Nurse AR interface: Low-Fidelity Report

Group: 5

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Introduction

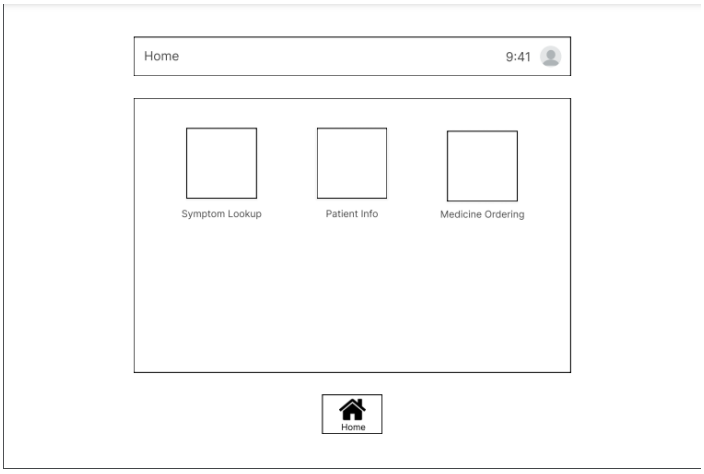
Our low fidelity prototype of a vr application user interface, is for nurses in a hospital. Our group has worked non-stop on accomplishing the full report. We analysed the duties of a nurse in a hospital setting and came up with three tasks. They are looking up symptoms of patients, scanning the qr codes o a patients bed to see their info and edit their status. And look up medicine to check stock, order or reserve some. The user interface was created to provide a way to complete these tasks and designed so that it could be used in a busy and loud public hospital setting using a hololens system.

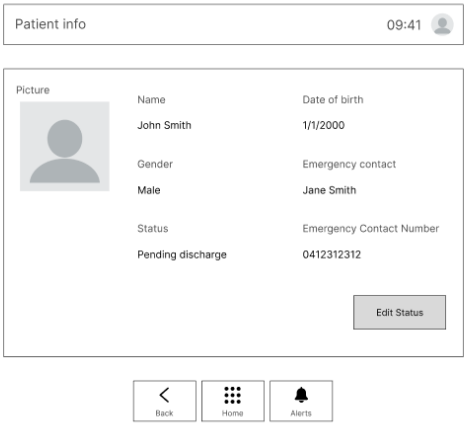
Design Process

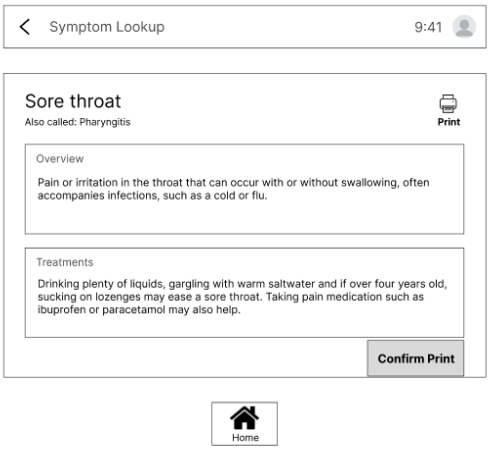
The process of designing the low fidelity prototype took several weeks, many attempts, trial and error, and different drafts until we got the final version we were happy with. The designs were made on the figma website, and printed out to be tested with by our testers on pieces of paper. They would touch the buttons on the paper that would simulate the process of clicking, typing or speaking into the microphone. The process is especially shown in our meeting notes.

In our first meeting, we discussed the basic ideas of what we wanted to do, as we chose the do a user interface for nurses. The next week, we came up with several tasks until picking the three main tasks for what nurses have to do, then the following week expanded those three tasks into three smaller tasks.

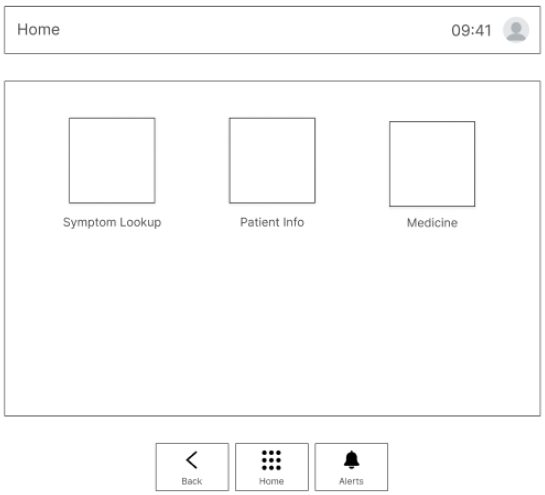
Over the next weeks, we made the first basic draft of the UI. Here are a few examples of that:

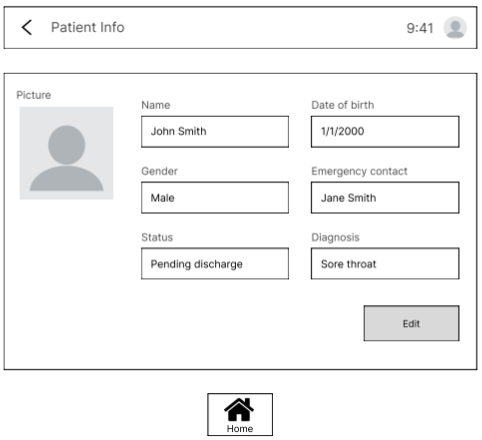


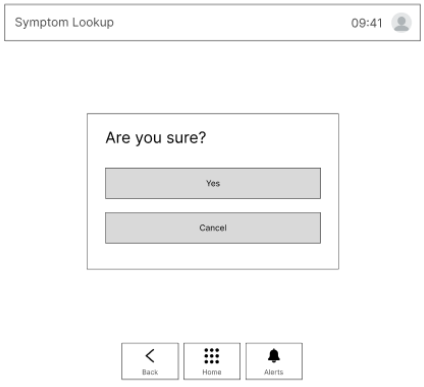




We went through it some more, and after we tested that interface, we came up with another draft. Here are what the previous screens look like after testing and became the final design:







As shown, the final design of the ui underwent several changes before finally submitting the final one. These changes were simply a part of the process of designing the ui.

Heuristics

In our heuristic analysis we were able to identify 7 features that would need to be added onto our initial prototype in order to make the low-fidelity prototype compatible for user testing. This process was determined by each member of the team acting as the end user, we would then try to navigate to the needed functions and any issues along the way were noted into the following list:

- Need to add a recent label to the symptom look up page, this allows the user to navigate to their recent searches increasing task completion speed massively.

- Add frame (page) for intermediate search results for symptom lookup, this shows the user how the interface would work realistically. This also improves task completion speed by allowing an “auto-fill” like feature.

- Change diagnosis to emergency contact number – We decided that a nurse should not be able to change their diagnosis status. It was more logistical to have their emergency contact number in the information screen.

- We decided to add the Edit page for patient info, including a submit/clear button for changing the patient's status.

- Very similar to the symptom look up page, adding a recent label for the medicines searched for in the look up increases task completion time by reducing the necessity of typing in the medicine each time.

- Add nurofen page for medicine, Add morphine page for medicine, Add morphine order page as well. For our prototype to be able to have distinctive tasks to complete for its respective scenario, there needed to be explicit pages for each of the medicines the user would be tasked with.

- Add frame (page) for intermediate search results for medicine ordering, for the same rationale as the symptom look up page.

From this analysis we were able to make sure to abide by the 10 usability heuristics suggested by Nielson. The intended actions described in the initial analysis were undertaken and imposed on the prototyping, this corrected issues within the prototype before usability tests were performed. However, the corrections that were made imposed a much smoother user experience compared to what would have taken place if we did not engage in such a thorough heuristics analysis.

