

Elder Carennection

Final Report - Getting the Design Right

Amber Amin | *Design*

Laura McFarlane | *Group Manager*

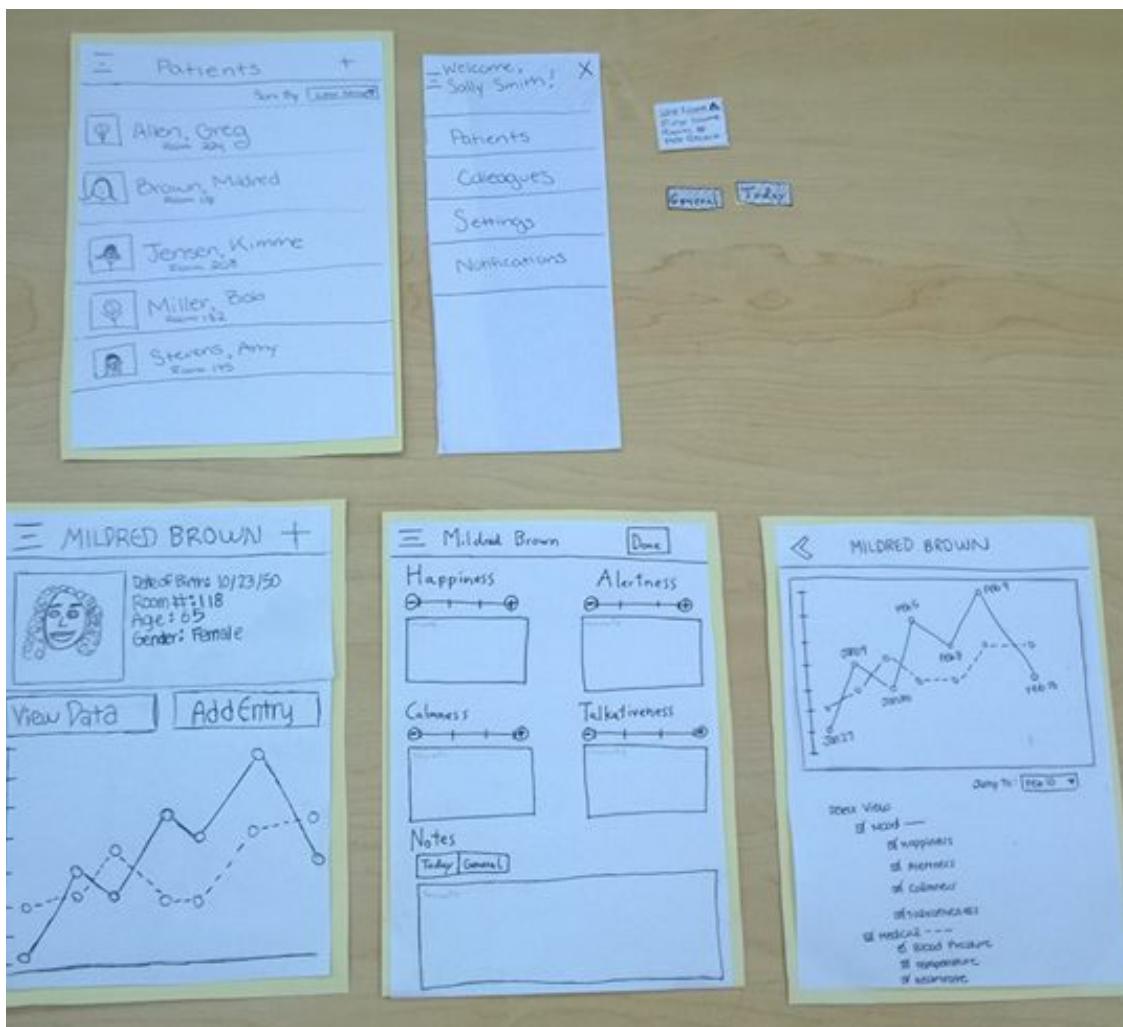
Tiffany Lin | *Documentation*

Ty Overby | *Fieldwork and Testing*

Problem Solution and Overview

Taking care of the elderly is a very difficult task. When in nursing homes or retirement homes, the elderly can be thought of as almost perpetual medical patients. However, the tools available to nurses in hospitals are not available to elder caretakers. Our product, a secure iPad mini app, can be used to cover this gap for the caretakers so they can focus on their main task: caring for the elderly. Through contextual inquiries, we've found that caretakers are very concerned about patient moods and comfort levels because those are good indicators of underlying problems. Elder Carennection will help caretakers track of moods and catch problems affecting mood before it's too late. In addition to that, it will act as a way for caretakers to communicate with each other, especially when the caretakers are dealing with multiple patients or even one patient who has a significant amount of information. Our application helps to provide a holistic picture of the elder for all of the caretakers involved in the care of the elder.

