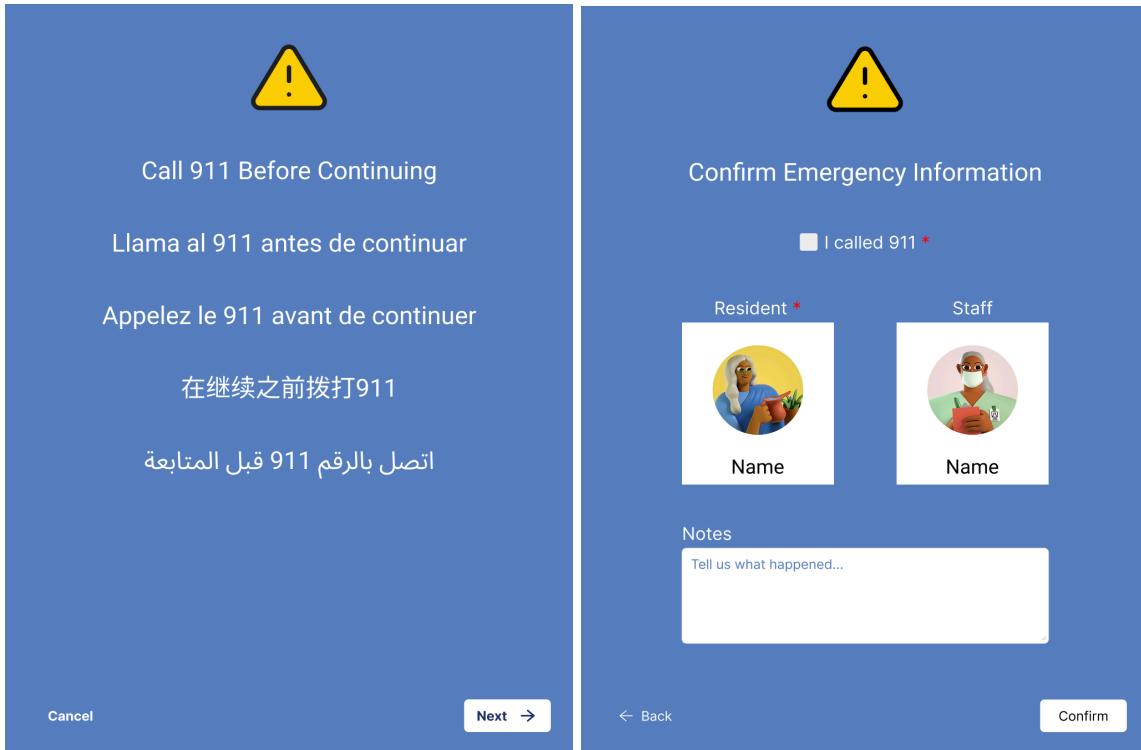
For Residential and Rehabilitation Staff Members

Below are screen-captured images of features for the staff-facing version. Presented in an array in this report, the experience progresses left to right, one row at a time. You can view the Figma prototype [here](#), as well as the complete design file [here](#).

