

## Version History

<b>Name</b>	<b>Date</b>	<b>Changes</b>	<b>Version</b>
vITal	2019-11-13	Initiated document	1.1
vITal	2019-11-19	adding the history-view design	1.2 <a href="#">Design decisions v0.2</a>
vITal	2019-12-03	Rewrote almost the whole document	1.3
vITal	2019-12-05	Fixed some minor grammatical errors	1.4

<b>Version History</b>	<b>1</b>
Document description	3
Base	3
<b>General layout</b>	<b>4</b>
<b>Designs prepared for the first user test</b>	<b>5</b>
General response from user test 1	6
Colors	6
NEWS2 colors	7
Fonts	7
Vital Parameter History	7
Other improvements	8
Decisions taken	8
<b>Design prepared for the second user test</b>	<b>9</b>
Login & Home page	9
Patient overview	10
Patient overview with parameter values	11
Feedback from the second user test	11
<b>Final design</b>	<b>12</b>
Login & Home page	12
Patient Overview	13
Vital Parameter History	15
<b>Further improvements?</b>	<b>16</b>
<b>Appendix 1</b>	<b>17</b>
<b>Appendix 2</b>	<b>19</b>

# Design decisions

A summary of decisions made regarding the design of the application

## Document description

Throughout the duration of the project, the application has taken different forms where we have kept the things that we either received good response from the user tests or simply the things we liked. In this document are some snapshots and descriptions of the process and the different forms the application has taken.

## Base

### Design timeline:

- First we had one prototype with box-view to show at first tollgate meeting
- After the feedback from the tollgate, we designed three different prototypes in preparation for the user test.
- After the data we got from the first user-test had been analysed, we continued developing the ideas from mainly the third prototype.
- Preparations for the second user test was one functioning product based on the good parts from the three prototypes.
- Good results after the second user test lead to minor additions and face-lifts.

## General layout

Based on the results from the first user test, we decided on the structure the application should have. It resulted in a design decision where the application starts the user experience from the 'Login page' where the user logs in with its personal credentials. From here the user is redirected to the 'Home page' where its given the option to either scan a patient's barcode, enter a patient's personal number, or to log out. If patients barcode/personal number has been entered and is valid, the user is taken to what we call the 'Patient Overview page'. Here the user is prompted to enter values for the NEWS2 parameters. After entering a value, the application translate the value into corresponding NEWS2 score on the left side of the entered value. We chose to have the results on the left of the fields because it is to our understanding that the journal system used in Sweden, uses the same alignment in their current work process.

From an interview with an end-user, we got the information that the usage of a tablet in their line of work, is very impractical, since it is heavy to carry around and too big to be able to fit in a pocket. Therefore we decided to optimize the application for mobile devices with screen ratio of a "normal" phone (iPhones), with a more precise width of 59mm and height of 105mm. The application will be able to be used on tablet sized screens, but might not look quite as intended.

## Designs prepared for the first user test

Before the first user test, our UX-team prepared three designs made in a prototyping program called Axure. These designs were made with the sole purpose of trying to pinpoint good or bad aspects of each of the prototypes in order for us to know what work-flows and design aspects to keep and what to throw away. Below you can see the three designs we came up with ('Login page', 'Home page' & 'Patient Overview page' shown below).



Figure 1 - Prototype 1.