Initial Paper Prototype



Our original paper prototype centered around the patient list, with the primary uses having to do with the patient mood data. Our first task was to enter data (“add entry” from patient screen) which led to a page with 4 sliders on categories relating to mood and many boxes allowing for notes. The next task was to view data (“view data” from patient screen). We show a static high-level overview on the patient page with a more in-depth view available when the user taps “view data”. From there, the user can scroll through and zoom into patient data over time. Data includes mood data entered in the first task as well as health and vitals data, both juxtaposed with each other to allow the patient to see correlations between the two. One can tap on a point to see further details on what went into that point’s calculation or tap the “jump to” dropdown to go to a specific date. They can also select or unselect what data is shown on the graph using the checkboxes.

After creating our paper prototype, we received great feedback prior to conducting formalized tests by having our designs heuristically evaluated. The key takeaways we abstracted from our feedback centered mostly around the graph (“view data” page) and some of our symbology throughout the application. Evaluators commented that the “jump to” box was confusing and that they wouldn’t think to go there to switch the date, suggesting that perhaps we switch the wording to something like “go to”. The “+” symbol wasn’t as intuitive as we’d hoped. Our intent was for it to be an “add” button, in whatever context the plus button is shown in (add patient, add entry, etc.). However, the symbol was not intuitively representative of adding something when used alone and was confusing on the patient profile page (“Mildred Brown”) because there was also an “add entry” button. We resolved to eliminate the plus sign from the patient profile page to eliminate this confusion. Additionally, it was brought to our attention that our designs lacked a back or cancel button so we added those in our next iteration. In terms of the visibility of system status and knowing where your are in the system, it was also raised that many of our screens just say the patient’s name at the top without giving indication of what the task they’re in is (view data, add entry, etc.) so we also revised the page titles in the next iteration as well.

Testing Process

Method

We conducted “think-aloud” usability tests with one team member acting as the conductor/computer and another team member acting as the observer. We created a rough script (see appendix) so that all three of our usability tests were standardized. This began with introducing our user to his/her caretaker situation - we stated that they were entering a patient’s room to do daily duties, and afterward would take mood data based on their interactions. This immediately led to Task 1, which happened to be more successful than Task 2, so led the usability test to a good start. After inputting this mood data, we figured that our user would be pretty familiar with our interface and the general language our interface used, so we asked them to view mood data as the second task. Throughout the test, we encouraged users to think-aloud so that we could understand what was easy to find and what was confusing. This process helped us catch problems early on, such as our directions being interpreted incorrectly, certain missing functionalities, and oddly placed buttons. During the

test, we also counted the number of errors made during each task, and after the test we asked questions regarding likability, usability, and where users had the most trouble. We also wanted to conduct usability tests on actual caretakers, but failed to find convenient times for these to happen within deadlines.

Usability Test #1

Our first usability test was conducted on Brooke Lee, a 21 year old UW Student who is majoring in Political Science. We conducted the usability test in her work environment (the Leadership and Programming Office), because it was most convenient for our participant to meet there. We selected Brooke because we wanted our test to be from an unbiased user, meaning she had little experience with usability tests and medical data. We wanted to test purely the navigability and usability of the device, thinking less about the medical side of the interface. In the test, Laura acted as the observer and Tiffany acted as the conductor and computer. We got great feedback on our paper prototype by asking Brooke to think-aloud and recognized many areas that her eyes were not attracted to, which caused her to miss some steps of the interface.

We followed a script by introducing our interface, and the situation. The first task (adding mood data) went smoothly, but the second task (viewing previous data) was very confusing for her. We wanted to see our user succeed, so it was hard to re-situate ourselves when the user was not able to complete a task the way we had predicted. We learned to try not to control the user, because it isn't their fault if they couldn't complete the task on their first try. We also learned not to interfere with the usability test, and let them continue trying to complete the task. We ended up revising the interface for the second task to prevent future complications from occurring, and learned to step back when users are having trouble, instead of trying to probe for correctness.