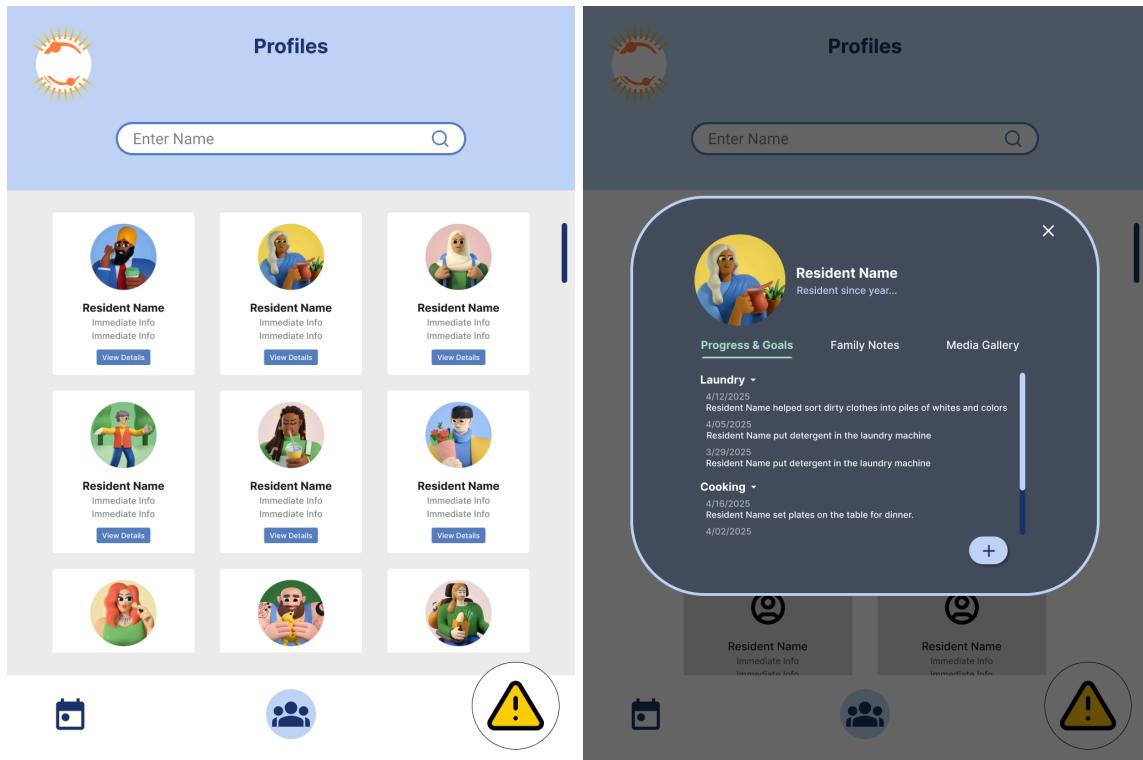
- **Task Checklists with Completion Tracking** - Staff can view daily responsibilities (e.g., hygiene care, meals, activities) and mark them complete in real time, ensuring clarity during shift changes.



- SOS Button for Emergencies** - A simple, high-visibility “SOS” function allows staff to alert leadership immediately in case of medical incidents or behavioral escalations.



- **Resident Profiles at a Glance** - Staff can access each resident's key information, goals, conditions, mood notes, and daily routines, so even new team members can provide informed care.



For Leadership*

- **Audit-Friendly Paper Trail** - All tasks and communications are time-stamped and recorded, giving leadership visibility into what's getting done and what's falling through.
- **Dashboard for Oversight** - An overview dashboard shows staff engagement, outstanding tasks, and unresolved incidents, helping with decision-making and accountability.

For Families*

- **Resident Highlights Feed** - Families receive photos and summaries of their loved one's day, capturing the joyful, human moments, not just problems or emergencies.
- **Customizable Privacy & Consent Settings** - Families choose what updates they want and how often. Information is protected and shared based on permission levels, ensuring privacy is respected.

***Note:** the prototype involves only the staff member features. Due to the high importance of the staff communication challenges and resource constraints, the prototype does not extend to leadership- and family-facing versions; these two versions were instead tested as concepts discussed with end users. With more time, leadership and family sides of the platform would be

developed and tested with a similar procedure as the one for the staff version, described as follows.

