Analysis and Design Models

CKD Calculator

(Team 33)

NephroTrack

This document presents the analysis and design models developed for NephroTrack; a CKD risk calculator created by Team 33 for the SDP module. These models form part of the planning and architecture phase of the project and support the understanding, development, and communication of system functionality. The diagrams included cover mandatory UML models – Use Case, Activity, and Sequence – and are supplemented by user personas, navigation flows, and early-stage design thinking. Collectively, these artefacts illustrate how users interact with the system, how information flows through it, and how key decisions and calculations are handled. They also help validate that the system aligns with both user needs and client requirements.

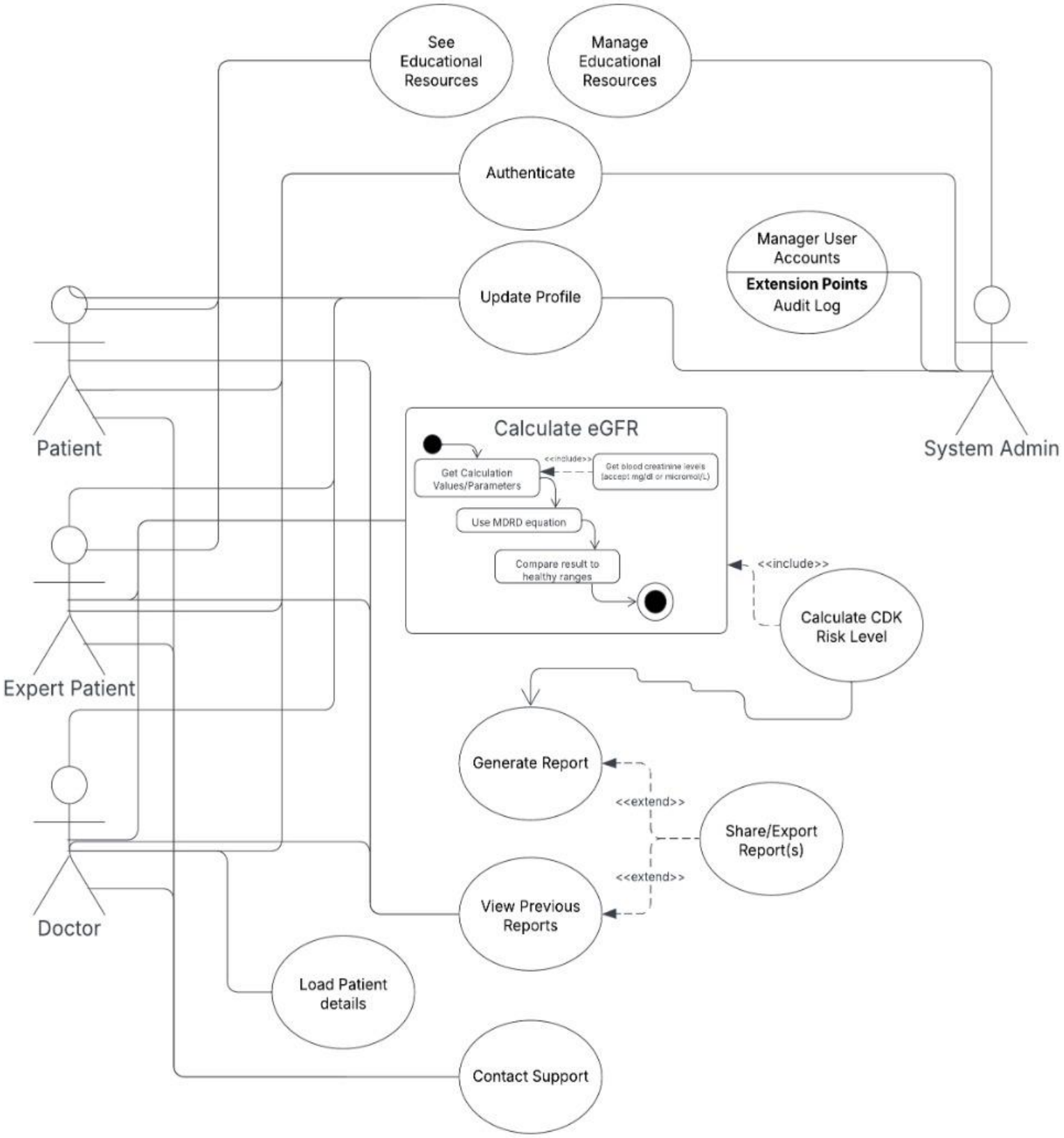


Figure 1: Use Case Diagram

This diagram illustrates the primary interactions between system users (Clinician, Patient, Expert Patient, and Admin) and the core features of NephroTrack. The use case includes actions such as authentication, profile update, eGFR calculation, report generation, and data export.