Risk assessment

This section presents the risk assessment made on the first prototype iteration, made in week 4.

Risk	Risk level (1-5)	Testing method	Potential mitigation strategy
Accidental form and request submission	5	The mitigation strategy was included before testing. Effectiveness of the mitigation strategy will be indicated by the amount of accidental submissions and requests.	Include confirmation pop-ups to all form submissions and print requests.
Accidental or unauthorised patient information editing	5	The mitigation strategy was included before testing. After testing, ask the testers if the ‘final’ info was perceived to be editable.	Disable editing of ‘final’ patient info variables for the standard user.
Unclear labels	4	A user’s understanding of the labels will impact the speed they perform the task, and how many unnecessary clicks they make. Therefore time (especially time the user is not active) and suboptimal click count will be metrics for this risk. Interviewing the testers after the test will also be critical.	Modify iconography and label names based on tester feedback.
Difficulty returning to home screen	4	Include at least one task for the user to navigate to the home screen.	Modify ‘return home’ button size, location, label or icon , based on user feedback.
Slow typing	2	For the low resolution prototype, this is not testable, because the risk is fundamental to the HoloLens. However, the affordance of the text to speech alternative can be tested: Notice whether the tester selects the text to speech button, and if not, ask during the post-test interview.	Incorporate voice to text as the primary input method. Display dynamic text completion suggestions and or search results as the user inputs to search fields.
Misreading time data	2	The mitigation strategy was	Change to display

Risk	Risk level (1-5)	Testing method	Potential mitigation strategy
		included before testing. No plans were made to test this risk.	time in an ISO 8601 compliant 24hr format.
Repeated search	1	The mitigation strategy was included before testing. To verify it's mitigation, the user will be asked to display the Symptom page of the most recently looked up symptom	Upon opening a search dialogue, a short search history of recent searches will be presented.

Briefing

Hello, thank you for helping us with testing our prototype. Today you are a nurse working in a hospital, our prototype will help you with specific tasks that you would encounter in everyday working (we think). You will be given a scenario card, which will have 3 tasks for you to complete on it, we will provide you with paper and a pen to write with.

Please note: The tasks can be completed in any order. If at any time you wish to end the test, please let one of us know.