5. Task & Risk Analysis

Sr. No.	Task Category	Sub Task	User(s)	Use Environment(s)	Use Error	Possible Causes	Action	Hazard	Severity (1-5)	Likelihood (1-5)	Risk Rating (Severity x Likelihood)	Mitigation
1.1		Log into the Leadership Module			Entering incorrect credentials or forgetting login PIN, resulting in denied access.	User does not see login interface on app screen	User makes a typo or forgets password	Unauthorized access	Exposure of sensitive resident data	2	8	Secure login with multi-factor authentication and enable two-step verification for pre-filled task templates, and validation.
1.2	Setting the weekly schedule in the leadership module	Create a New Daily Task for the Resident	CRC leadership	CRC leadership offices	Selecting the wrong task type or assigning the task to the wrong resident.	User forgets pin	User picks the wrong resident or task	Task created incorrectly	Missed meals/meals or inappropriate care	3	12	Display resident history and availability to help staff quickly assign tasks.
1.3		Assign residents to specific rooms			Placing residents in incorrect rooms or removing room assignments.	User does not know which residents are assigned where	User does not know resident list and room layout	Confusion among staff	Incorrect resident placement	3	3	Confirm task summary before publishing.
1.4		Put the first schedule as actionable tasks for the staff members			Publishing an incomplete schedule with missing or duplicated tasks for certain residents.	User does not view first task scheduled	User "Publish" or "Publish" the correct schedule	Incomplete task creation or duplication	Task missed or delayed	2	8	Auto logout, identity verification using biometric PIN.
2.1		Log into the Staff Module			Mislogging login PIN or password; logging into another staff member's account by mistake.	User does not see login or PIN screen	User makes a typo or forgets password	Wrong account access	Staff performing tasks not assigned to them	3	3	Use visual indicators (green/red) to highlight logins, rooms, due date.
2.2		View the complete task schedule assigned to your profile			Misinterpreting which tasks are yours, especially in shared-responsibility zones.	User does not see personalized task assignments and timing	User does not identify and interpret task requirements and timing	Misinterpretation of assignments	Wrong task performed or skipped	3	3	Include task-specific instructions and reminder notes.
2.3		Work on the specific task (meals, meds, cleaning up)			Performing the wrong task for a resident (e.g., giving a meal instead of medication or skipping hygiene steps).	User does not see list of task categories	User does not recall task requirements for resident	User does not recall safety for care tasks	Incorrect task performance	2	10	Use confirmation and color-coded task categories.
2.4		Tap on the task category that you wish to log information in			Tapping on the incorrect category, leading to misclassification of the task record.	User does not view list of task categories	User does not tap on correct category	Wrong task type selected	Inaccurate records for compliance and care	3	3	Use confirmation and color-coded task categories.
2.5	Staff Module	Enter the 3 digit unique PIN to verify the staff member completing that task			Entering another staff's PIN or inputting an invalid code, resulting in failed verification.	User does not view PIN input screen	User does not enter correct verification ID	PIN mistyped or spoofed	Task recorded under wrong staff member	2	8	Limit attempts; enable staff photo confirmation.
2.6		Click on the residents who have completed the specific task			Selecting the wrong resident(s) or failing to check off all residents involved in group tasks.	User does not view list of residents	User does not identify which residents the task applies to	Wrong resident selected	False record of care, compliance risk	3	3	Show resident photo and use confirmation modal.
2.7		Add comments or notes if necessary			Leaving out important observations, or entering vague/incomplete notes that others can't interpret.	User does not see optional note box or "Add Note" icon	User does not reflect on whether notes should be shared	Missing/incorrect notes	Missed care needs, miscommunication	3	9	Prompt user to review before submitting.
2.8		For certain positive tasks, add a photo of the resident completing the task to be shared on the residents profile with their loved ones			Uploading the wrong photo or forgetting to do so, necessitating consent before sharing.	User does not see camera or camera option	User does not know how to take photo and for profile picture	Wrong photo or privacy breach	Breach of confidentiality	2	6	Add comment reminder; enable review before upload.
2.9		Click on confirm to log the task that you have completed successfully	CRC residential staff and CRC rehab staff	CRC residences or rehab facilities	Confirming the task without completing all required steps or double-tapping it accidentally.	User does not see confirm/log button on screen	User does not recognize that task is ready to submit	User does not tap to confirm and submit	Incomplete logging	3	2	Requires confirmation of all steps before logging.
3.1		Tap on the SOS button hovering over every application frame			Accidentally tapping SOS when trying to navigate the screen or dismiss a notification.	User does not see floating SOS button on interface	User does not recognize that SOS button is present and quick access menu	User does not tap emergency button to initiate alert	False SOS trigger	3	2	Add confirmation prompt for SOS.
3.2	SOS Initiation	Search the resident profile that you are initiating the SOS for			Selecting the wrong resident due to name similarity or blurred scrolling.	User does not view resident search results	User does not know individual in emergency	User does not type or scroll to select correct resident	Unnecessary panic and response	4	12	Add photo, DOB in list; prompt confirmation.
3.3		Tap a Senior staff member to assign to that specific SOS initiation			Tagging the wrong staff member.	User does not view dropdown list or staff directory	User does not know who is responsible for escalation	Wrong resident tagged	Incorrect care escalation	2	8	Show staff availability + role badge.