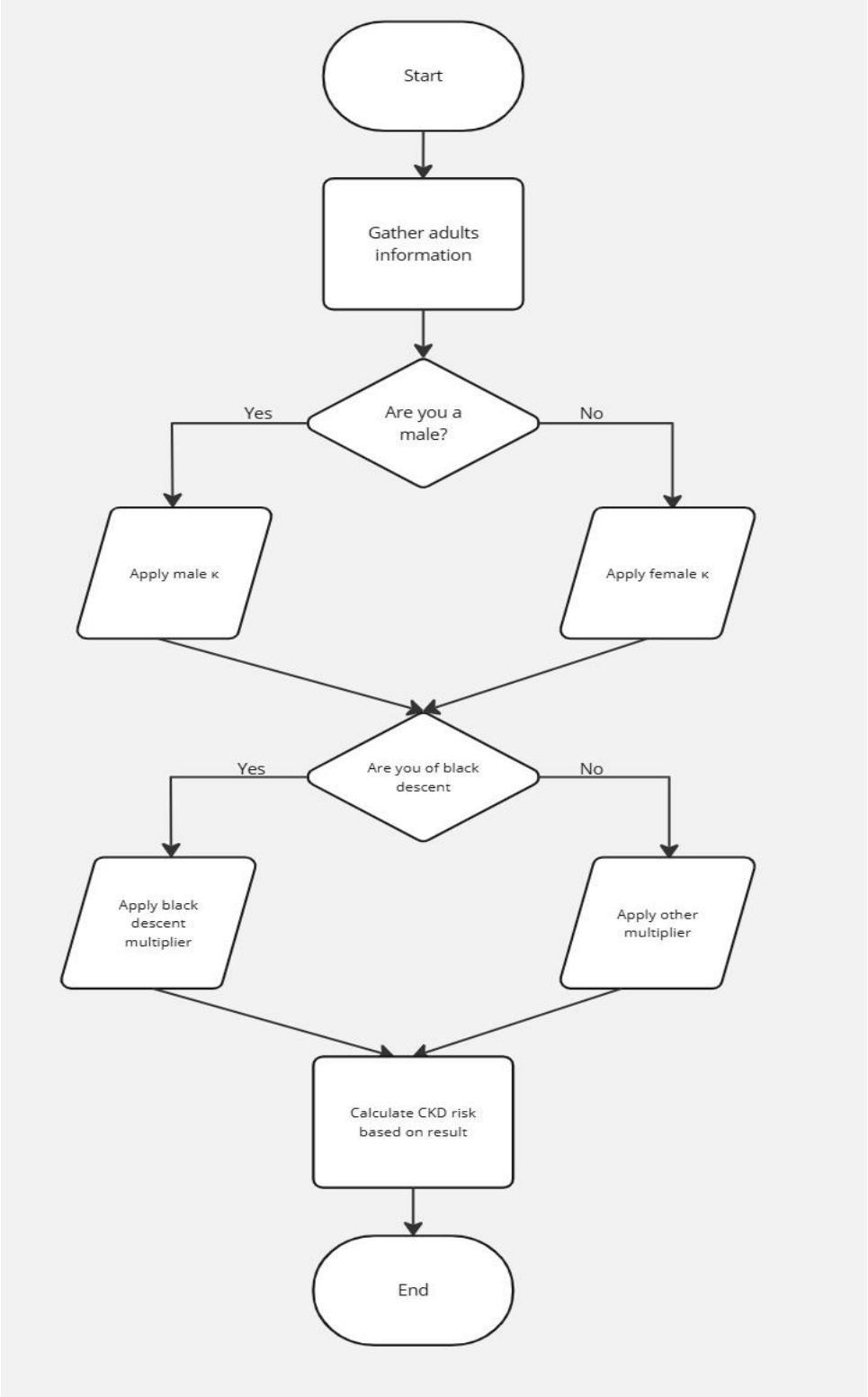


Figure 2:Activity Diagram - eGFR Calculation Flow

The diagram above represents the flow of logic when a user interacts with the system. It starts with user input and determines whether the adult or paediatric calculator should be used, based on age validation. It then routes the user accordingly and calculates the eGFR if applicable.