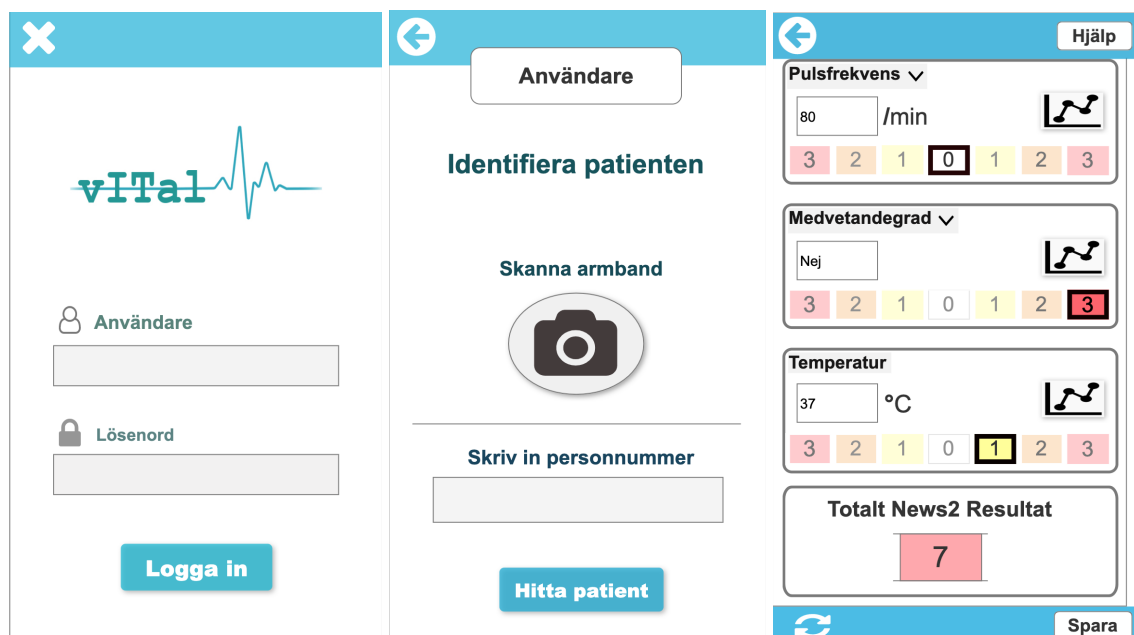


Figure 2 - Prototype 2.

<b>viTal</b>	<b>Identifiera patienten</b> ➡	<b>Registrering</b> Historik ➡
Registrering av vitalparametrar	Inloggad som Kim Andersson	John Doe, 931029-9581


### Logga in

Användarnamn:

Lösenord:

**Logga in**

### Scanna armbandet:



**Patient ID:**  
Namn:

**OK**

Vill du inte scanna?  
Använd manuell inmatning:

**Manuell inmatning**

1	Andningsfrekvens	10	+
0	Syremättnad	100	+
3	Tillförd syrgas	Ja <input checked="" type="checkbox"/> Nej <input type="checkbox"/>	+
0	Blodtryck	Systoliskt: 140 / Diastoliskt: 90	+
0	Medvetande-grad	A <input checked="" type="radio"/> C <input type="radio"/> V <input type="radio"/> P <input type="radio"/> U <input type="radio"/>	+
2	Temperatur	38	+
2	Puls	90	+
<b>NEWS2 Score</b>		3	<b>Spåra</b>

**Avbryt**

Figure 3 - Prototype 3.

## General response from user test 1

The summary of the test can be found in **APPENDIX 1**. The conclusions that we drew from the test was that most people liked the third prototype the most. This was because this prototype was clear and did not have excessive amounts of information. Most of the test subjects liked that it was a simpler design with the option to extend for more information regarding specific parameter. Furthermore, decisions were made in improving the workflow in the application with measures such as fewer clicks and being able to see every parameter without having to scroll through them.

## Colors

As mentioned above, the general response was that the test subjects wanted a visually clear and simple design to hopefully avoid any misunderstandings and confusion. With this as our goal, we came up with this color scheme (figure 4). We chose to have a darker background for the top and bottom bar compared to the registration section which has a brighter gray. This was done with the intent to hopefully distinguish the different sections of the application to in the end, make it easier to use.