Usability Test #2

Our second usability test was performed with Youn, a 31 year old in-home caretaker for a Amber's grandmother. Amber conducted this test as both the conductor/computer and the observer. Youn has a background in nursing and routinely monitors her patient's blood pressure, blood sugar, comfort and more. The usability test was conducted by Amber in her parents' home, where her grandmother lives and Youn works daily. We selected Youn to complete this test because of her profession as a caretaker, and thus obvious connection to our user group, and the access we have to her since she works in Amber's home. Again, we tested the usability and navigability of our design by asking her to both enter new data and view previous data. Youn had no problem with the first task, however the second task was somewhat more revealing of a way our design could improve. In the first task of entering new mood data for Mildred Brown, Youn succeeded with ease and seemed to appreciate the slider scale for the various aspects of a patient's mood. On the second task, it took Youn a while to figure out that she should slide the graph to scroll horizontally. She correctly guessed that she should tap on a data point to see more details. To make it more obvious that the graph is continuous and can be slid, she suggested eliminating the borders of the graph so it spans horizontally from edge to edge of the screen. We liked this suggestion and implemented it in our future prototypes. We also added arrows to increase the obviousness of the scrolling capabilities.

Usability Test #3

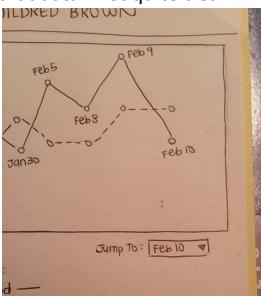
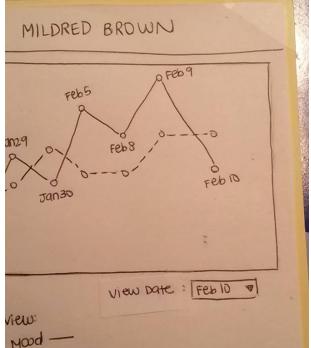
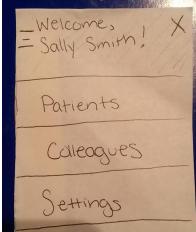
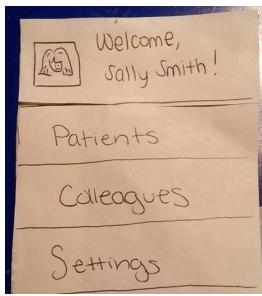
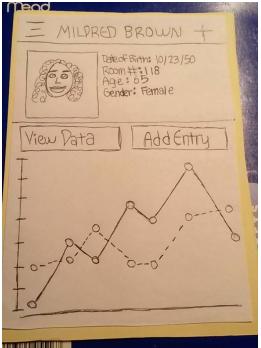
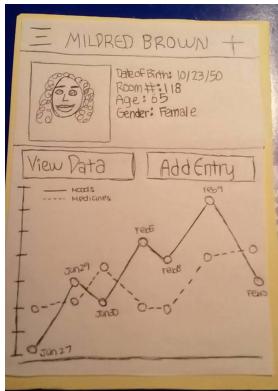
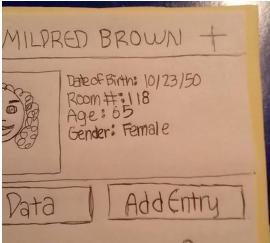
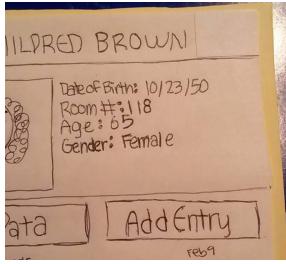
Our third usability test was conducted on Brian, a 22 year old HCDE student. We chose Brian as a participant because of his experiences in UX design and knowledge of HCI. He also has a lot of experience in paper prototypes and usability tests, so can offer us tips on our interface. The usability test was conducted by Tiffany (conductor/computer and observer) in HCDE's Design Lab because it was most convenient for him. The setting was quiet with lots of room for the testing. We followed the same script and introduced the situation to Brian. The only thing that changed was the way we presented the tutorial arrows when viewing data. We explained that they would "appear and go away" to signify that the user could slide the graph. Brian successfully completed the first task, adding data, with no errors and a clear understanding of the goal of the task. However, he had trouble during the step of going to another date. We realized the problem was the way we introduced the arrows. We seemed to rush through the explanation and he interpreted that the arrows just "disappeared". In future usability tests, we need to clarify our language. In addition to that Brian also suggested other ways to navigate, like allowing users to view by date or month. This could help speed up the swiping process, or also give users good ideas of trends over longer periods of time. We took this idea into consideration and put that into our paper prototype.