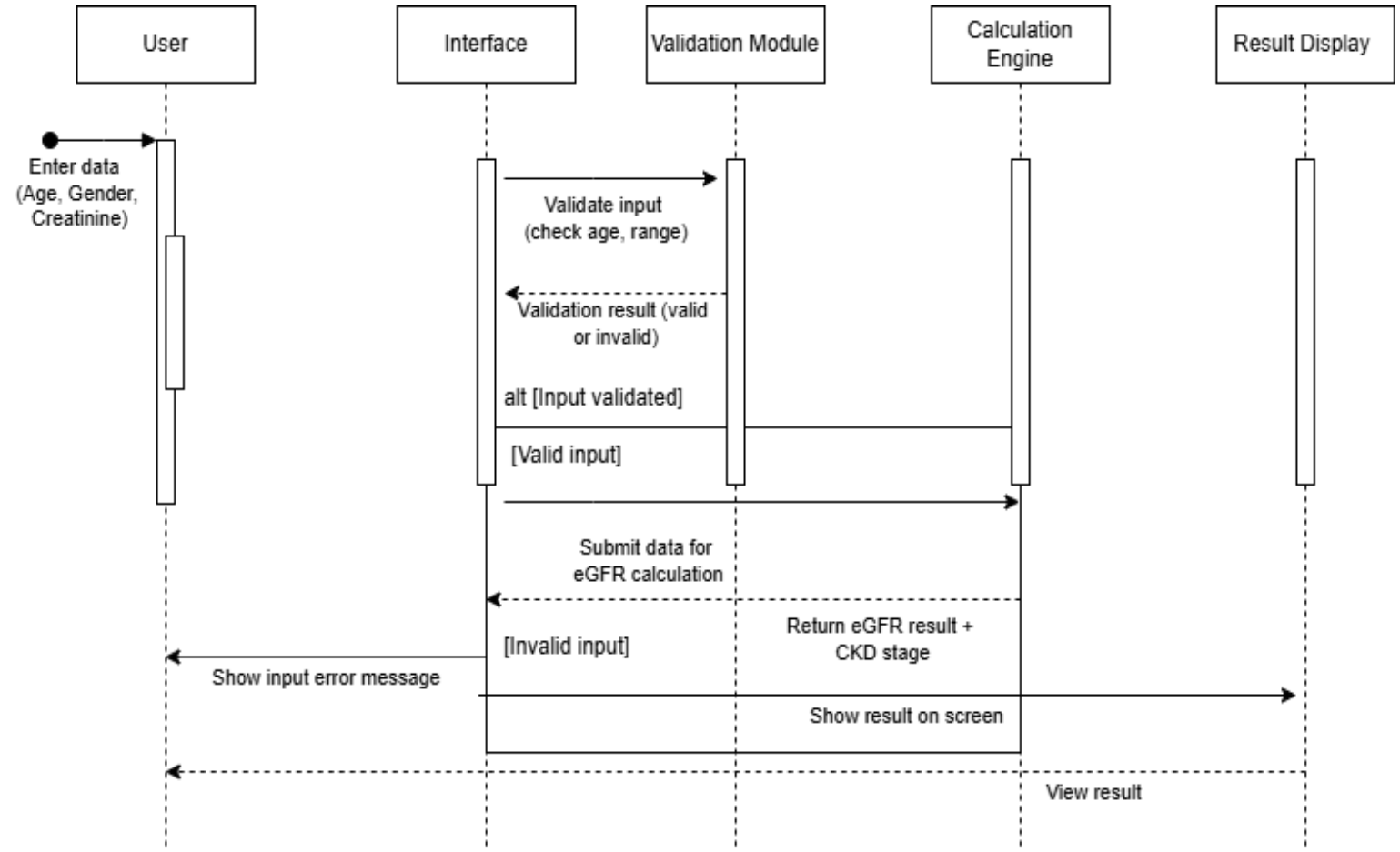


Figure 3: Sequence Diagram - eGFR Calculation Interaction

This sequence diagram illustrates the dynamic behaviour of the system during an eGFR calculation request. The process begins when the user inputs their age, gender and creatinine levels. This data is sent through the interface to the validation module, which checks for appropriate value ranges and age eligibility. If the input is invalid, an error message is then displayed to the user. If valid, the data is forwarded to the calculation engine which applies the MDRD formula to determine the estimated Glomerular Filtration Rate (eGFR) and Chronic Kidney Disease (CKD) stage. The result is then passed back to the interface and shown to the user through the result display. An 'alt' frame in the diagram captures the conditional logic for handling both valid and invalid input paths.

User Journey Mapping

These journey diagrams visualise the system from a user experience perspective, demonstrating how users navigate between key screens such as login, data entry, result display, and optional features like history or export. Each flow is tailored to a specific user role or persona, including clinicians, expert patients, and standard users. The flows support UX planning and interface logic for NephroTrack's mobile-first design.

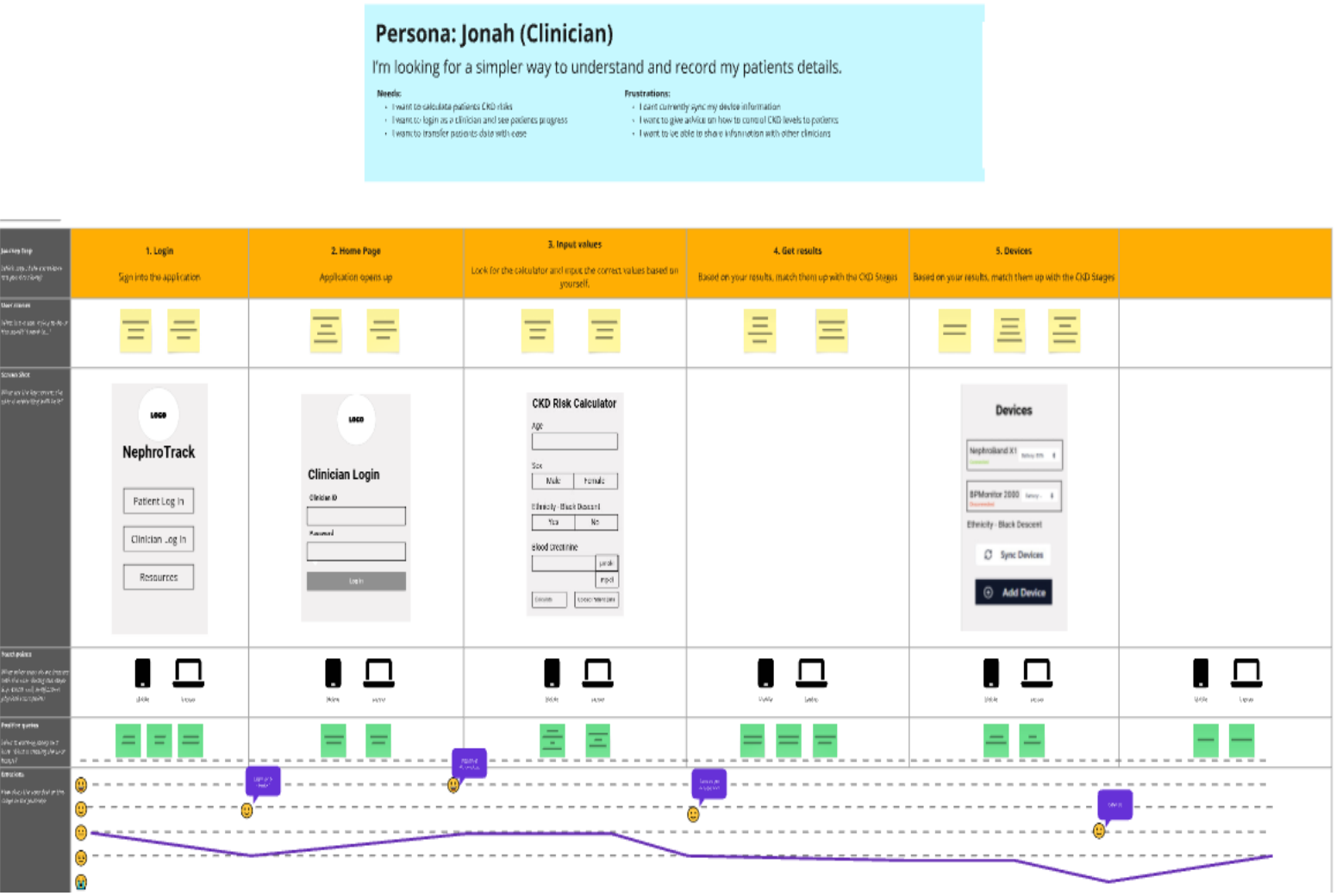


Figure 4: User Journey - Jonah (Clinician Persona)