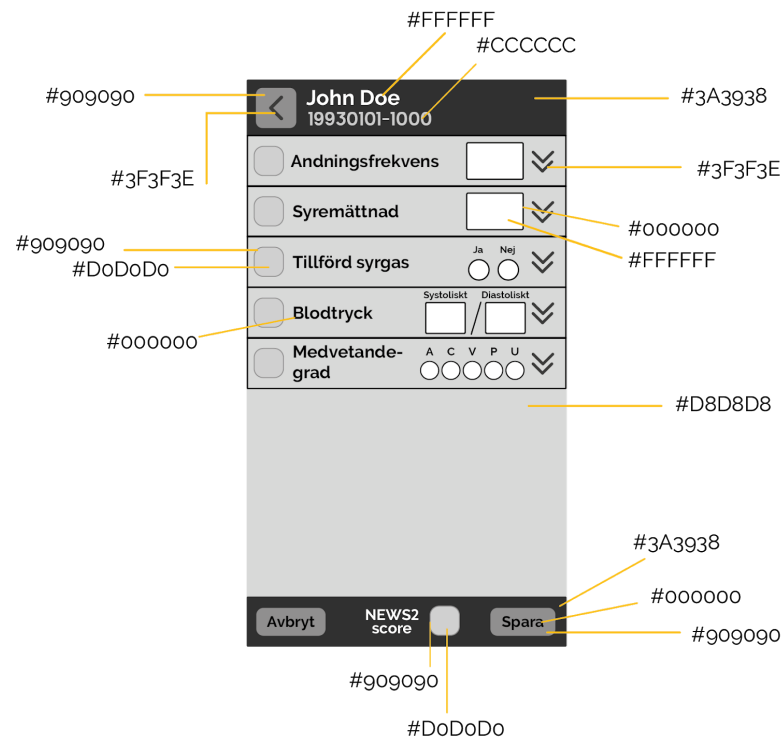


Figure 4. Patient overview with updated color scheme

## NEWS2 colors

We chose this dark and grey color scheme to not draw too much attention from the NEWS2 score results. The NEWS2 score coloring is not displayed in the picture above (you can view it on prototype 3), but the NEWS2 scores corresponding colors for every result will be displayed to the left of each vital parameter and also in the center of the bottom bar (the boxes marked with color hex code #D0D0D0 in Figure 4). This will make for a clear display of what each individual parameter value, calculates into what NEWS2 result

## Fonts

Choosing fonts can be a difficult task and is in the end, a matter of preference. Fonts can bring substance and focus to different parts of a web page, depending on how you use them. In our case, we chose the font-family Sans-Serif which we find, puts focus on the clarity with its simplicity and lack of serifs. Within this font-family, we chose the font Raleway Bold for text (words) and the font HighTide for numerics. We chose two different font for text and numerics to furthermore make a distinction between these two since the text will mainly focus on descriptions of different kinds and numerics on parameter values and NEWS2 scores and results.

## Vital Parameter History

The response that we got from the first user test regarding the history was a bit twofold. Some test subjects liked the usage of a graph, another had the opinion of only using the values to show the trends, and others thought to use them both. The conclusion that we drew from that was to offer the list of values complemented with the graph, so the user can choose to use either one of them, or

to use them both. Of trying to keep the ‘Patient Overview page’ clear, clean and simple, we chose to move forward with the use of a separate page to view the history of a parameter (as prototype 3 (not shown in the snapshots above)). We think this is the best way to operate, since it is to our knowledge, that the users will not use the history aspect for every patient every time. Therefore, we think that this will not lead to too many clicks in the long run while keeping the ‘Patient Overview page’ clean and easy to use.

### Other improvements

Minor changes and wishes from the tests subjects were taken into account regarding mostly work-flow related things such as bottlenecks. Full summary of the first user test can be found in **BILAGA 1**.

### Decisions made

Below are some bullet points on decisions made after the first user test:

- Remove the second patient scanning at submission, this was originally asked to be included by a representative at Vrinnevi Sjukhuset, Region Östergötland, but at the user test, he changed his mind. End-users have not expressed a need to have this either.
- On history view: actual values are shown first/at the top, and the graph below.
  - History in text include: date & time, actual value and corresponding NEWS2 score.
  - Graph include: date & time, actual value, and a line connecting the dots.
- Change expand-icon to something more intuitive, and when expanded that should be indicated visually



## Design prepared for the second user test

The following figures (*figure 5-11*) shows snapshots of the prototype we had ready for the second user test. It follows the same general layout as before but with updated interface, buttons and usability.