Scenario Tasks

Index Cards

Scenario 1: Symptoms

Task 1: Print most recent looked up symptom

Task 2: Lookup sore-throat and note first line of symptom

Task 3: Navigate back to home, after finding sore-throat description

Scenario 2: Patients

Task 1: Scan given QR code, note patient DOB

Task 2: Scan given QR code, edit patient status, submit

Task 3: Scan given QR code, edit patient status, clear changes

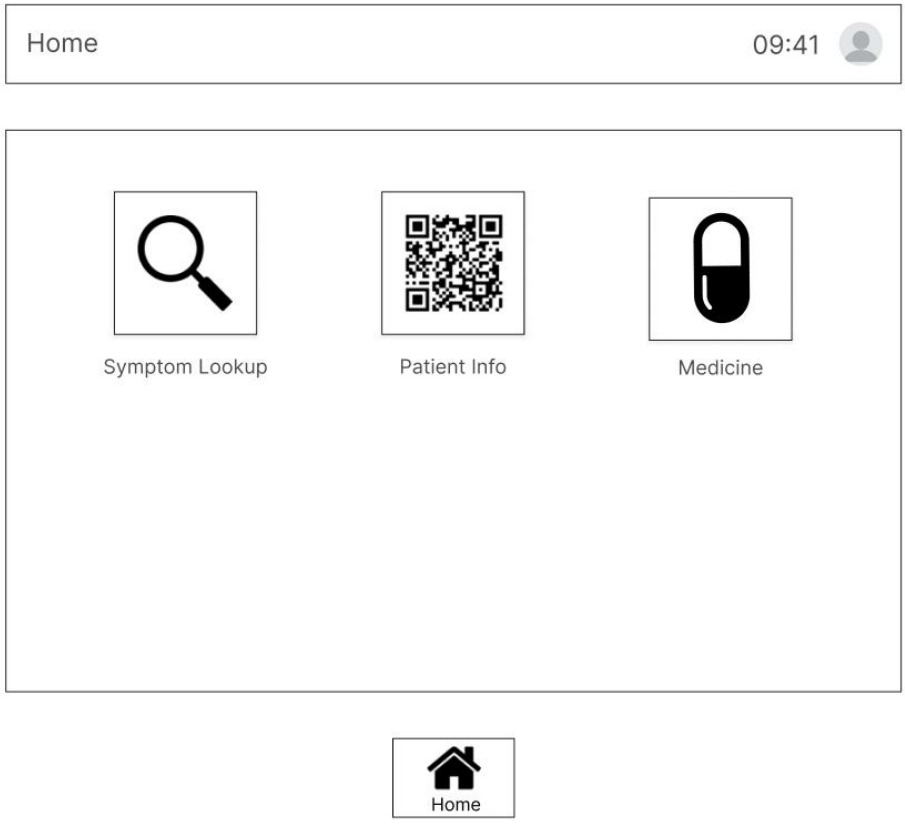
Scenario 3: Medicine

Task 1: Check stock level of Nurofen

Task 2: Reserve 8 instances of Panadol

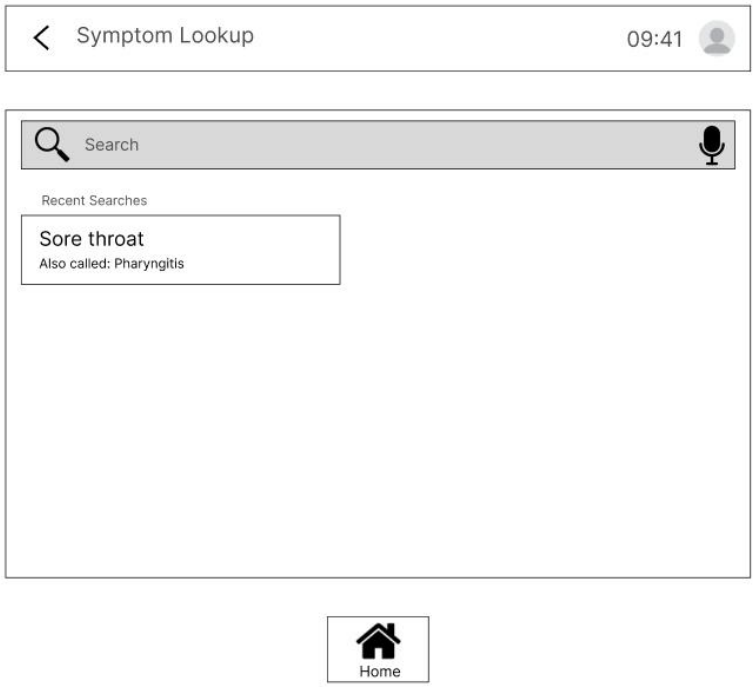
Task 3: Order 16 instances of Morphine

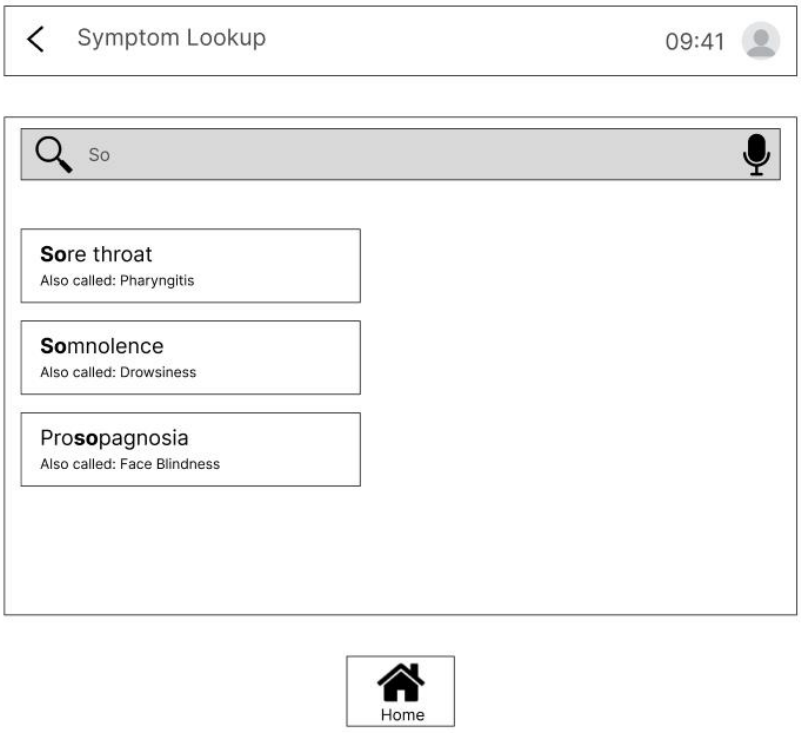
Pages of the prototype

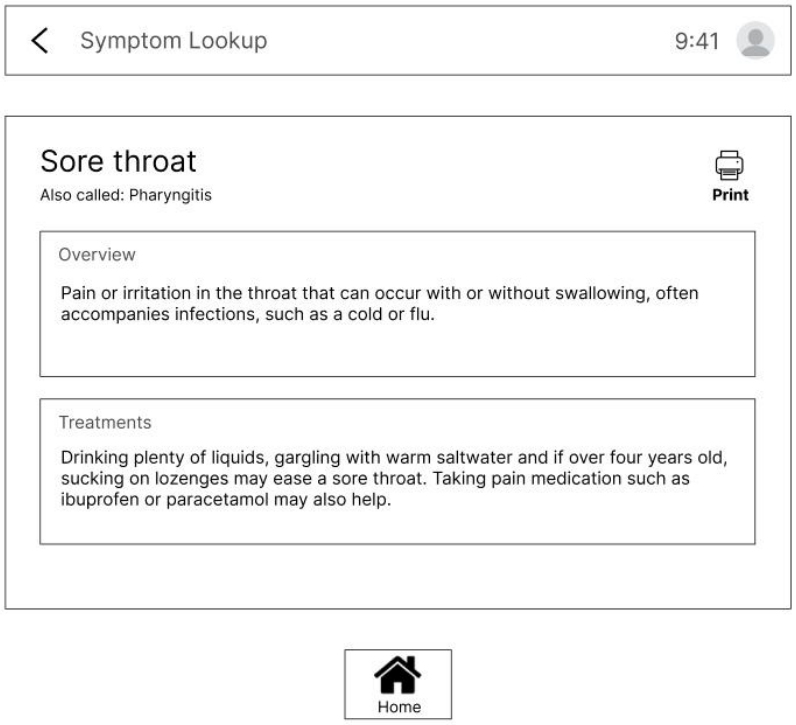


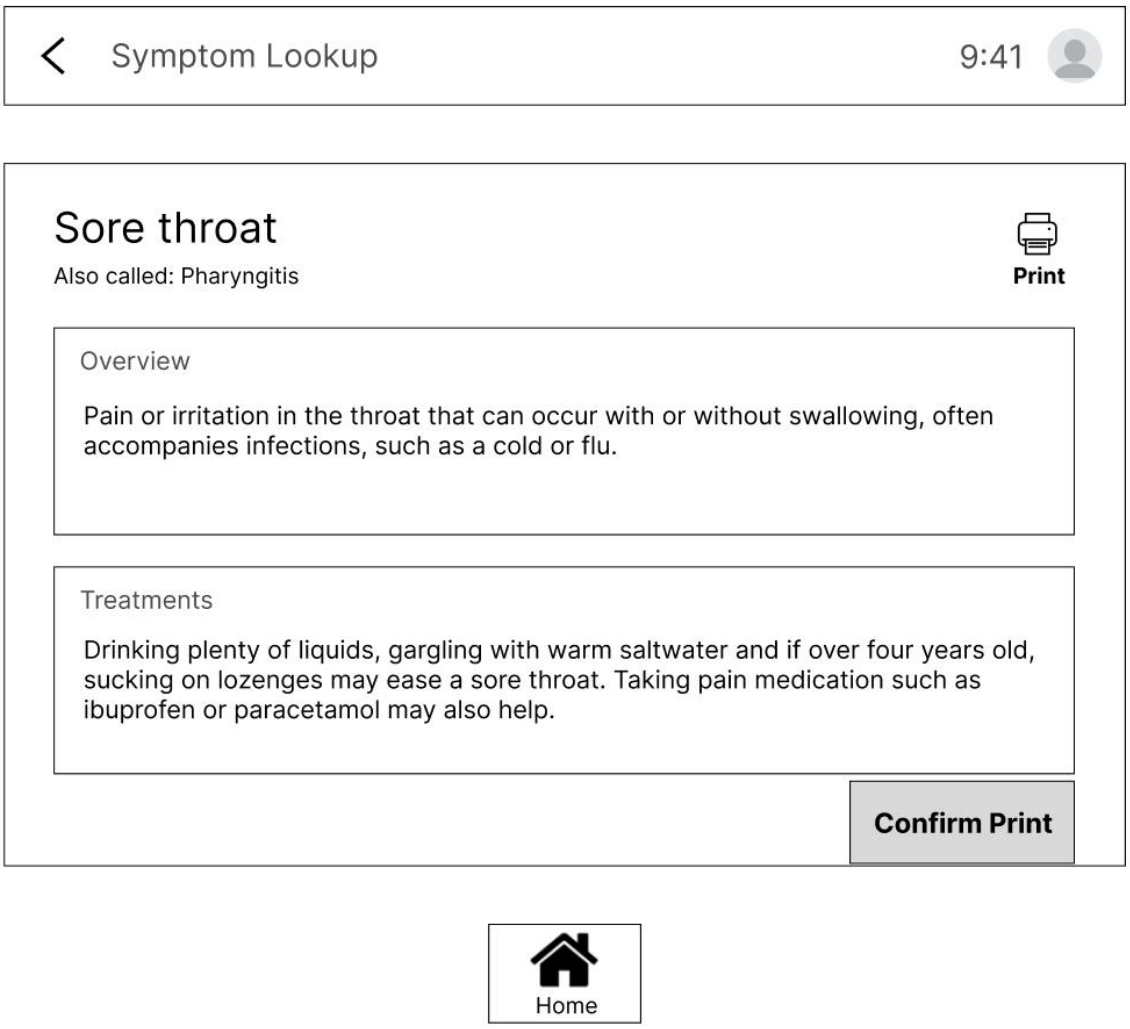
This is the home page from which all scenarios are first accessed. Depending on the testers' or users' choice, they can complete the previously mentioned scenarios, which were designed to align with tasks that a nurse, the target user, might need to accomplish in the course of their job—tasks like finding symptoms, editing patient information, and ordering new medications. The consistent design and widely recognized metaphors used in the prototype make it easy for users to navigate and understand without requiring specialised training or in-depth knowledge of

the app. This is particularly crucial because nurses may not always have the same level of technology literacy as professionals in fields like information technology.