With our concept prototyped in sufficient fidelity to garner useful feedback, we conducted a task analysis of our envisioned use cases of the solution. We focused on the staff-facing version of the platform, as it was the most fleshed out of the three conceived versions. Once we described all associated tasks, we identified potential use errors and assessed them for severity and likelihood to determine the overall risks of our solution. To view the complete task analysis and corresponding risk analysis, please refer to the spreadsheet linked below. The table outlines key user tasks, associated use errors, hazards, and potential harms, along with severity and probability ratings, calculated risk levels, and mitigation strategies. [Click here to access the full task and risk analysis.](#)

Changes After Our Analysis

- Added **visual indicators** like priority, room number, and due time to help staff quickly understand what needs attention and when.
- Include **resident photos** and a short description or note (e.g., preferred name, key considerations) to avoid mix-ups and support more personalized care.
- There are built-in **task-specific instructions**, so no one has to guess what “help with lunch” actually means for a particular resident.
- Introduced a **confirmation modal** for the SOS button so it’s not accidentally triggered. Made it so staff must **review and confirm** each action (like toileting assistance or feeding) before it’s logged to ensure everything is accurate.

- Designed the platform to **require checklist completion** before allowing a task summary to be submitted. That way, nothing gets forgotten in a rush.
- Ensured sensitive actions (like emergency reporting or medication support) now come with a **final prompt** to double-check everything before it's sent.

6. Usability Test

Test Protocol

This usability test focuses on evaluating the early-stage prototype of our communication and task-tracking platform designed for CRC. The goal is to assess how effectively the prototype supports real-life care coordination, communication, and resident engagement across staff roles. Participants will interact with a rehabilitation and residential-facing version of the platform using the clickable Figma prototype. The prototype emphasizes core workflows such as task completion, emergency communication, and resident information access.

Target Users - To reflect the actual user base and gather varied perspectives, we will include one representative each from the following groups:

- Leadership
- Rehabilitation Staff
- Residential/Nursing Staff
- Family Members/Guardians of CRC Residents

Setup - Participants will be asked to open the following Figma prototype link in full-screen mode.

- The prototype simulates the experience on a tablet device.
- Participants will be briefed about Figma limitations (e.g., static screens, pre-set input responses, specific click paths).
- Clickable areas will be visually highlighted; participants may ask for guidance if needed.

Tasks & Associated Questions

- **Task 1: Complete a Scheduled Task**

Scenario: A staff member needs to mark a scheduled task as complete and note that a resident did not participate, including a brief reason.

Observation Notes:

- ➔ Time taken to complete the task
- ➔ Whether help was needed
- ➔ Any user confusion or hesitation

Follow-up Questions:

- ➔ What is your impression of the calendar/schedule page?

- Is anything missing from this page's functionality?
- What do you think about the timing and placement of the passcode entry?

- **Task 2: Report an Emergency**

Scenario: A resident experiences a seizure. After calling 911, the staff member must report the incident and tag the relevant individuals.

Observation Notes:

- Ability to locate and activate the emergency report
- Flow between steps and clarity of fields
- Any hesitations or errors during navigation

Follow-up Questions:

- Does the emergency protocol include enough detail?
- How do you think this would affect emergency response in real life?
- Is there anything you would expect to see that isn't included?

- **Task 3: Follow Up on an Emergency**

Scenario: Later in the day, the user wants to check for updates regarding the emergency reported earlier.

Observation Notes:

- How easily can they find the information?
- Are the updates clear, complete, and accessible?

(No specific follow-up questions, unless confusion is observed.)