### Login & Home page



Figure 5

Figure 6

Figure 15 shows the login page. Here we chose to redesign our logotype a bit with a change of color scheme, with the intent of further striving for the focus on simplicity and functionality of the application rather than a flashy designs. Figure 16 also shows our attempt of simplifying the design and yet again putting focus on functionality before visuality.

## Patient overview

Figure 7

Figure 8

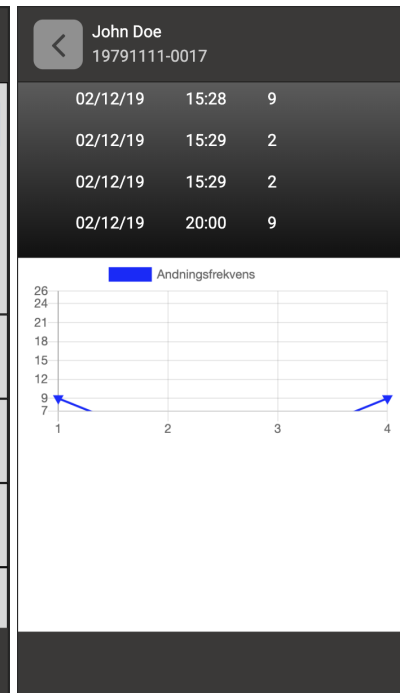


Figure 9

Following the same general layout, after either scanning a patients barcode or entering their personal number manually, the user gets redirected to the ‘Patient overview’. Here we took advantage over the positive feedback from the first user test with a good overview of every parameter. Each parameter has a drop down menu to view the last measured value complemented with the option to view the history for that specific parameter measurements (as shown in figure 19). At the history view, the user gets shown the four latest measurement that can also be viewed through the graph underneath.

## Patient overview with parameter values

John Doe  
19791111-0017

0 Andningsfrekvens 12

1 Syremättnad 95

2 Tillförd syrgas Ja Nej

3 Blodtryck 90

1 Pulsfrekvens 50

3 Medvetandegrad A C V P U

Totalt värde 10 Klinisk risk: Hög Spara

Figure 10

John Doe  
19791111-0017

0 Andningsfrekvens 12

Senaste värde:  
02/12/19 20:00  
9/MIN  
Mer historik

1 Syremättnad 95

2 Tillförd syrgas Ja Nej

3 Blodtryck 90

1 Pulsfrekvens 50

Totalt värde 10 Klinisk risk: Hög Spara

Figure 11

Figure 20 and Figure 21 demonstrates how the application looks when values have been entered into the parameters. The NEWS2 score color of red uses the hex-code #F59681, orange #FDC889, and yellow #FFF1AB. This is where our grey-scaled design serves its purpose, to really put focus on the NEWS2 score the patient's vital values translates into.

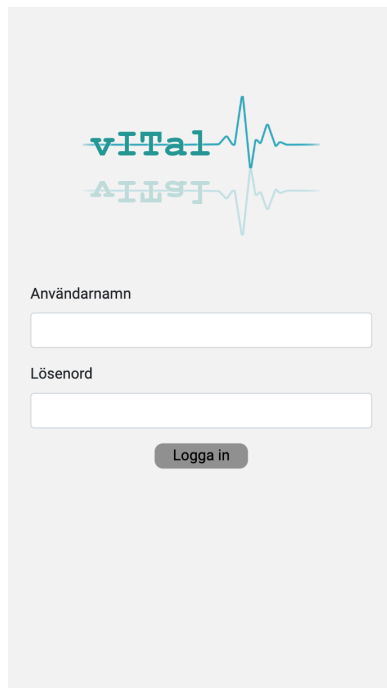
### Feedback from the second user test

Overall we were really happy with the results from the second user test. Every test subject were, overall, happy with the application and its features. Some minor improvements were requested, mostly related to usability. Full summary of the second user test and its results can be found in *appendix 2*.