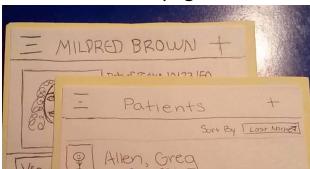
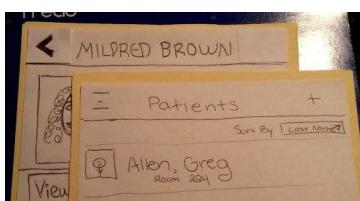
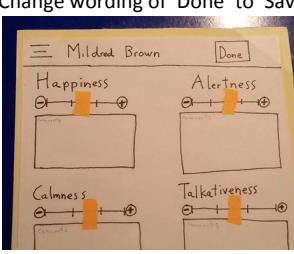
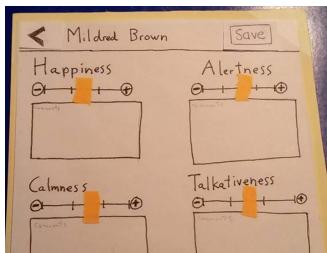
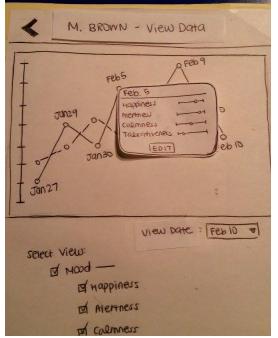
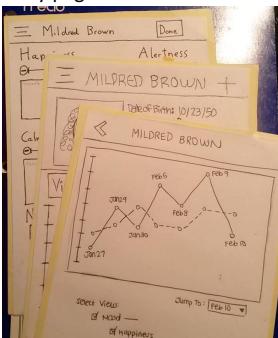
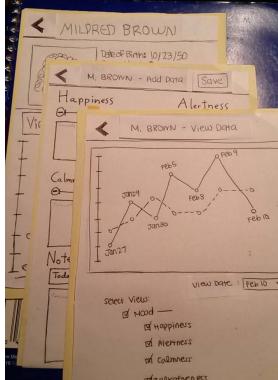
Testing Results

Takeaways from Heuristic Evaluation

Some of the errors we found and corrected after the heuristic evaluation were:

- consistency errors
 - We imagined that Elder Carennection would be used on something like an iPad mini, but forgot to add small buttons in obvious locations, or added too many buttons in unneeded locations.
 - Our user was confused with how she got from one screen to another.
- recognition difficulties
 - We used unfamiliar language and forgot to label some data for a first time user to immediately understand.
- error prevention tactics
 - We didn't provide options for first-time users to 'save' themselves from trouble.

Severity 0 - no problem 4 - catastrophe	Heuristic Violated	Problem	Revision
1	Recognition rather than recall	Not sure if "jump to" means that all you see is that day's data or the timeline centers around that data - not quite clear 	
2	Consistency and standards	Not sure why the hamburger icon is shown on the menu when expanded 	
2	Recognition rather than recall	User initially looked at Mildred's 'View Data' page, and didn't know what the graph meant at all. User asked, "What do the dots and lines mean?" 	
3	Consistency and standards	Confused by having "Add Entry" and "+" sign on same page that do the same thing 	

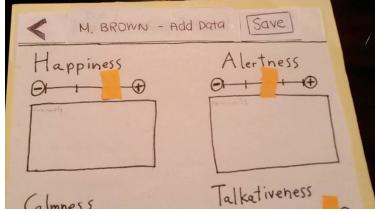
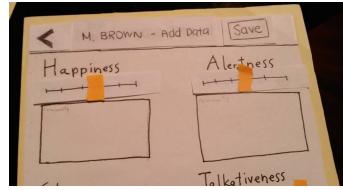
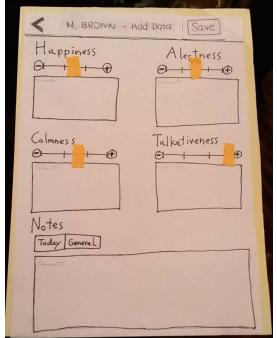
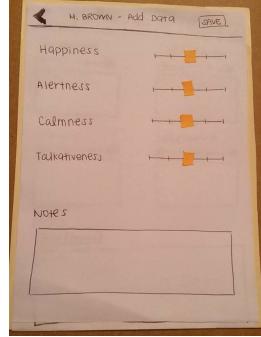
4	Consistency and standards	Clicked + without knowing what it did. Confused that it was on both the 'List of Patients' and Mildred's 'Profile' page.		
4	Error prevention	Need back or cancel button on 'Add Data' page. Change wording of 'Done' to 'Save'		
4	Error prevention	User asked, "How do you undo or delete data entries?"		
4	Recognition rather than recall	User was confused what page they're on because every page said 'Mildred Brown'.		