Symptom Lookup
09:41
Search
Recent Searches
Sore throat
Also called: Pharyngitis
Home

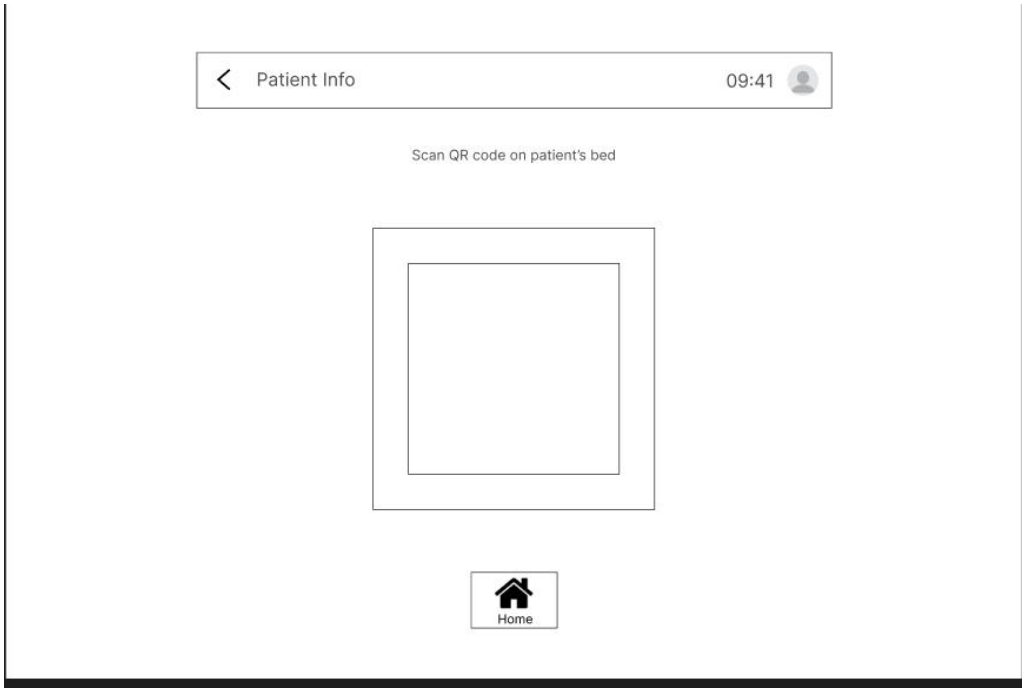

Symptom Lookup
09:41
So
Sore throat
Also called: Pharyngitis
Somnolence
Also called: Drowsiness
Prosopagnosia
Also called: Face Blindness
Home

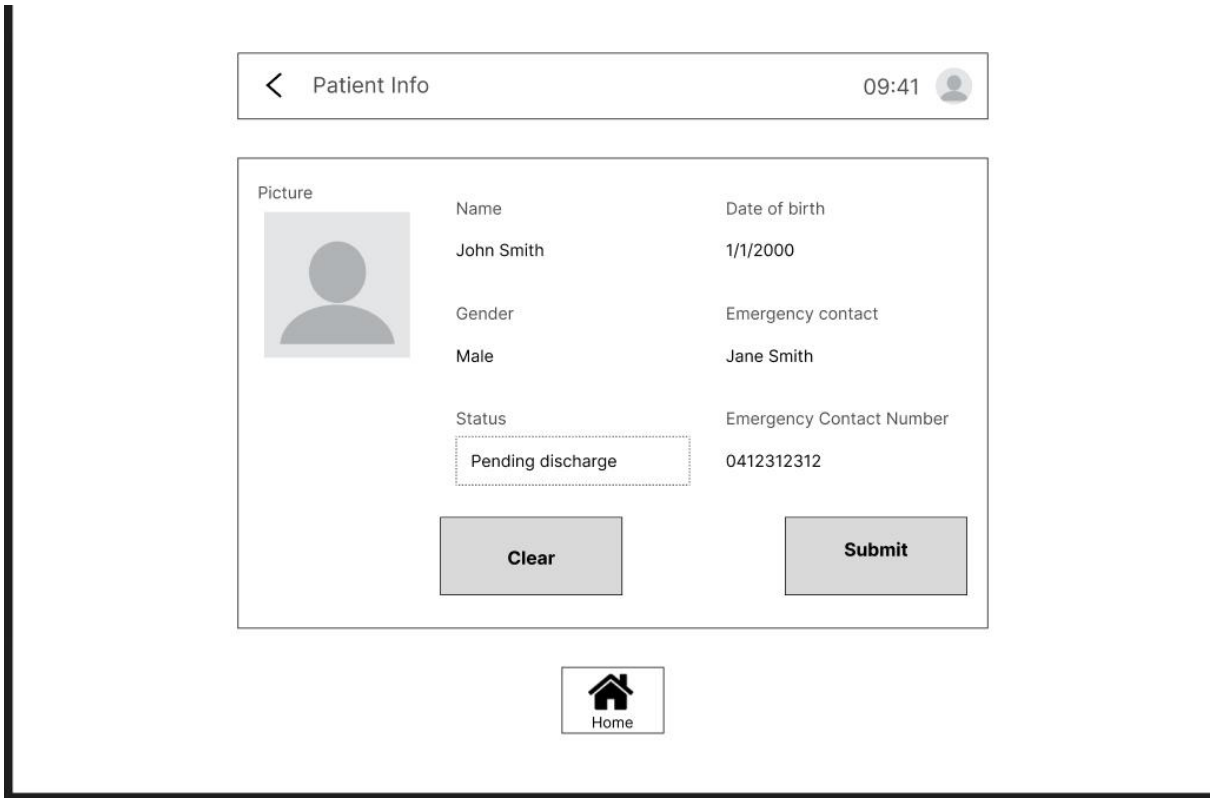

Symptom Lookup
9:41
Sore throat
Also called: Pharyngitis
Print
Overview
Pain or irritation in the throat that can occur with or without swallowing, often accompanies infections, such as a cold or flu.
Treatments
Drinking plenty of liquids, gargling with warm saltwater and if over four years old, sucking on lozenges may ease a sore throat. Taking pain medication such as ibuprofen or paracetamol may also help.
Home