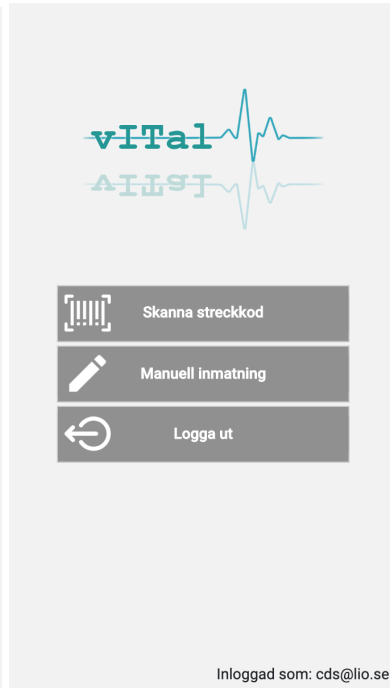
## Final design

In this section, we present the final design.

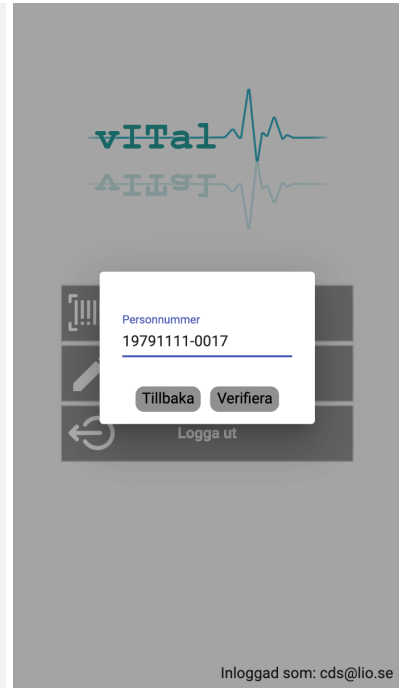
### Login & Home page



*Figure 12*



*Figure 13*



*Figure 14*

This is what the ‘Login page’ (figure 12) and ‘Home page’ (figure 13 & figure 14) looks like. We made some minor changes to the login page, mainly with a slight change of background color to follow a unified color scheme throughout the application. The ‘Home page’ had some more work done to it in the form of “face lift”. We scaled up the buttons a bit to make it easier to use and added logotypes to hopefully give more clarity in what the buttons actually do. In figure 14 you can see the popup window that appears after you have pressed ‘Manuell inmatning’. Here the user is prompted to enter the patient’s personal number, just as before.

## Patient Overview

Figure 15 shows the Patient Overview page for John Doe (ID: 19791111-0017). The page displays a list of vital signs and clinical data. All input fields are empty, and the 'Spara' button is light gray, indicating that no data has been entered yet.

Parameter	Value
Andningsfrekvens	
Syremättnad	
Tillförd syrgas	Ja Nej
Blodtryck	/
Pulsfrekvens	
Medvetandegrad	A C V P U
Temperatur	

Totalt värde: Klinisk risk: Spara

Figure 15

Figure 16 shows the Patient Overview page for John Doe (ID: 19791111-0017). Some data has been entered: Andningsfrekvens (8), Syremättnad (95), Blodtryck (96/56), and Pulsfrekvens (70). The 'Spara' button is now dark gray, indicating that data has been entered and can be saved.

Parameter	Value
Andningsfrekvens	8
Syremättnad	95
Tillförd syrgas	Ja Nej
Blodtryck	96 / 56
Pulsfrekvens	70
Medvetandegrad	A C V P U
Temperatur	

Totalt värde: Klinisk risk: Spara

Figure 16

Figure 17 shows the Patient Overview page for John Doe (ID: 19791111-0017). All data fields are filled: Andningsfrekvens (8), Syremättnad (95), Tillförd syrgas (0), Blodtryck (96/56), Pulsfrekvens (70), Medvetandegrad (0), and Temperatur (37). The 'Spara' button is dark gray, and the 'Klinisk risk' is displayed as 'Medium'.