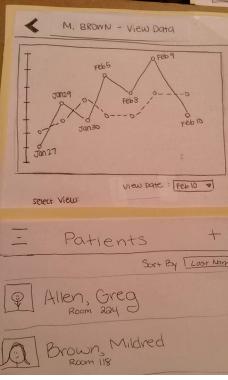
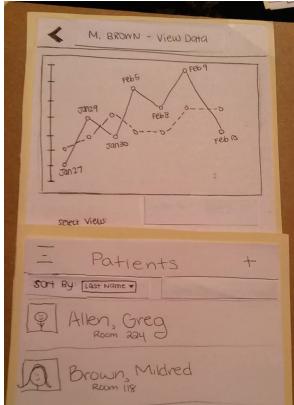
Takeaways from Usability Test #1

The confusions we found and corrected during Usability Test #1 were:

- consistency errors
 - Our user chose to click buttons instead of using the sliders we provided because we had increase/decrease buttons in addition to the sliding point.
- excessive comment sections

- Our user didn't use the extra comment boxes provided, and when asked about that, didn't understand the need for all of them.
- quick visualizations
 - Our user didn't use or notice some options presented in the top-right of sections. Their eyes were not attracted to that, so they didn't realize those options were there.

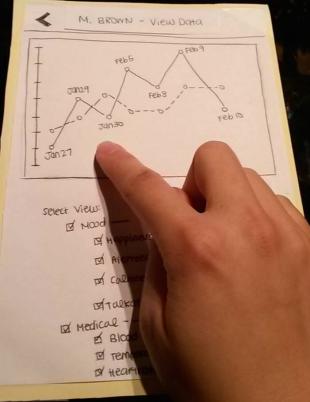
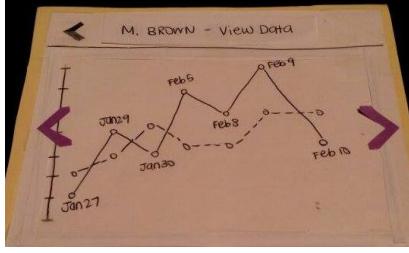
Severity 0 - no problem 4 - catastrophe	Heuristic Violated	Problem	Revision
4	Recognition rather than recall	Instead of dragging the slider to set mood data, user clicked the '+' and '-' button expecting that to move the slider. 	
0	Visibility of system status	May have misheard task directions, and clicked the wrong date. User clicked a data point instead of using date switcher to change date.	- need to provide clarity to task -
4	Flexibility and efficiency of use	User was confused with many comment boxes, and only ended up using the bottom comment box. 	

4	Recognition rather than recall	User's eyes were not drawn to the 'Sort By' and 'View Date' options, situated at the top right hand corners of screens.  
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Takeaways from Usability Test #2

The confusion we found and corrected during Usability Test #2 were:

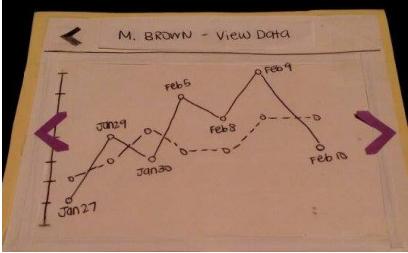
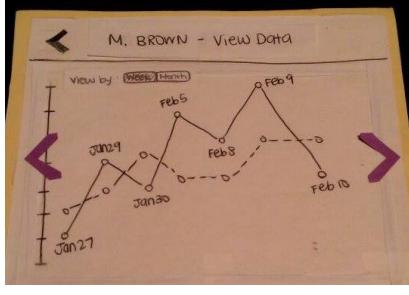
- efficiency errors
 - Our first-time user took a lot to think about how to navigate with our graph, so we added arrows to help symbolize movement.

Severity 0 - no problem 4 - catastrophe	Heuristic Violated	Problem	Revision
3	Flexibility and efficiency of use	User took some time to think of swiping graph for previous data, but eventually got it right. 	removed outer edge so graph isn't constrained; added arrows that appear then disappear to signify ability to swipe 

Takeaways from Usability Test #3

The confusions we found and corrected during Usability Test #2 were:

- language errors
 - Our user said that the language we used to signify that the arrows would appear then disappear was confusing, even though the arrows themselves made sense.