This diagram outlines Jonah's typical navigation flow through NephroTrack, covering login, calculator input, result matching, and device syncing.

Full step-by-step journey diagrams for all personas (Jonah, Rebecca, and Trent) are provided in Appendix A, with one page per step for improved readability.

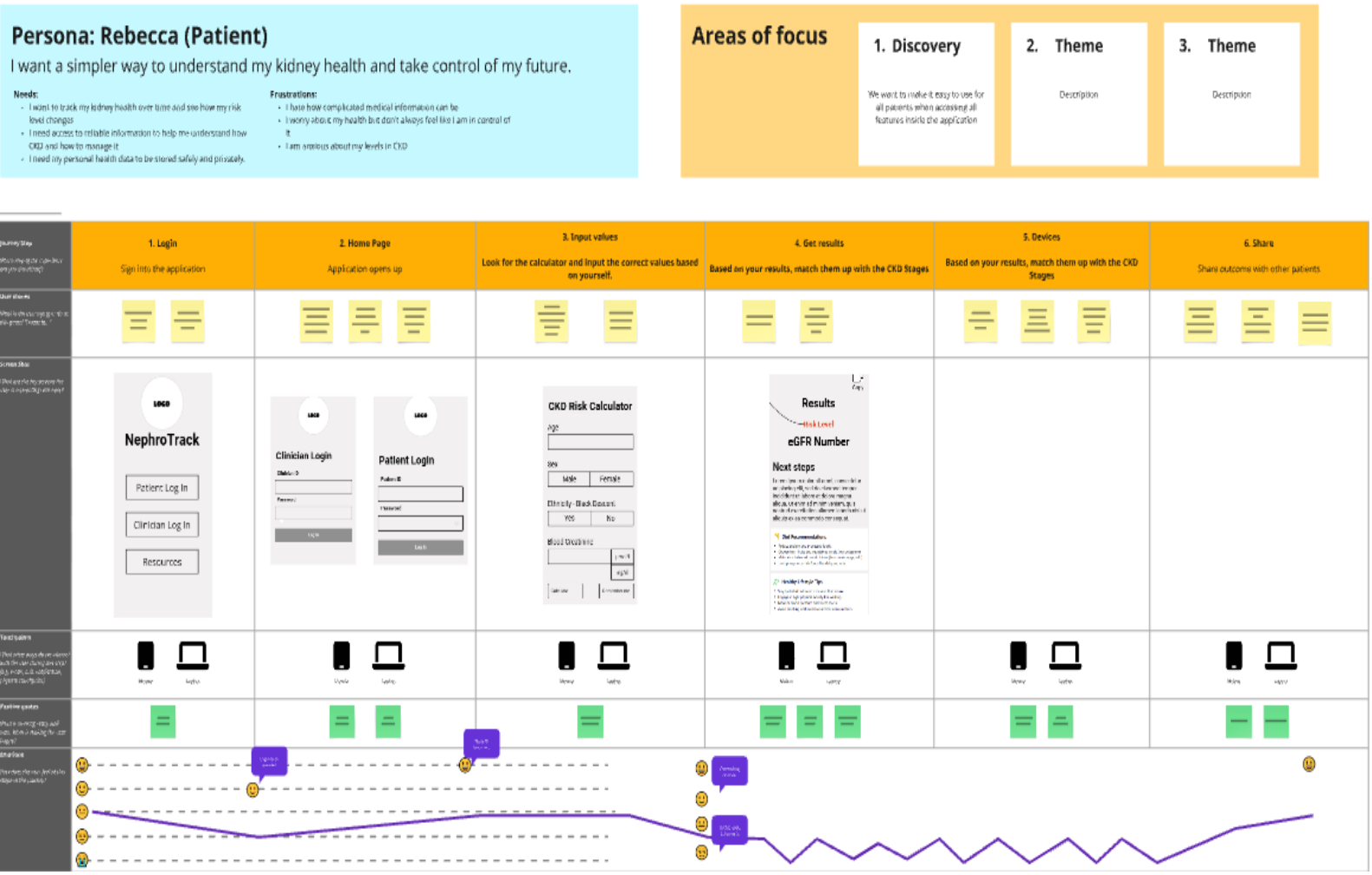


Figure 5: User Journey - Rebecca (Patient Persona)

This diagram shows Rebecca's navigation through NephroTrack from a patient's perspective. It includes login, CKD risk calculator input, result interpretation, and access to supportive tools like device syncing and sharing outcomes with peers.

Rebecca represents a typical patient persona who wants to take control of her kidney health using NephroTrack. Her journey prioritises accessibility, clarity of medical information, and emotional support. This flow emphasises simplicity, privacy, and reassurance – all vital to the patient experience. Her pathway includes six key stages: login, homepage navigation, value input, result review, device syncing, and the optional sharing feature.