- **Task 4: View a Resident Profile**

Scenario: The staff wants to access a resident's profile and find a note from a loved one about a recent health concern.

Observation Notes:

- Ease of navigation across tabs
- Ability to locate personalized notes or health updates

Follow-up Questions:

- Did the profile include the information you expected?
- What would you add or change in the profile layout or content?

Post-Task Evaluation Questions

- What did you like about the platform?
- What would you change?
- What surprised you the most (positively or negatively)?

Root Cause Analysis

Using the five-whys method of root cause analysis, we drilled into five main instances of use errors, moments of assistance, and difficulty that occurred during usability testing sessions. We

were able to generate 10 root causes, representing exactly why problems arose as well as why the same problems might arise for different reasons.

Type	User	Description	Root Cause	ID
Use Error	Caitlin	Supposed to click on the SOS button, but instead ended up clicking on the second task item in the calendar page (which indicates that the icon itself might not be sufficient)	The colors on the task item attracted a lot more attention from test subjects than the SOS button.	1
			The SOS didn't clearly state a label mentioning its function.	2
Assist	Kevin	Did not realize that the “Mark as Completed” button was a button and thought that it was saying that it was already marked as complete. The user had to be told to press the button to return to the calendar.	There is no drop shadow or border for the button.	3
			There is no back button without marking it as complete, serving as an alternative button, so the only way to return to the calendar is by marking it as complete, which the user may not always want to do.	4
Assist	Caitlin + Althea	The “View Details” button in the resident profile page was difficult to click on because of its smaller-sized CTA.	Didn’t follow the existing mental model of a larger click target for this action.	5
			The button and text are small.	6
Assist	Kevin	Tried typing in the notes box for the resident before unchecking the resident.	His mental model of unchecking a resident and adding notes was that the order would not matter, but for Figma, you need to uncheck the box and then add the notes.	7
Difficulty	Kevin	Had difficulty pressing the check box on and off to select if a resident participated in an activity (Missed the small checkbox)	Figma cursor is larger than the checkbox, so the cursor might not click it even if it encloses the checkbox (i.e., because the checkbox is not centered in the cursor bounds).	8
			The instructions for selecting/deselecting residents are in very small font.	9
			The instructions are below the content they pertain to.	10

Subjective Feedback

Participants responded positively to the platform's simplicity and ease of use. The calendar layout felt familiar, and staff appreciated features like task tracking, updates, and the potential to improve communication between teams. The SOS alert was seen as a useful addition, and users felt it could save time in emergencies if implemented well.

At the same time, users shared several suggestions. They wanted the SOS button to be more visible (e.g., red with a clear label), with options to categorize emergencies and add follow-up notes. Other "nice-to-haves" included personalized care videos, task icons, flexible due times, the ability to log notes for all residents (not just those who didn't participate), and more visibility into residents' preferences and routines. Families liked the idea of photo galleries but expressed privacy concerns.

Overall, users felt the platform had strong potential to streamline care, boost accountability, and foster more meaningful engagement, both with residents and their families.

7. Reflection

Next Steps

If we were to continue this project, our immediate next steps would include conducting additional rounds of usability testing with a broader range of CRC staff, including new hires, part-time workers, and overnight residential staff, to ensure the platform supports all user needs and work contexts.

We would also begin developing higher-fidelity prototypes of the leadership and family-facing views, incorporating role-specific functionality and access levels. In parallel, we would collaborate with CRC's IT team and compliance teams to evaluate data privacy, consent management, and integration feasibility with existing systems. Lastly, we'd work closely with staff trainers to design onboarding materials and explore lightweight training modules to support adoption.

CRC has expressed interest in including this project in a report to support grant funding efforts aimed at hiring developers and continuing the application buildout. Alternatively, we may explore passing this project off to a student team or organization at Tufts for further development and implementation in the coming semester(s).

Conclusion

This project allowed us to explore how thoughtful, role-specific design can improve communication in a high-responsibility care environment.

CRC's new platform was shaped by direct input from staff and families, and while still a prototype, it reflects a promising step toward reducing friction, improving transparency, and centering resident dignity and participation in every interaction.