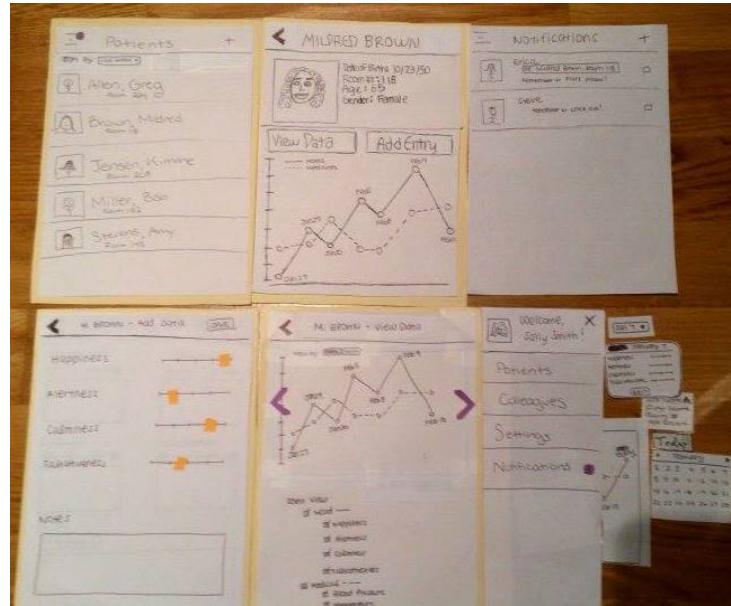
Severity 0 - no problem 4 - catastrophe	Heuristic Violated	Problem	Revision
2	Flexibility and efficiency of use	User questioned ability to move quickly from one week to another, and view trends. Suggested ability to switch views intuitively. 	Added ability to view by. 

User Ratings

After each usability test, we asked our users to rate each of the following categories on a scale of 1-5 (1-low, 5-high). We can see that the paper prototype did evolve to be more user friendly because the ratings tend to increase as we continued to iterate (although only having one user test per iteration skews these ratings a bit).

Participant	Clarity	Quickness	Likeability	Ease of Use
#1 - Brooke	3	5	5	4
#2 - Youn	4	-	5	3
#3 - Brian	5	5	5	5

Final Paper Prototype



Our final paper prototype followed the same tasks: adding data and viewing data. Our overall changes from the first paper prototype to final are summarized below.

Simplification of mood-entry (“add data”) screen

The first major change was the reduction and simplification of the mood-entry screen. Firstly, we went from having a 'notes' box for each mood point, to just a single box for the day. We noticed that in the usability studies that the users just defaulted to the non-specific notes box anyway, so we removed the specific notes box and kept the larger, more general one. Removing these boxes are important for clearing excess objects on the screen because caretakers often take notes quickly - we want to refrain them from having to feel forced to click through many areas and wonder where particular notes might go. This will also make the user interface scale better if we want to let the user add their own mood categories to track. We are also still considering having a distinction between "daily notes" and "total notes". Secondly, the scrolling arrows were confusing in our first usability test because the user clicked “+/-” buttons to move the scroll unit, instead of dragging it like we intended. We quickly made a fix to this scroll bar by removing the “+/-” options and only having the scroll unit. Our second and third usability testers quickly understood the intention.

Simplification of “view data” graph navigation

Another issue that users had while using the paper-prototype was navigating the graphs. We believe that this is due in part to the nature of paper not really being able to respond to the users inputs. There are several ways that this could be remedied. One is by adding arrows to the sides of the graph. These arrows will be identified as buttons and would

be used to navigate the graph. Another suggestion from a classmate during Thursday's quiz-section discussion was that we have the graph scroll a small amount on the entrance to the graph view. We tried to inspire our users to swipe by adding tutorial-like arrows to our paper prototype to inform the user that they the graph could be moved. Additionally, per the recommendation of one of our testers, we've eliminated the borders of our graph area to better indicate the continuous nature of the graph and hint at the ability to scroll.

Relocation of organization features

When asking our usability testers questions about our interface, we realized that there were many parts of it they had overlooked when trying to do both tasks. Firstly, our first usability tester didn't realize there was an option to organize patients, which was a drop down menu we had put in the top-right portion of the screen. We thought this feature was necessary because caretakers should be able to customize how they want to access information (alphabetical order, schedule order, priority, etc.). We want it to be seen because it would help them finish tasks quicker, so we moved it from the top-right to the top-left portion of the screen, thinking that most people read left-to-right so this menu would more likely be seen. Lastly, our usability tester also didn't see the date pop up menu to select dates, which was located to the bottom-right corner of the graph. We realized this location easily hide this feature, and that it was also a confusing feature because without it, users all intuitively wanted to swipe the graph to go to another date. Therefore, we removed the date menu entirely and added navigation arrows to help signify swiping.