Parameter	Value
Andningsfrekvens	8
Syremättnad	95
Tillförd syrgas	0
Blodtryck	96 / 56
Pulsfrekvens	70
Medvetandegrad	0
Temperatur	37

Totalt värde: 6 Klinisk risk: Medium Spara

Figure 17

Figure 15, 16 & 17 shows snapshots of our 'Patient Overview page'. Figure 15 and figure 16 demonstrates how the application is viewed directly after the user has scanned the patient's barcode or entered its personal number. Figure 15 demonstrates the scenario when the patient's vital data are not collected automatically through the Phillips machines (Intellivue) at hospitals and figure 16 shows when the data is collected. This page has not been revised much after the second user test since it got such good results then. Smaller modification has been made though, as you can see when comparing between figure 15 and figure 16, the 'Spara' button is darkened to indicate that you cannot save anything when no parameter values have been entered. We also added the button 'Hämta Phillips data' to mock how the application would handle in different situations (this is not something the application would have in practice). Figure 17 demonstrate how the application looks when every parameter value has been entered in each respective field.



Figure 18



Figure 19

When the user is ready to save the entered values and have pressed 'Spara', the dialogue box 'Är du säker på att du vill spara?' pops up (figure 18). This is added as a verification state so the user does not accidentally press 'Spara' and data is directly sent off. After having pressed 'Ja', the verification that data has been successfully stored gets presented to the user (figure 19). After this the user can choose between staying at the 'Patient Overview page' to review history etc. by pressing 'Ok', or going back to the 'Home page' by pressing 'Skanna en ny patient'.

## Vital Parameter History



Figure 20

Figure 21

Above you can view how the application handles the history for a specific parameter. As decided after the first user test, we chose to have the history as a separate page. The user gets directed here if they press the button 'Mer historik' if they want to view more history than the last measured value. Here we have also implemented the usage of the NEWS2 color scheme to further draw attention to that rather than something else. The value table presents the user the date, time, actual parameter value, and corresponding NEWS2 score with its corresponding color. Below you can view the measurements presented in a graph to get a quicker view of the trend the parameter has.

## Appendix 1

<https://docs.google.com/document/d/1tnrfKUjoe7iRt8lfWAfr1wORJWkZAvY5mV8WrgWe0p8/edit#>

### Summary of users' preferences from each tester

#### Tester 1:

- Avoid too much scrolling
- Lock footer and header
- Base: Grey list but the NEWS2-value is to the right and the boxes to fill into the left
- Order according to ABCDE
- When you expand the history should be available as in prototype 2 (both table and graph)
- Color scheme is good and clear

#### Tester 2:

- Liked 1 and 3
- What she liked about the box was that she didn't need to scroll about the boxes but wanted to fill in the values at the start box view (i.e. not need to go into another view)
- No double scanning
- No graph needed but more like the latest three values

#### Tester 3:

- Preferred 3, the grey one. It was clear
- She thought the 2nd one was good but when she saw the 3rd she liked that one more
- She liked the color scheme, it was nice that only the fields that was to be filled in was white and the rest grey
- She liked the font in the 3rd one and size of the text
- Good to not have to scan the patient again
- idea is to have a short history section in the expandable part, with button to go to full history (new page)

#### Tester 4:

- Liked 1 and 3. Favorite was 1 but 3 was clear and easy to read
- For 1 he liked the idea and view, but the font was messy
- The history was best in 1 and 2
- He thought the colors of 2 was messy
- 1 is more similar to the one they use today

#### Tester 5:

- Liked the graphs
- Nice not to need to switch view to fill in the values
- Likes the icons so that there wasn't any unnecessary words



- The extra choices in the first view would have been nice
- All parameters in one view, preferred not to scroll

## Decisions made

- Remove the second patient scanning at submission, this was originally asked to be included by representative of Region Östergötland, but at the user test he changed his mind. End-users have not expressed their need to have this either.
- On history view: actual values are shown first/at top, graph below.
  - history in text include: date & time, actual value and score
  - graph include: date & time, actual value,
- *Syremättnad* and *tillförsel av syrgas* should be placed together in the view, but be separate choices (motivate in design document)
- Change expand-icon to something more intuitive, and when expanded that should be indicated visually