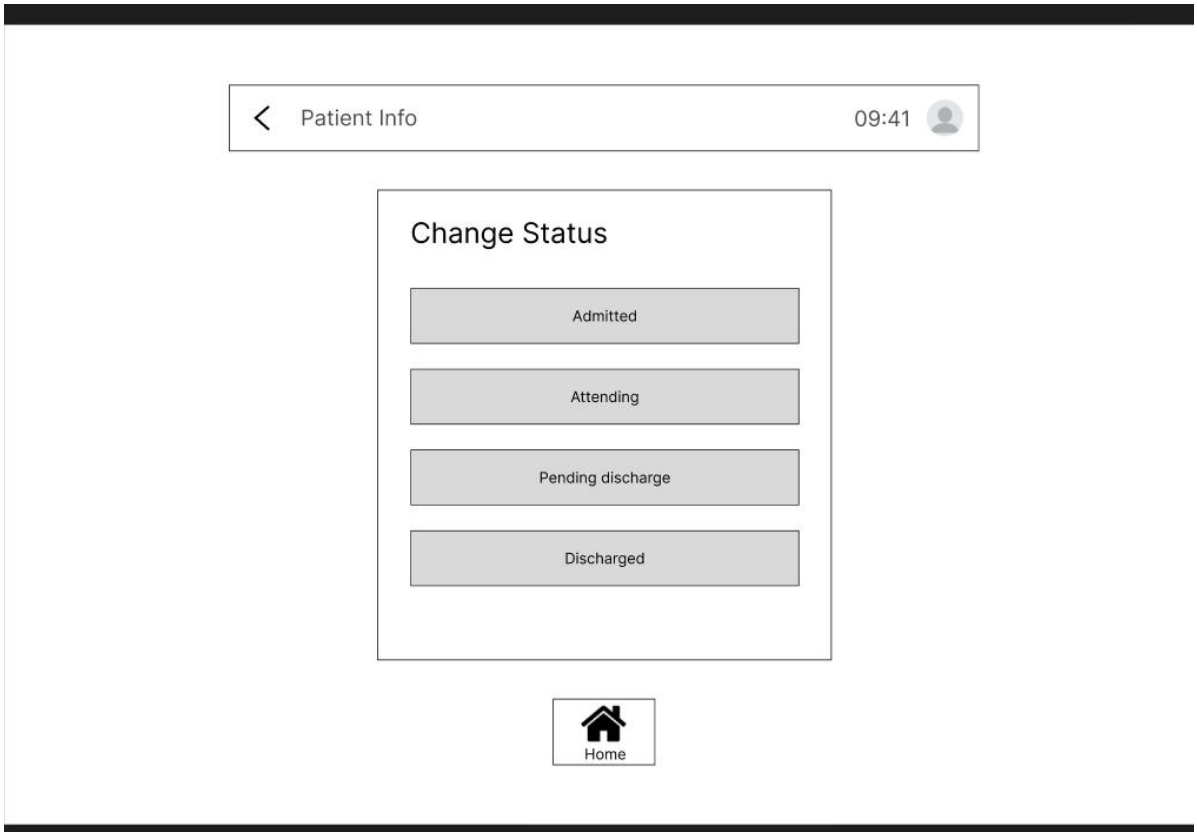


These are the screens for Scenario 1. There are four screens in total, although some individual tasks will only require a portion of the screens shown. As the user progresses through the scenario, some tasks will only take up a fraction of the three screens displayed. On average, Scenario 1 required 9 clicks and 1 minute and 33 seconds to complete, with another tester achieving it in 7 clicks and 48 seconds.

For Scenario 2, there are also four screens, and similarly, some tasks within this scenario will only occupy a portion of the full three screens. On average, Scenario 2 required 15 clicks and 1 minute and 51 seconds to complete, with another user completing it in 1 minute and 30 seconds

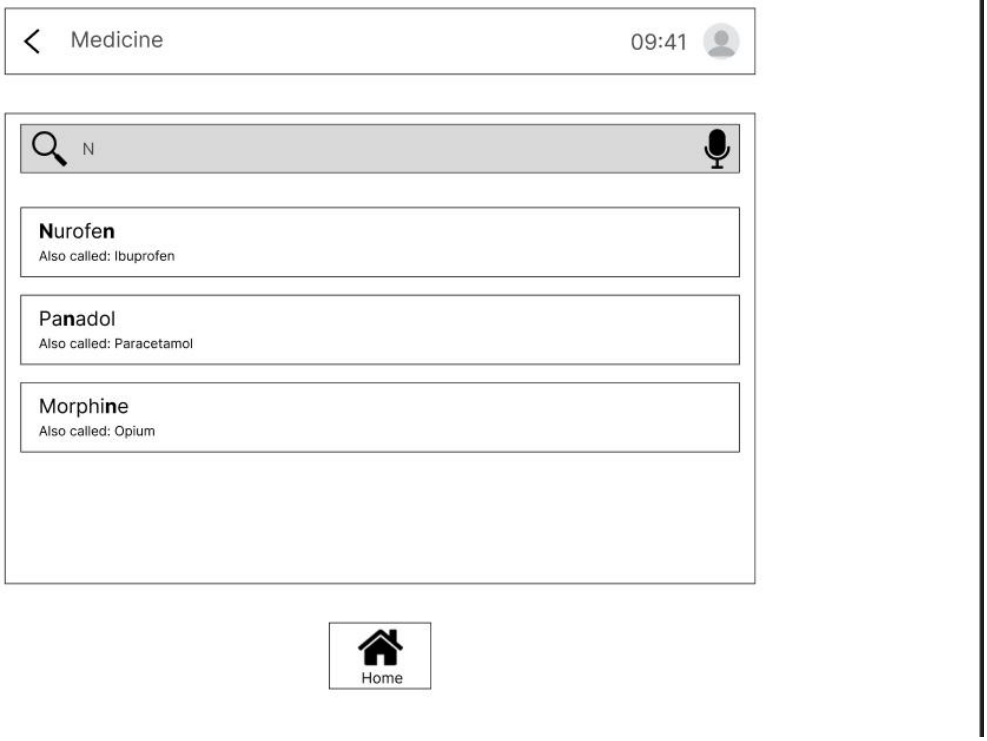

Patient Info
09:41
Scan QR code on patient's bed
Home


Patient Info
09:41
Picture
Name
John Smith
Date of birth
1/1/2000
Gender
Male
Emergency contact
Jane Smith
Status
Pending discharge
Emergency Contact Number
0412312312
Clear
Submit
Home

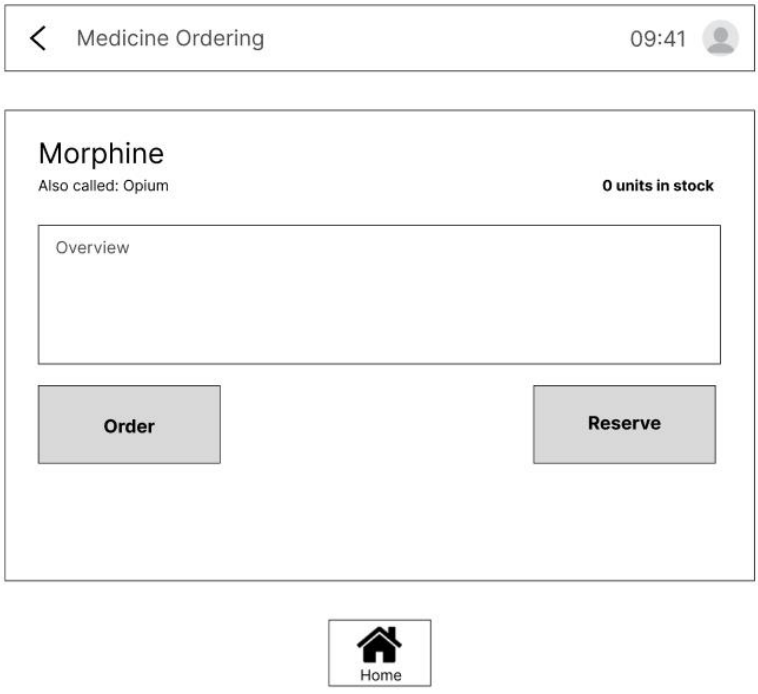


These are the screens for Scenario 3, consisting of ten screens in total, although some individual tasks may only require the user to interact with a subset of the screens within the scenario. This scenario is the longest to complete, with an average of 10 clicks and 3 minutes of compilation time