Digital Mockup

The digital mockup consists of four main screens:

- Dashboard:** Shows a welcome message "Welcome, Sally Smith!", a sidebar with "Patients" (1), "Colleagues", "Notifications" (2), and "Settings", and a "New Patient" button.
- Patients:** A list of patients with icons for adding and viewing data. It includes Greg Allen (Room 224), Mildred Brown (Room 118, marked with a red notification dot), Kimme Jensen (Room 208), Bob Miller (Room 132), and Amy Stevens (Room 145). A "Sort By" dropdown is set to "Last Name".
- Notifications:** A list of notifications for Steve (Patient: N/A, Remember to clock out!) and Erica (Patient: Mildred Brown (118), Remember fluff pillows!). Each notification has a checkbox.
- Mildred Brown Profile:** Details for Mildred Brown (Room #: 118, Date of Birth: 10/23/50, Age: 65, Gender: Female). It shows a timeline from June 10 to June 28 with mood and medical data. Alerts indicate talkativeness levels possibly affected by blood pressure changes. It also includes a "New Entry" button, a "View Data" button, and a notes section.
- New Entry:** A screen for tracking mood (Happiness, Alertness, Calmness, Talkativeness) over time. It shows a graph with a black trend line and colored segments (green, yellow, red). A "Done" button is at the bottom.
- Mildred Brown Timeline:** A detailed timeline for Mildred Brown from June 10 to June 28, showing mood fluctuations (black line) and medical data (blood pressure, heart rate, temperature, alertness, calmness, happiness, talkativeness). A legend on the right identifies the data series.

Firstly, our digital mockup was the first time we conveyed our concept using color. We chose to work with a teal and purple color scheme because of teal's calming nature and purple's frequent use in elder-related branding and its association with loyalty. We used light purple for the top navigation bar and on the hamburger menu. We used teal for interactive elements and notifications. Lastly, we used darker purple for headline and label words. Our primary tasks are still to view data and add entries. These two tasks can be accomplished in generally the same ways as in our paper prototypes, with the exception of the changes to these tasks described below.

Takeaways from Design Critique

Our Design Critique revealed an important area that was lacking in our design thus far, the use case of the data by the caregivers. We realized that you cannot give the user a bunch of data and expect them to do something useful with the data. This realization led us to a detailed discussion as a group about the purpose of the data and how caretakers had previously told us they currently interact with data. After much discussion we added in alerts to our digital mockup which alerted the caretaker when there was an abnormal change in the data, upon clicking the notification the caretaker is taken to the graph and data sets to interact with the data. We also added back in the medical information (heart rate, blood pressure and temperature to the patient's data graph, which we had previously removed following one of our first iterations of our paper prototype.

Quicker ability to add or view data from the Patients screen

Initially, users had to go to each patient's page and then click "Add Entry" or "View Data" to get to the respective pages. After some helpful feedback from our critique sessions, we've added shortcuts to the Patients list screen to allow one less click for advanced users while still retaining the previous path of accessing these features from the Patient Profile page. We also added iconography on both options, eliminating the "Add Entry" and "View Data" language on the shortcut since it is meant for advanced users who have already developed associations to the icons.

Data visualization and alerts

The graph view originally lost the ability to view medical data due to the lack of ability to input the medical data. Recently we did however add it back in by adding a wearable component to our overall concept that measures vital signs such as heart rate, blood pressure and activity level and records it to our application automatically and in real time. This allows us to provide alerts on sudden changes in vitals or mood and speculate as to correlations between the two. The graph goes from one side of the screen to the other, hopefully to show that it continues off on to the other side of the screen and is scrollable. Dates were also moved to the bottom of the grid to make viewing easier.

Rethinking the "+" symbol

We've removed the "+" icon which was previously at the top right of the Patients page during our first iteration of the design. We removed this based on feedback gained through our user interviews. A new button for "New Patient" was instead added at the bottom of the Patient List. In addition, we've added a "+" sign to the add entry button only, accompanied with the actual phrase "new entry" to make it clear what the button does and help the user recognize that the "+" on the Patient List page also means "new entry".

Discussion

The iterative design process was a long and insightful learning experience. We found that one of the most important parts of the design process was the "ship early, ship often" mentality that startups are so popularly in favor of. All of the daily meetings often showed us holes in our original design, or gave us ideas to use that we could implement right away. It wouldn't make sense to present the same design to each person we saw and make all of the changes right away. Instead, we changed up the design every time we showed it to someone, each time taking the previous feedback into account. The feedback that we got was extremely helpful, especially in locating parts of the user-interface where users get stuck. Without our usability tests, the team would have likely stayed ignorant of many design flaws. The reviews during class were also very insightful because help from people that were aware of the problem that we were working on was much like having an extra set of "expert" eyes on the UI and task workflow. It was from these discussions that we decided to add shortcuts to make expert's tasks easier, and we got ideas on how to make it more apparent that our graphs were scrollable. Throughout the process of refining the UI, our usability tests were helpful in identifying issues, and the group discussions were helpful in remedying them.