## Appendix 2

[https://docs.google.com/document/d/1\\_vmcyqrFfQTsgVpGkiar9aLAZ8NsgEfXfz2o7FxVDN8/edit#heading=h.2b0xwsye2wtn](https://docs.google.com/document/d/1_vmcyqrFfQTsgVpGkiar9aLAZ8NsgEfXfz2o7FxVDN8/edit#heading=h.2b0xwsye2wtn)

### User Test 2 Results

#### Results from tasks/areas

“Mycket svårt” = Very hard

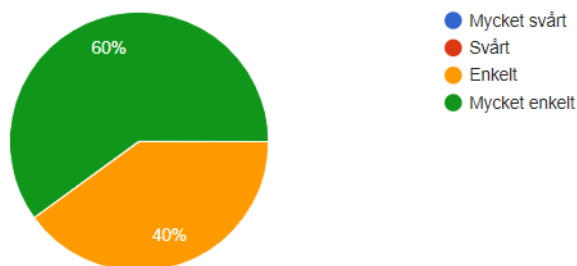
“Svårt” = Hard

“Enkelt” = Easy

“Väldigt Enkelt” = Very easy

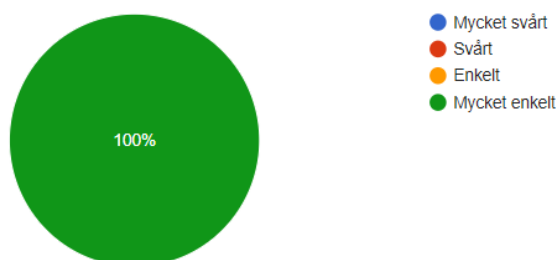
#### Login and retrieve a patient:

- Login is working more smooth now as scanner function has been implemented. All users deem the process to be easy or very easy



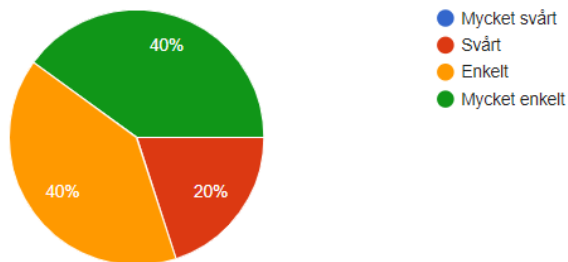
#### Patient home screen (patient info)

- The name and person number could possibly have been even more in focus. Maybe a different color of the background.
- Would be nice if everything would fit in one screen



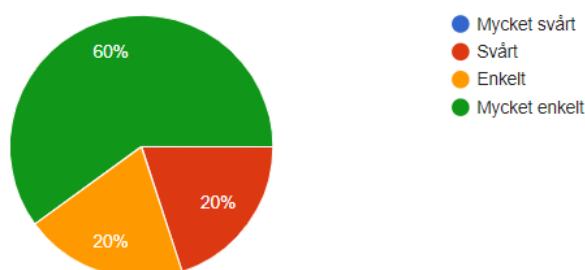
#### Register values for specified parameter and get its NEWS2 score

- The problems noted in this process was that the footer holding the “save button” is pushed up as the numpad is opened. This caused the users to believe that the save button should be pressed after every single input.



### Change the input field for “syremättnad” to be according to “skala 2” (scale 2)

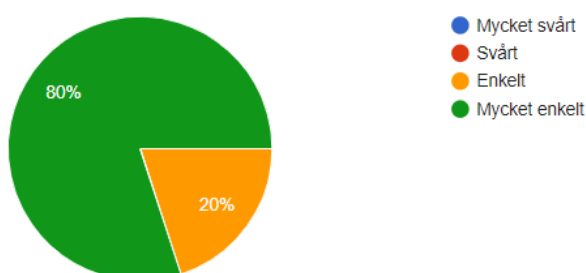
- It has become more clear than before that the item can be expanded. It could however be improved even further
- When assigned the task to set it as “skala 2” most people said they found it with easy, but only because they remembered the process from the last user test
- Suggestion: Would be nice if the item closed after having entered “skala 2” as input



### History

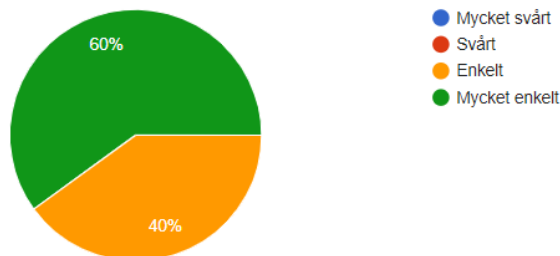
Finding history was deemed to in general be easy. Some suggestions for improvement was that it was not completely intuitive, how to get back from the history view.