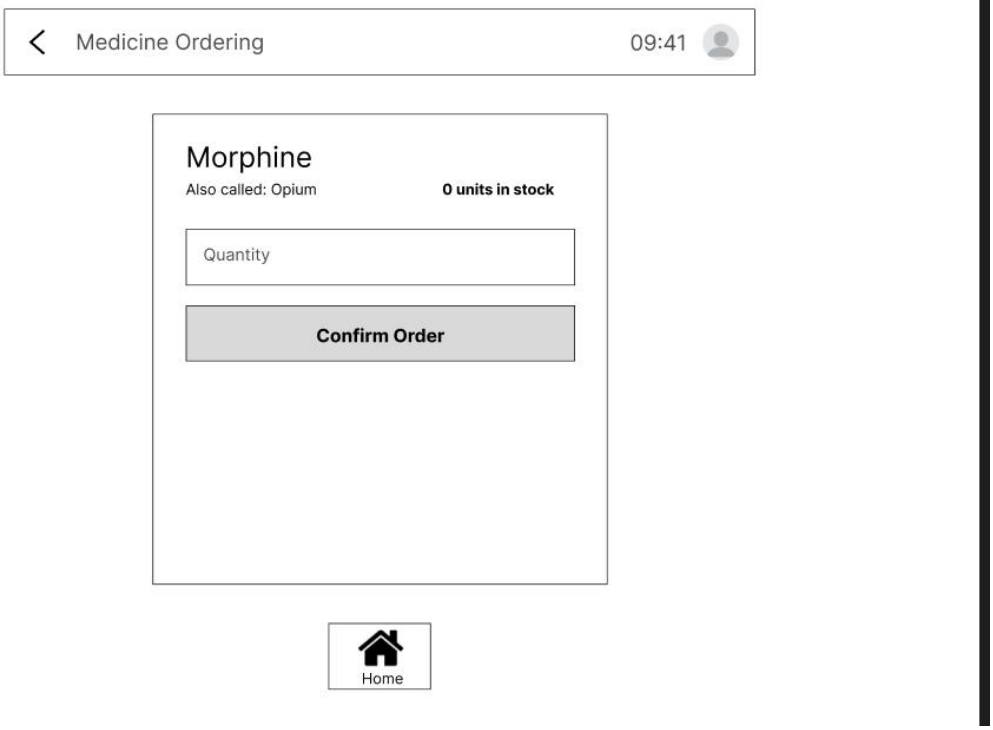

Medicine
09:41
Search
Recent
Nurofen
Also called: Ibuprofen
Panadol
Also called: Paracetamol
Morphine
Also called: Opium
Home

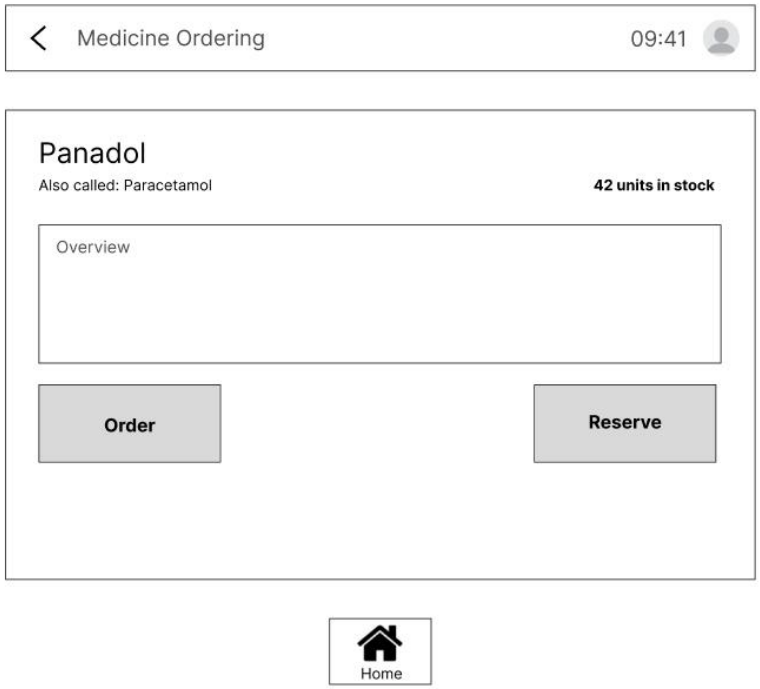

Medicine
09:41
N
Nurofen
Also called: Ibuprofen
Panadol
Also called: Paracetamol
Morphine
Also called: Opium
Home


Medicine
09:41
Nurofen
Also called: Ibuprofen
3 units in stock
Overview
Order
Reserve
Home


Medicine Ordering
09:41
Morphine
Also called: Opium
0 units in stock
Overview
Order
Reserve
Home


Medicine Ordering
09:41
Morphine
Also called: Opium
0 units in stock
Quantity
Order
Home


Medicine Ordering
09:41
Morphine
Also called: Opium
0 units in stock
Quantity
Confirm Order
Home


Medicine Ordering
09:41
Panadol
Also called: Paracetamol
42 units in stock
Overview
Order
Reserve
Home


Medicine Ordering
09:41
Panadol
Also called: Paracetamol
42 units in stock
Quantity
Reserve
Home


Medicine Ordering
09:41
Panadol
Also called: Paracetamol
42 units in stock
Quantity
Confirm Reserve
Home

Observations:

Scenario clicks and durations

Below is the click count and time spent during each test.

Scenario	Test number	Clicks	Average clicks	Time (minutes:seconds)	Average Time (minutes:seconds)
1	1	9	8	1:33	1:10.5
	2	7		0:48	
2	1	15	13.5	1:51	1:40.5
	2	12		1:30	
3	1	10	10	3:00	3:00

Tester Responses

Below is a table of the responses to the post-test questions.

Scenario	Test number	Questions			
		Was it easy to use?	Did anything leave you feeling slightly concerned/unhappy?	Any favourite features?	Is there any room for improvement?
1	1	yes	Prompt for print confirmation (audio or text)	Clear	Fix print confirmation
	2	yes	-	Ease of use	-
2	1	yes	Unsure where patient status would be	Pretty minimal interface	Confirmation on submit Proper errors for wrong input on edit info
	2	yes	no outlying issues	Easy to use	popup for unreadable

					QR code
3	1	yes	First time reserving was slightly difficult	Ease of use	Better naming (labelling) for ordering/checking stock

Analysis

Analysis of the results of tests.

Scenario 1:

- Lacks a pop-up message indicating print confirmation.
- Print button should be bigger.

Scenario 2:

- Home Page needs to indicate that patient info is the QR scanner.
- Lack of pop up messages to indicate if changes want to be made and submitted.
- Patient status hard to see (make the textbox bolder in editing mode)
- No error message for wrong input info or unreadable QR code

Scenario 3:

- Medicine ordering should be changed to simply ‘medicine’.
- Vague task. Task instructions should say ‘note unit stock’.
- The unit stock label should be larger.

General Notes:

- Buttons and labels need to be larger, bolder and clearer.
- Back button needs to look more like a button.
- Tasks should be clearer.
- Keep easy to use interface and simplicity

Risk Resolution/Prototype Iteration:

Links to prototype files

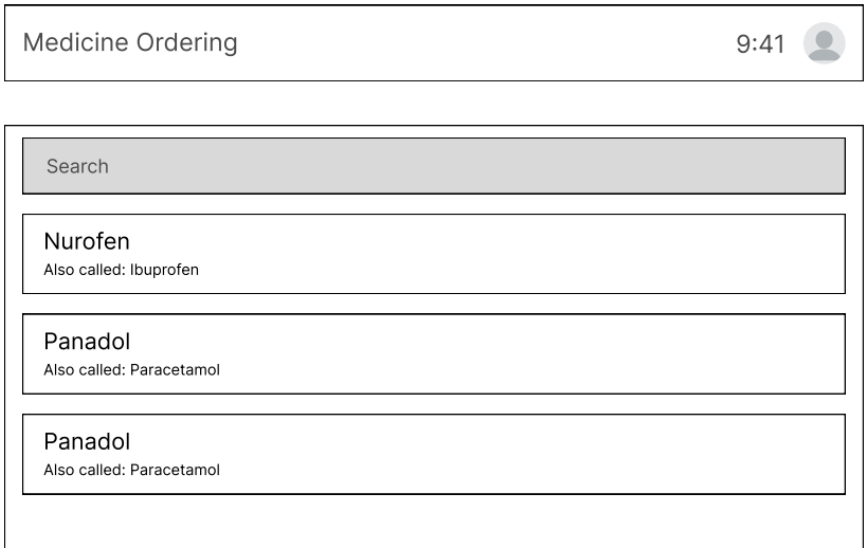
Prototype 1: File Link (23.5 MB)
Prototype 2: File Link (48.82 MB)
Prototype 3: File Link (55.75 MB)