When it comes to shaping the final design, I would say that we converged on a final design that focused our core ideas for the app. During the course of the design process, we kept our focus and tasks the same: make it easy to input and to analyze data about a patient's mood and health. Instead of pivoting, we stayed with those tasks and mostly modified the user experience and the way that we present the data. More iterations would have likely seen more changes to the design, but it's unsure how substantial these changes would have been and if it would be very beneficial. Ideally, we would develop out the actual app and have usability tests done with the actual controls.

Appendix

Script/Order of Events

- Introduce ourselves
 - tell them they'll be navigating through interface to finish two tasks
 - Ask them to think aloud to help us better understand the design
 - we'll be observing your interactions - "We are testing our interface, not you"
 -
- Storyline:
 - "You're a caretaker for a nursing home, so you take care of many patients and it's hard to keep track of information about your interactions. This device will help you keep track of patient's moods and share this information with other coworkers. This device also keeps track of patient's medications and heart rate/blood pressure through [mood ring?]. Overtime, this device can also compare mood and comfort levels with their health."
 - Task 1: "Patients" → "Add Data"

- "You're entering Mildred Brown's room, and you have a great conversation with her. Although she's *very talkative*, she *isn't very happy.*" Ask her questions and fill in this data.
- User should click ADD DATA...and complete that.
- Task 2: "Patients" → "View Data"
 - "You want to double check Mildred's data from January 7th".
 - User should click VIEW DATA to get to new page. User should swipe or switch date...see new dates, and then click on data point.
- Ending Questions
 - Ask them demographics
 - age
 - field
 - Rate [0 - strongly disagree, 10 - strongly agree]:
 - usability/ease of use
 - likability
 - design
- Observation
 - Qualitative
 - *where were these mistakes? confusions?*
 - *what user could/could not accomplish*
 - *"would you use it?"*
 - *what was biggest challenge?*
 - *likes and dislikes?*
 - *recommendations?*
 - Quantitative

	Time to Complete	# of touches	# of errors
Task 1			
Task 2			

Notes: Usability Test #1 - Brooke Lee

- Successfully completed both tasks for adding data and viewing data.
- She pressed on the "+" located at end of the slider to move it rather than clicking and dragging to move the slider
- Was confused if the "save" button closed the screen on the add data page
- Clicked "Jan 7th" on graph
 - Slightly confused with the calendar
- Understood that "<" meant back page
- Said that she would think the menu would close by sliding up

- When asked about the most confusing part of the application:
 - The graph, she was confused about the date selection
 - Said that she assumed she would slide left or right to view previous or other dates
 - Other confusion about the “today notes” vs “general notes”
- Her eye was not drawn to the “sort by” and “view date” drop down filter tabs
- Said she was confused by the add patient button which was represented by “+” in top right corner of Patients screen.

Notes: Usability Test #2 - Youn

- Overall, Youn successfully accomplished both tasks (adding data and viewing data)
- Had no problems completing the first task, the sliders were intuitive for her and she assumed that if she added a note, the keyboard would slide up from below, as on a iOS device
- Correctly adjusted the sliders on happiness and talkativeness, as described in the storyline
- On task two, it took Youn a bit to figure out that she should swipe to view previous data but she eventually guessed it
- When she had “slid” to the correct date, she correctly guessed that she should tap the data point
- She recommended eliminating the borders of the graph so the graph spans horizontally from edge to edge of the screen. She feels this would help indicate that it is a continuous graph that can be slid.
- She did not try to pinch to zoom, although the scenario didn’t require her to
- Overall, the app made sense but the graph was most challenging
- Demographics:
 - Age: 31
 - Field: Care-taking with a background in nursing
- On a scale of 1 to 5 she rated the following:
 - Usability: 8
 - Likeability 10
 - Design: 7
- She said she would use the app but she doesn’t have an iPad. She speculates that practices already using iPads would be interested. The most challenging part will be persuading people to ditch the old fashioned notebooks for a more high-tech practice
- She likes that the app provides a way of quantitatively recording patient mood with the sliders because currently she just qualitatively logs these things in her notebook, making it harder to detect trends.

	Time to Complete	# of touches	# of errors
Task 1	Under a minute	5	0
Task 2	Under 2 minutes	8	1

Notes: Usability Test #3 - Brian

confusions

- knew to move scroll things on ADD DATA
- confused on language, of scrolling data

suggestions

- should be organized by week
- what if i wanted to see by month?
 - view by week, view by month, view single day

clarity: 5

quick: 5

likeability: 5

easy of use: 5