History results should in general be presented in a more clear way. It was a bit messy to see which value is the latest and when it was taken.



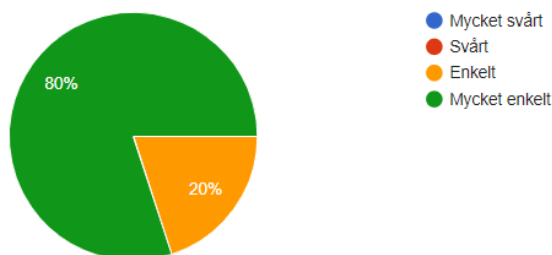
## Register all values

The process of adding data to all input fields was a bit tricky. Felt like it was a lot of “clicking”. As previously mentioned, some users thought that save had to be selected after each input. Suggestions for improvements would be that the cursor focus automatically jumps to the next input field. It was also found irritating that the numpad was covering a big part of the phone during all input making it hard to gain an overview.



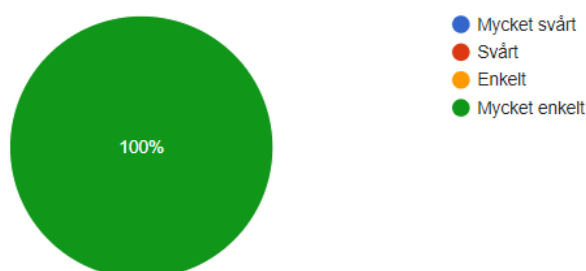
## Save

It was not clear when it was possible to save or when information had actually been saved. Some people felt like the color of the button “gray-ish” appeared to be inactive. After having saved the data the button does not change its color making the user uncertain if the data was saved or not. When selecting save the user is presented with a verification pop up. Verifying the save another pop-up is presented asking the user to select “ok” or scan a new patient. Some users felt like the last pop-up was unnecessary.



## Log out

Log out was clear. The only feedback given was that it is not completely clear how you reach the log out button. That you have to select the back button in order to find the log out screen.



## Summary of feedback and areas of improvements

### Positives (What the users liked)

The new scanner functionality is very appreciated. Design is similar to current systems and feels familiar. Easy to navigate and find information. Users are in general very impressed by the application and how smooth it is to handle. It is more clear that item can be selected and hence expanded for more information.

60% believe that the application would work well in a hospital environment while 40% believe it would work very well.

40% find the application easy to navigate while 60 % find it very easy to navigate

### Negatives (What to users did not like)

Uncertainty among the users regarding how the RLS scale works for consciousness. The buttons for selecting the scale of consciousness where small (depending on cell phone model). The numpad covering the screen and blocking the user from getting a good overview. The functionality of the back button is not completely clear. For example not certain that the back button would lead to log out. Save button does not react well on changes or updated status. Not clear when information can be saved or when it has been saved

20 % find difficulties getting an overview of the patients historical data

### Improvements

More suggestions for future improvements can be found in the Product Roadmap.

1. Would like the name and personal number header to be even more in focus
2. Log out button in patient overview page
3. Further clarify the functionality of the arrows (expanding the item). For example through a square around the arrows
4. History is not clearly presented. Not sure what order the results are presented in
5. Would be nice with a tab enabling quicker swap between different parameters inside the history view
6. Make a clear change of color when save button can be selected and change it when information has been saved.
7. Make the cursor auto switch field after having entered valid data. ex systolic blood pressure -> diastolic blood pressure. Would make the process of registering values more smooth.