Risk Resolution

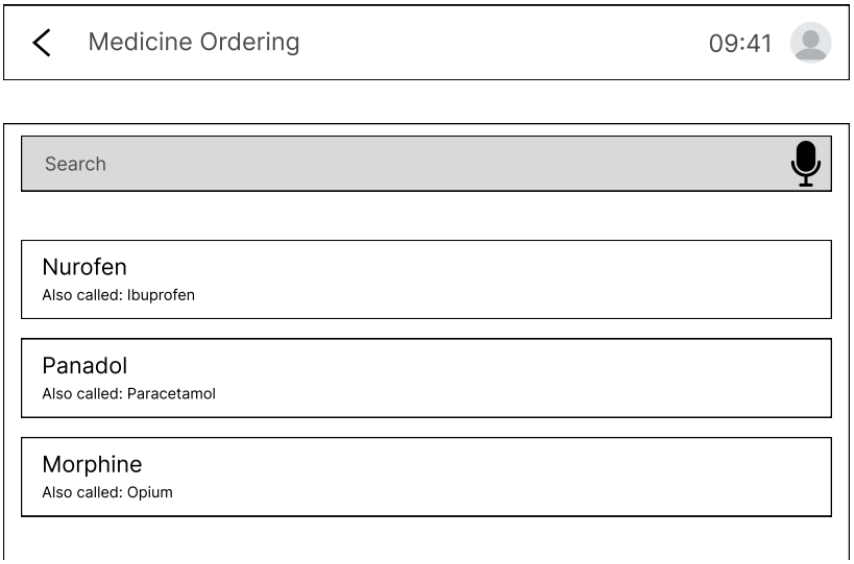
Throughout the design process of the interface multiple risks regarding the usability of the interface were raised with varying degrees of severity, as some were only minor issues making little to sometimes no difference in the ease of access and time or number of clicks to use certain functions, they were not regarded as a serious usability problem. However two of these risky interface designs had very high probability of significantly lowering the efficiency of the interface, making them a serious usability problem.

Due to the demanding workplace environment for nurses, quick and easy use of the interface was regarded as crucial and the first usability problem in the design process was the absence of speech-to-text function, as typing on the hololens 2 is very difficult and time consuming. To ensure maximum possible time efficiency the text-to-speech function was added in the form of an interactable microphone icon, as shown across the two prototypes below.

Prototype 2



Final Prototype

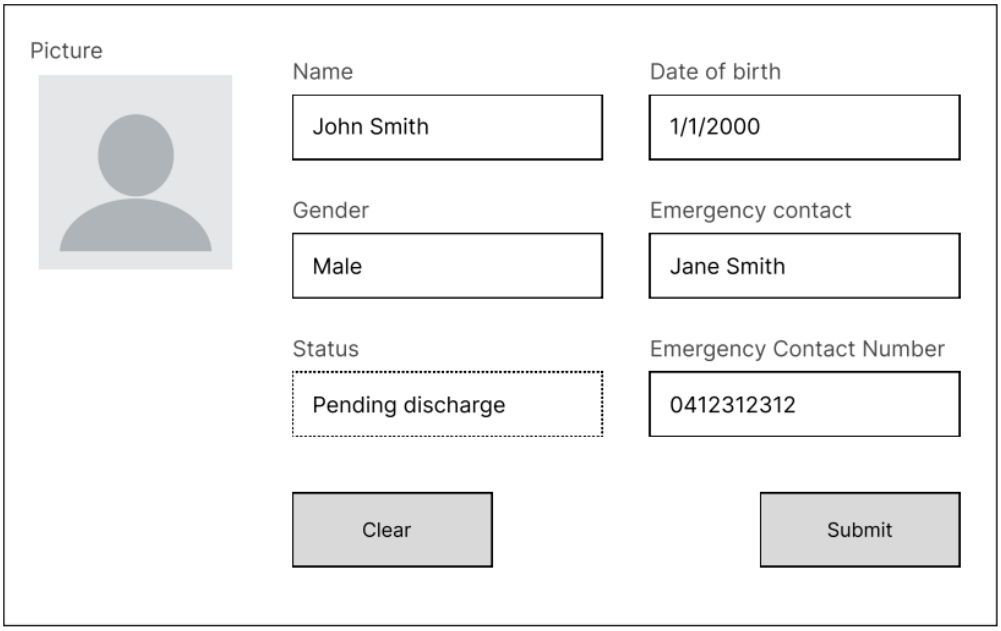


As shown across the two prototype iterations, the microphone was added and when clicked signals the user for a voice prompt, there was also a change in time format from 12-hour to 24-hour time and a back button added in case the home button either did not work, or the user was unaware of the interface metaphor and its use. The two changes just mentioned were minor ease of access improvements, whereas the introduction of the microphone for the speech-to-text function as a solution to the typing difficulty was the main goal, as well as an effective means of addressing the main usability issue.

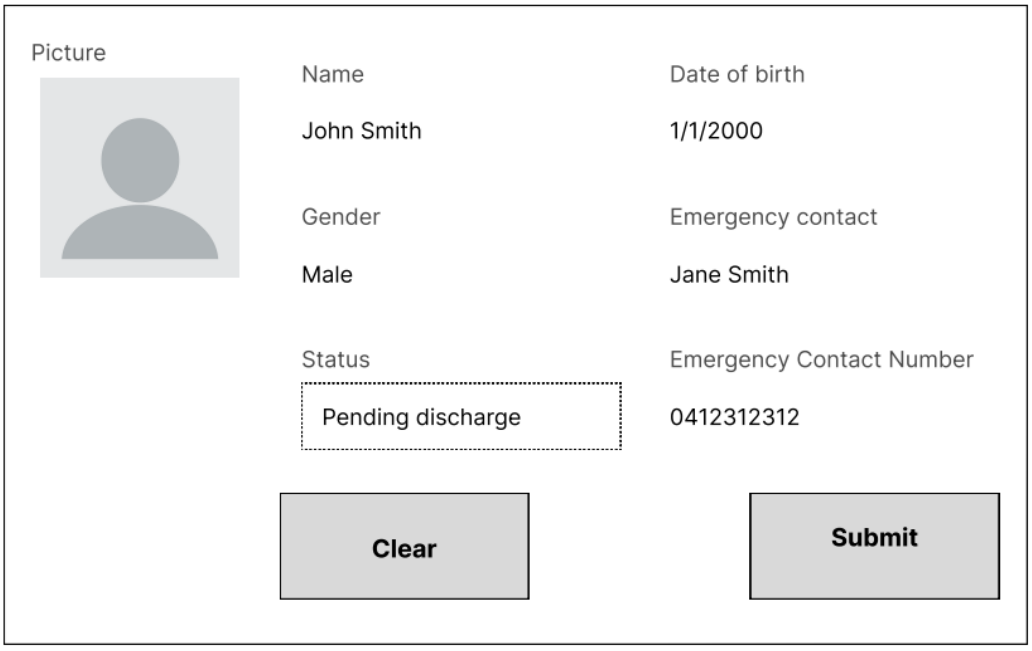
The other serious usability issue was the clarity of the interface, after testing our interface, two observations were made regarding this issue.

The first was the edit info screen, as the multiple text boxes made it difficult for the user to know which info they can edit. To fix this the text boxes were removed and the clear and submit buttons were made more noticeable, as shown in the below prototypes.