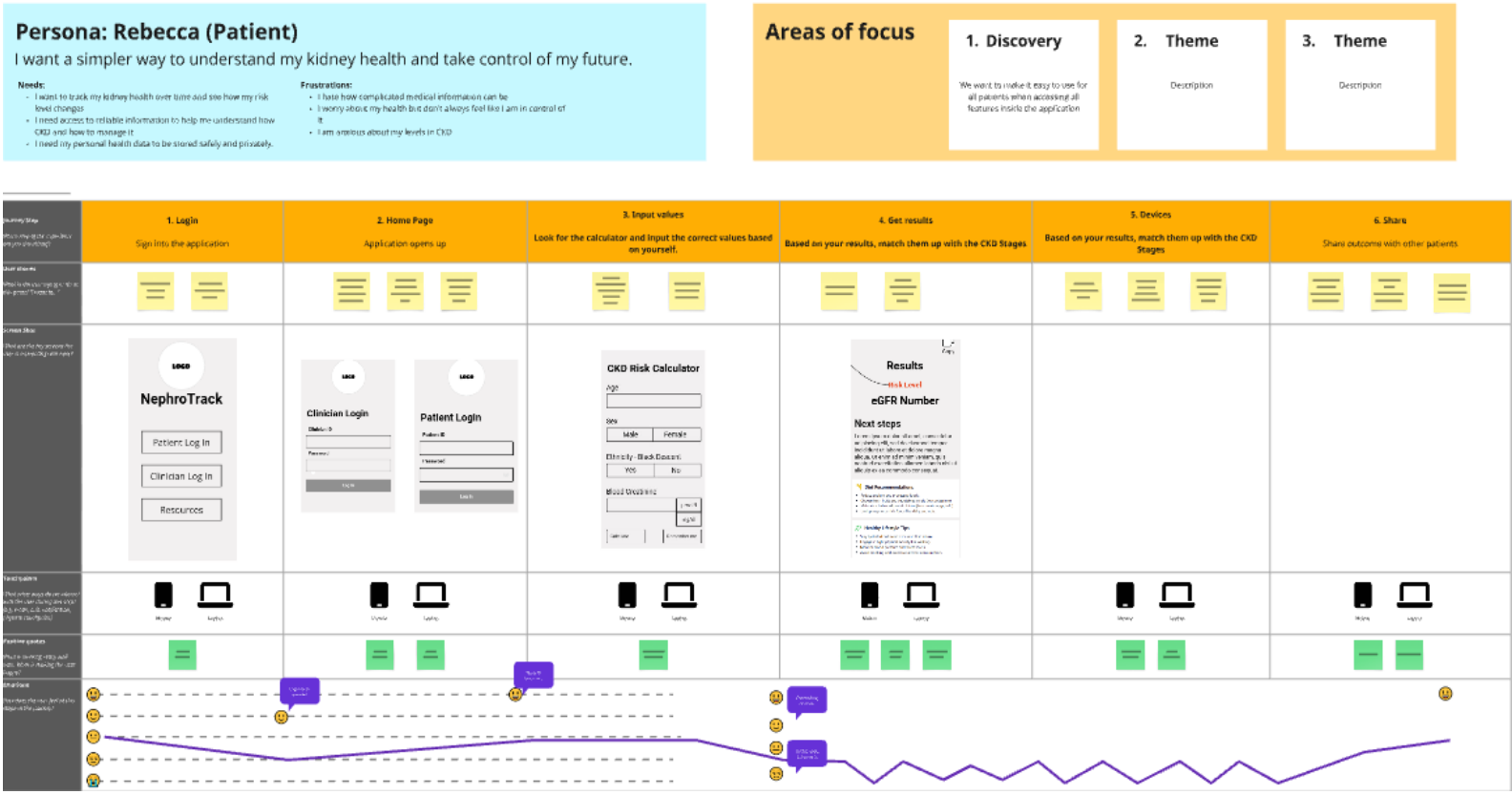


Figure 6:User Journey - Trent (Under 18s Persona)

This flow illustrates how Trent, a younger patient, engages with NephroTrack to explore and understand his kidney health. It maps his experience across login, calculator use, and results, with special attention to simplicity accessibility, and educational guidance for under-18 users.

Trent's user journey reflects the unique needs of younger users navigation medical information. The interface supports learning by simplifying terminology and visual steps, helping Trent track results without being overwhelmed. Emotional reassurance, device integration, and clarity are key components of this tailored UX. Although similar to the adult patient flow, Trent's path minimises complexity while ensuring accurate CKD stage guidance.

Project Requirements Overview

(A mind map was created but it was completely illegible when included in this document so it will be summarised)

This section summarises the key information outlined in our original brainstorming mind map, including functional requirements, non-functional considerations, and app vision.

Vision Statement

- To create an application that allows clinicians to send multiple data entries at once.
- To remember patient data across sessions to minimise repeated input.

Proposed App Names

- RenalCare
- CKDCare
- Renal360
- KidneyPath
- KidneyGuard
- CKDTrack

Functional Requirements

- Measure CKD risk (calculate eGFR and compare to healthy ranges)
- Shareable output
- Clinician/patient login authentication
- Patient and clinician database
- Input Creatinine in mg/dL or µmol/L
- Progress monitoring and report generation
- “Remember me” function for reusing data
- Import patient data file
- Access to educational resources
- No local data storage

Non-Functional Requirements

- Cross-platform compatibility
- User-friendly interface (target audience 18-100)
- GDPR compliance
- End-to-end encryption
- 24/7 availability
- Scalable infrastructure
- Actionable guidance after risk assessment

SWOT Analysis

This analysis outlines NephroTrack's internal strengths and weaknesses, as well as external opportunities and threats. It highlights where the app currently performs well, identifies areas for improvement, and considers potential developments and risk as the system evolves.