Prototype 2



Final Prototype



This change removed a lot of unnecessary and possibly misleading boxes, allowing for maximum clarity and efficiency, as well as following the simple and minimalist design incorporated throughout the rest of the design.

The second was the lack of clarity for the user regarding the “confirm print” button, as there was no prompt alerting the user that the print was confirmed properly, this was solved by adding a voice notification so the user was made aware that the print was confirmed properly. This function was then incorporated to the rest of the buttons that confirmed processes such as confirming reservation or order of medicine.

Conclusion:

Our group has sufficiently made a valiant effort into creating the low fidelity prototype for a vr application for nurses. Every week, we all gave our own contributions into working on each step of the report, as we attempted to perfect our design as much as possible until the report was completed. We analysed every part, and edited, changed, or even removed the parts that weren’t working well.

We came up with the basic concept and design of the VR application, and discussed what it should look like We then made the early draft designs on figma, that would constantly be changed and updated as the report progressed. We discussed the heuristics and problems with the report that had to be fixed, and the risks that our design may present to users. Finally, came the testing of the design, in which we made a briefing of the project and came with scenarios and tasks that can be accomplished using the low fidelity prototype. We observed how people approached these tasks, and found out ways we could fix our prototype to be in its best possible state. Finally, we resolved all risks and put the work made throughout the workshop weeks all into the report in a coherent format.

All in all, we believe we fulfil the needs of the report and that our design is a great start for a high-fidelity design that could easily be genuinely used in a real life situation.

Minutes:

Week 1 (Group Formation/Role Assigning):

HCI Group Minutes

2023-07-19

* Everyone added to a discord chat

* Discussed the project

* Must select 3 use case scenarios. Brainstormed options

* Triage

* Symptom association lookup

* Patient intake form

* Surgeon Robot control interface

* Nurse Xray vision assistance

* AR patient identification

* Chosen to make a system for Nurses

Consider what could go wrong in use cases:

| risk | solution |

|----------|----------|

| spelling mistake | fuzzy lookup, 'did you mean' message |

| cannot look at the screen at the time | text to speech |

| hands a full | speech to text, voice commands |

Week 2 (Problem Space/Mental & Contextual Model):

Problem space:

For nurses in the hospital,

Assumptions: they can put on AR headset

1. Symptom lookup

Existing symptom lookup not efficient, is that its not just readily available – need to lookup on computer.

Makes it more convenient, more accessible.

2. Patient bed identification

Can be slow to identify who is meant to be in each bed/room, a hospital is large, very difficult to remember each patients bed/room efficiently

Faster identification of patient if/when needed.

Assumption: QR reader in headset

3. Medicine supply management

Could be slow to identify if medicine needed for patient is in stock/available

Once a nurse identifies they need a certain medicine, can allocate that medicine to a certain patient

Conceptual model:

Symptom lookup:
Enter patient symptom -> choosing symptom from list -> send to doctor
simple input box -> autocomplete word as typing -> list symptoms a-z -> button to print
Lookup of symptoms will be a magnifying glass, print button is a printer icon
Interaction mode: Conversing/ Instructing
((can refer to med supply))

Patient bed identification:
Scan QR code -> shows patient information
Image scanner software in headset - > patient information in Name, DOB, Diagnosis, Emergency Contact, Sign in status
QR code for QR code scanner
Interaction mode: Instructing

Medicine supply management:
Enter medicine name -> Choose medicine from list -> Reserve/Order medicine
Simple input box -> autocomplete word as typing -> list medicine a-z -> button to reserve/order
Magnifying glass for input box
Interaction mode: Conversing/Instructing

((can assign medicine to a patients bed))

Mental model:
1. Text near the input box saying to enter symptom, enter button (enter arrow from enter key), clear button (clear button can have an X), home button (house) and back button (left arrow) in top left corner. Symptom list will have a visible scroll bar, implying that you can scroll if needed. After a symptom is chosen, a prompt for printing is added to top of symptom description.
If there is an exception/crash display error message and return to home screen.

2. Upon pressing app, brings up scanner. Zoom options for patient information, pinch to zoom for closer up analysis. Home button (house) and back button (left arrow) in top left corner. Edit patient information option at the bottom of their info
If there is an exception/crash display error message and return to home screen.

3. Text near input box prompting for medicine, enter medicine, enter button (enter arrow from enter key), clear button (clear button can have an X), home button (house) and back button (left

arrow) in top left corner. Medicine list will have a visible scroll bar, implying that you can scroll if needed. After a medicine is chosen, a prompt to reserve is shown if quantity >0, otherwise prompt to order with a box of amount needed.
If there is an exception/crash display error message and return to home screen.

Product analysis:
-

- [ ] Agree on

Week 3 (Scenario Creation/Task Analysis):

Discussed the two prototypes made by myself and Lachlan

Preferred Lachlan's title bar setup, home + back button.

Addition of recent symptoms, treatment button

Decided to use figma, Lachlan will convert powerpoint to figma

Gaussian blur background instead of white window, light mode

User Analysis:
User's probable state, stressed/limited
We want the user to be content, so that they can solve their problem fast

1. Symptom lookup
    1. Print most recent looked up symptom
    2. Lookup sore-throat and note first line of symptom
    3. Navigate to home from sore-throat description
2.

3. Patient lookup
   2.1 Scan given QR code, note patient DOB

   2.2 Scan given QR code, edit patient status, submit

   2.3 Scan given QR code, edit patient status, clear changes
   3. Medicine Lookup
   3.1 Check stock level of Nurofen

   3.2 Reserve 8 instances of Panadol

   3.3 Order 16 instances of Morphine

Task analysis:
All tasks, AR training

1.Connected to internet, exception for no results make sure it tells them there isn't a result

2. pre-condition each bed has a QR code, exception: bad code read, prompts you to scan again.

3.Exception trying to reserve more items than there currently is; Error message, quantities don't match, would you like to order prompt
No results if input is bad/there isn't a result

No time constraints, scenario 2 would be most frequently used

Week 4 (Heuristics/Risk Assessment):

Need to add recent label to symptom look up page

Add frame for intermediate search results for symptom lookup

2. change diagnosis to emergency contact number

Edit page for patient info, submit/clear button

3. Need to add recent label to medicine ordering page

Add nurofen page for medicine

Add morphine page for medine

Add morphine order page aswell

Add frame for intermediate search results for medicine ordering

Risk assessment:
ADD MICROPHONE ICON NEXT TO TEXTBOXES ease of access input for input boxes

Add back button to all pages but home (feature pages are only missing it currently)

24 hour time, prevents confusion of time (add a 0 in front)

Confirmation prompts for printing,ordering and reserving, this prevents any serious error/hard to recover

Only make status editable; prevents unexepected changes to critical patient info (change edit button to update status button)

Week 5 (Testing Week 1):

Scenario 1:

- Popup message indicating print confirm.
- Print button should be bigger.

Scenario 2:

- Home Page needs to indicate that patient info is the QR scanner.
- Pop up messages to indicate if changes want to be made and submitted.
- Patient status hard to see (make it textbox bolder in editing mode)

- No error message for wrong input info or unreadable QR code

Scenario 3:

- Medicine ordering should be changed to simply ‘medicine’.
- Vague task. Say note unit stock.
- Unit stock label should be larger.

Other General Notes:

- Buttons and labels need to be larger, bolder and clearer.
- Back button needs to look more like a button.
- Tasks should be clearer.
- Keep easy to use interface and simplicity

Week 6 (Testing Week 2):

Minute Meetings:

Magnifying glass on search bars

QR code symbol on patient info button

Make bottom three biggers bigger

Make important text, buttons and labels larger and bolder