Strengths	Weaknesses
- Tailored for CKD and eGFR monitoring - Dual focus on clinician and patient usability - Mobile-first responsive design - Instant eGFR calculation with CKD stage classification	- Depends on correct user input (e.g., creatinine, age) - Limited NHS data integration in early stages - No offline access functionality - Data security must meet strict GDPR standards

Opportunities	Threats
- Expand to include more renal health indicators (e.g., BP, urine results - Potential for integration into NHS systems or HealthTech partnerships - Integration with wearable health tech and home monitoring devices	- Other medical apps may offer more comprehensive functionality - Misinterpretation of clinical data without professional guidance - Cybersecurity risks due to handling of sensitive personal and health information

Conclusion

The diagrams and analysis provided in this document guided the early stages of NephroTrack's development. They helped ensure user needs, system behaviours, and technical goals with aligned throughout planning. This documentation forms the foundation for implementation and future iterations as the app continues development under Team 33.

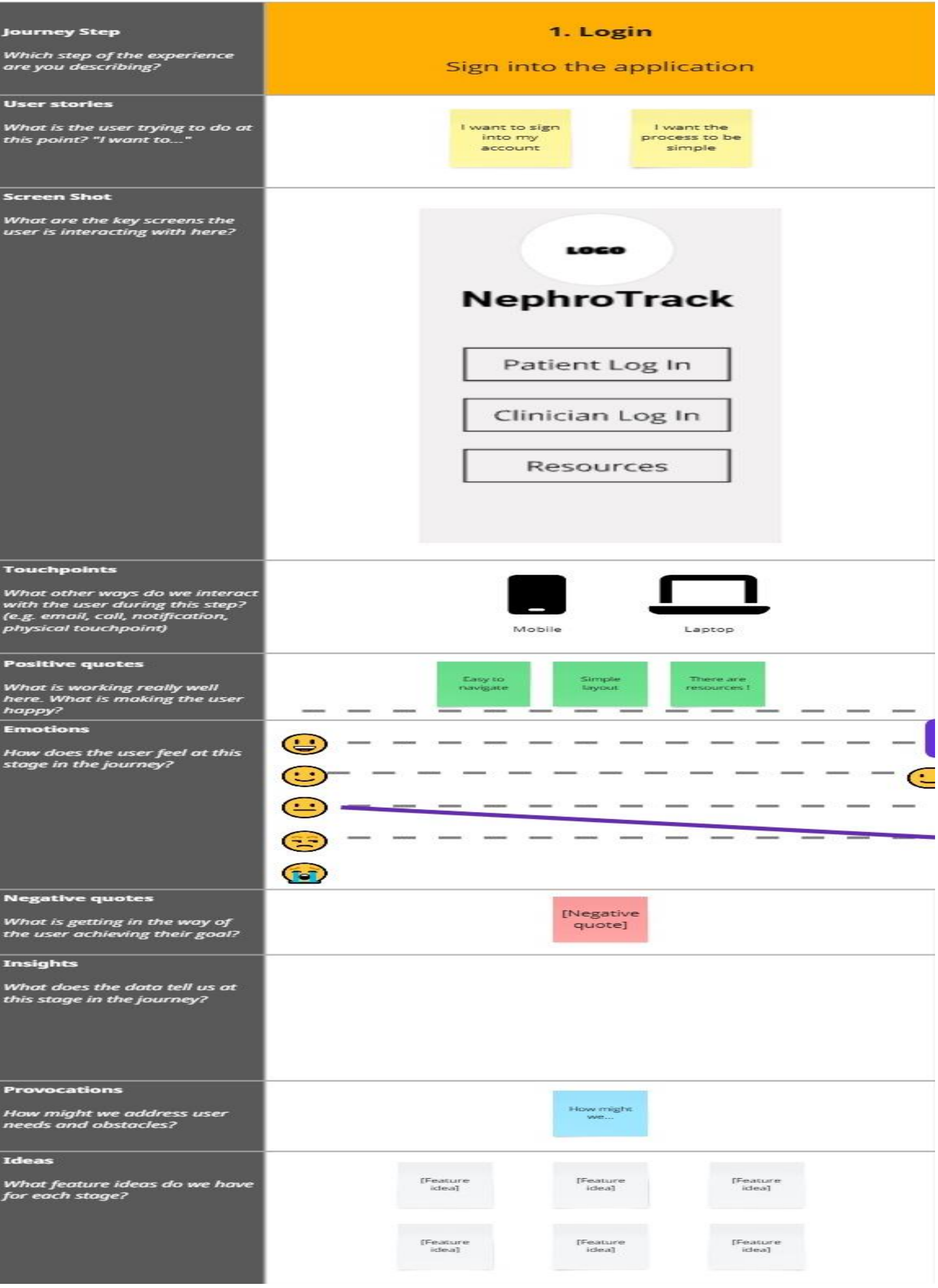


Figure 7: Jonah - Step 1:Login

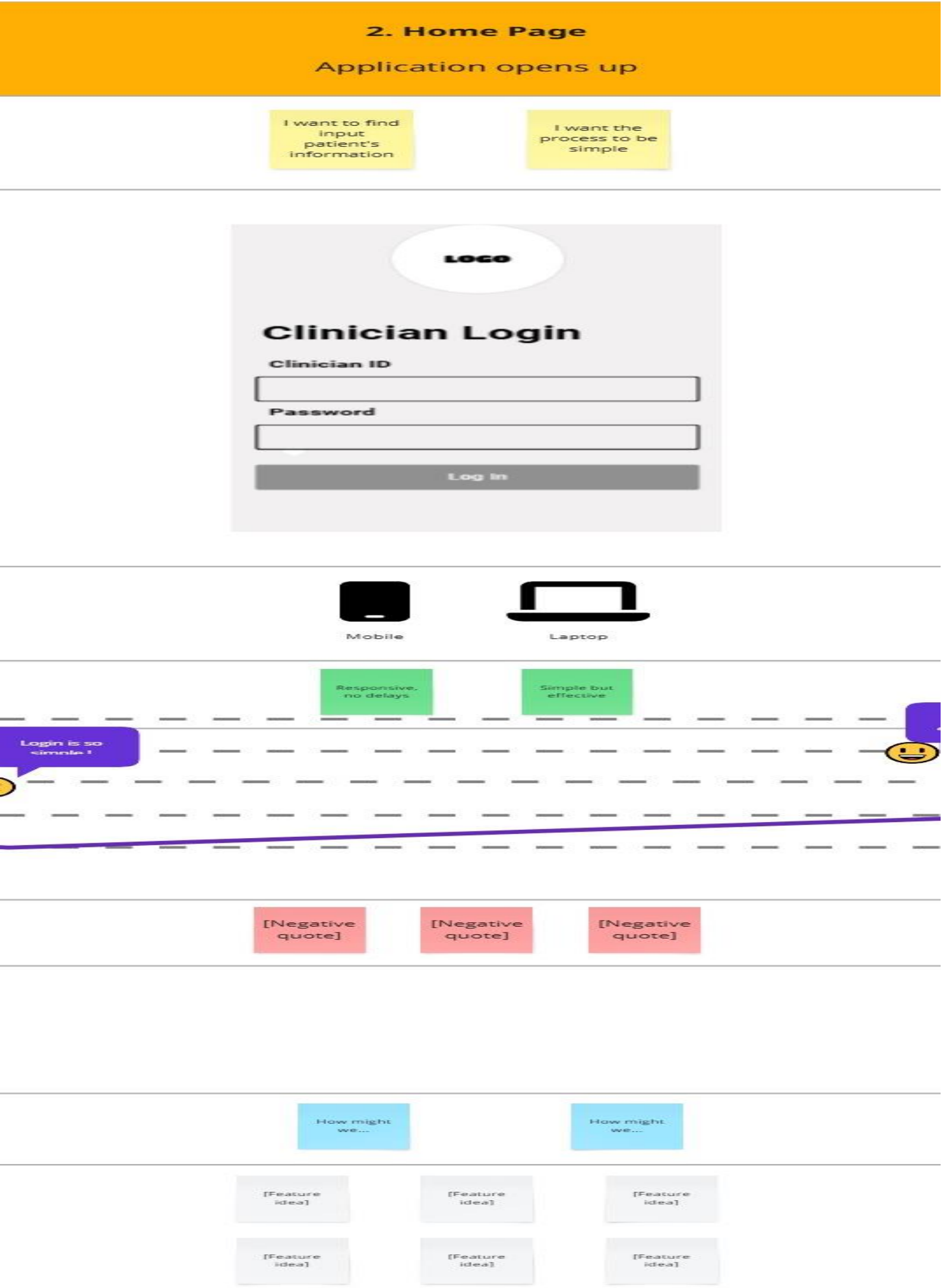


Figure 8: Jonah - Step 2: Homepage

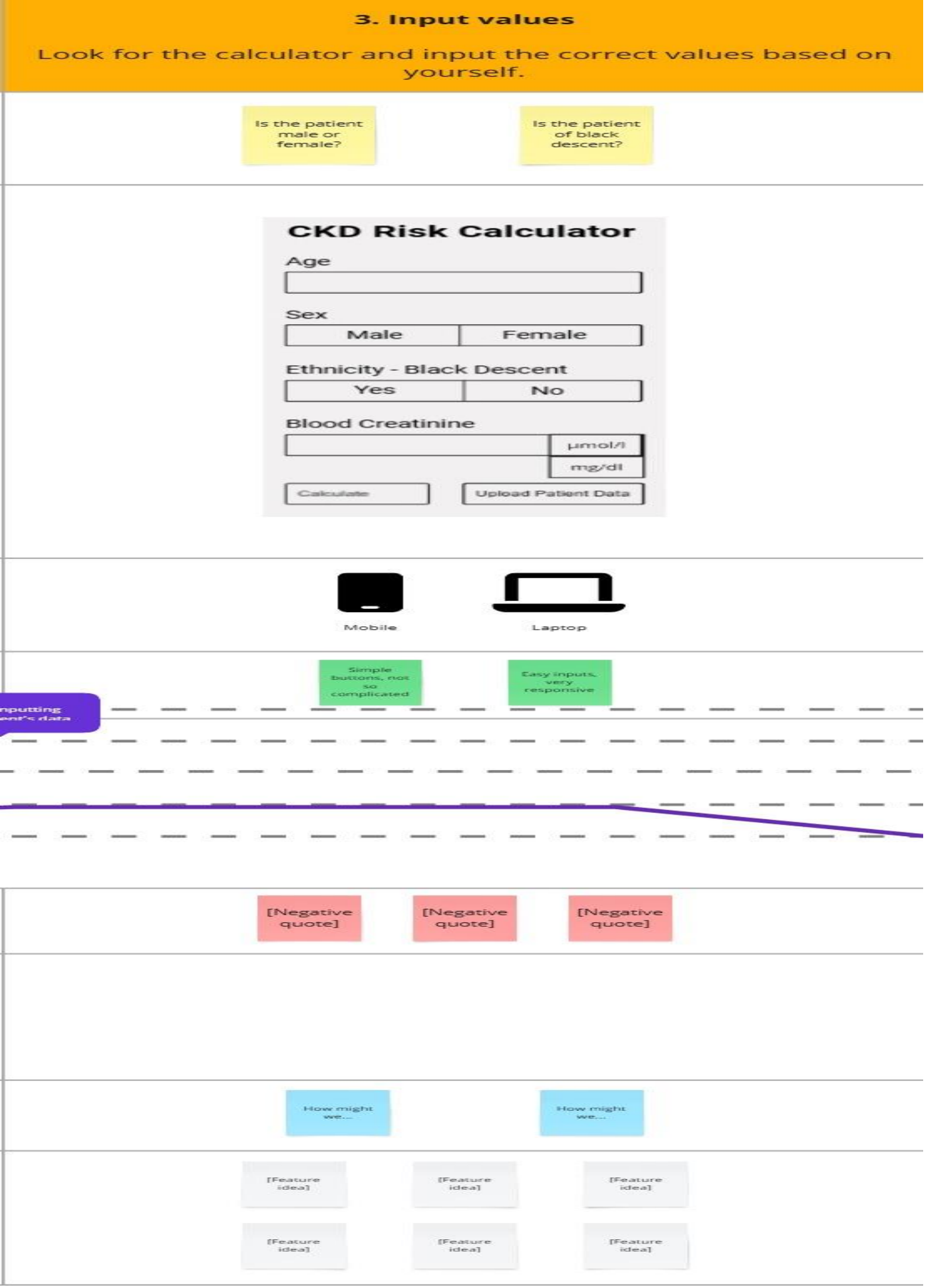


Figure 9: Jonah - Step 3: Calculator Input

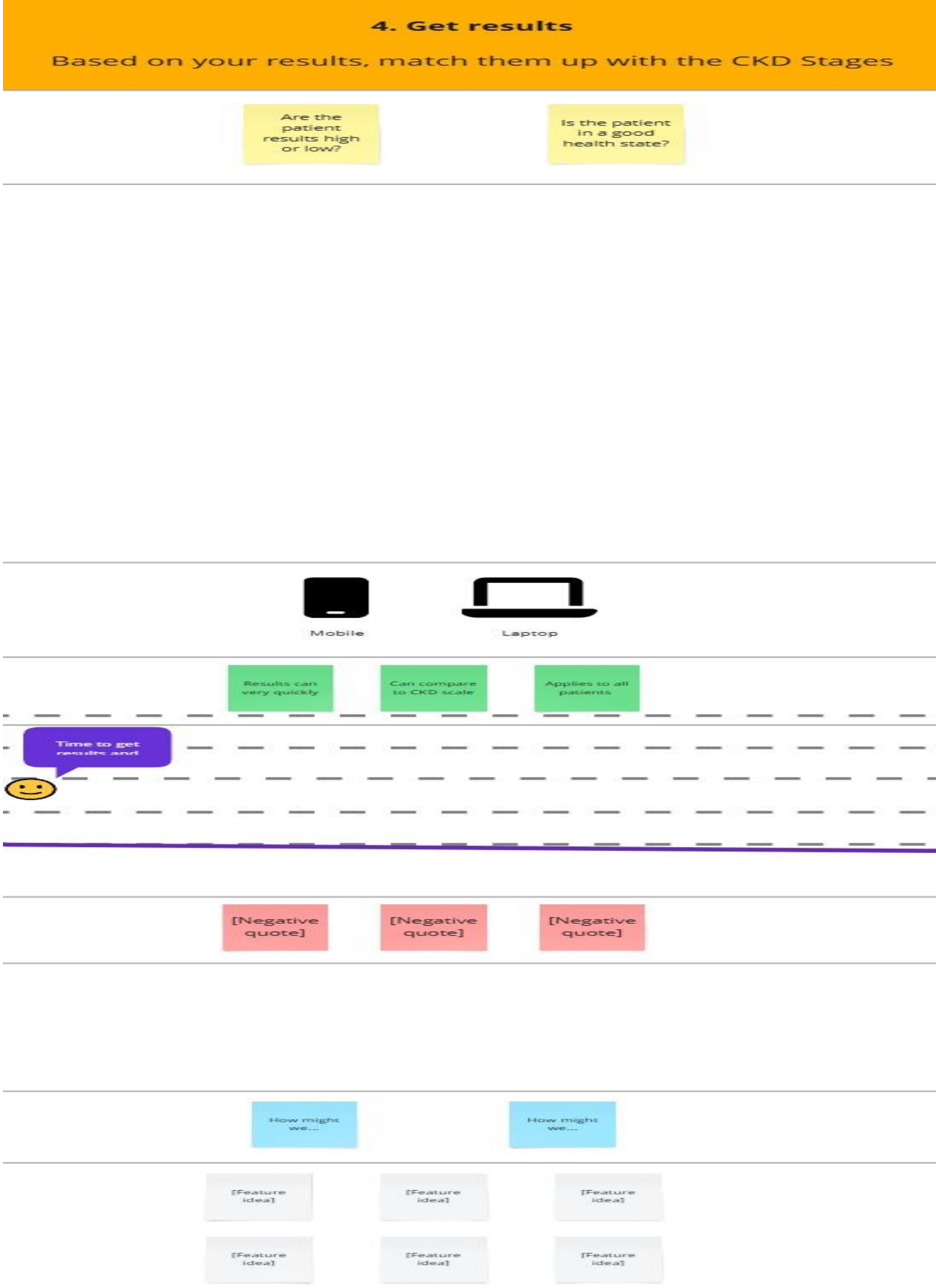


Figure 10: Jonah - Step 4: Result Display

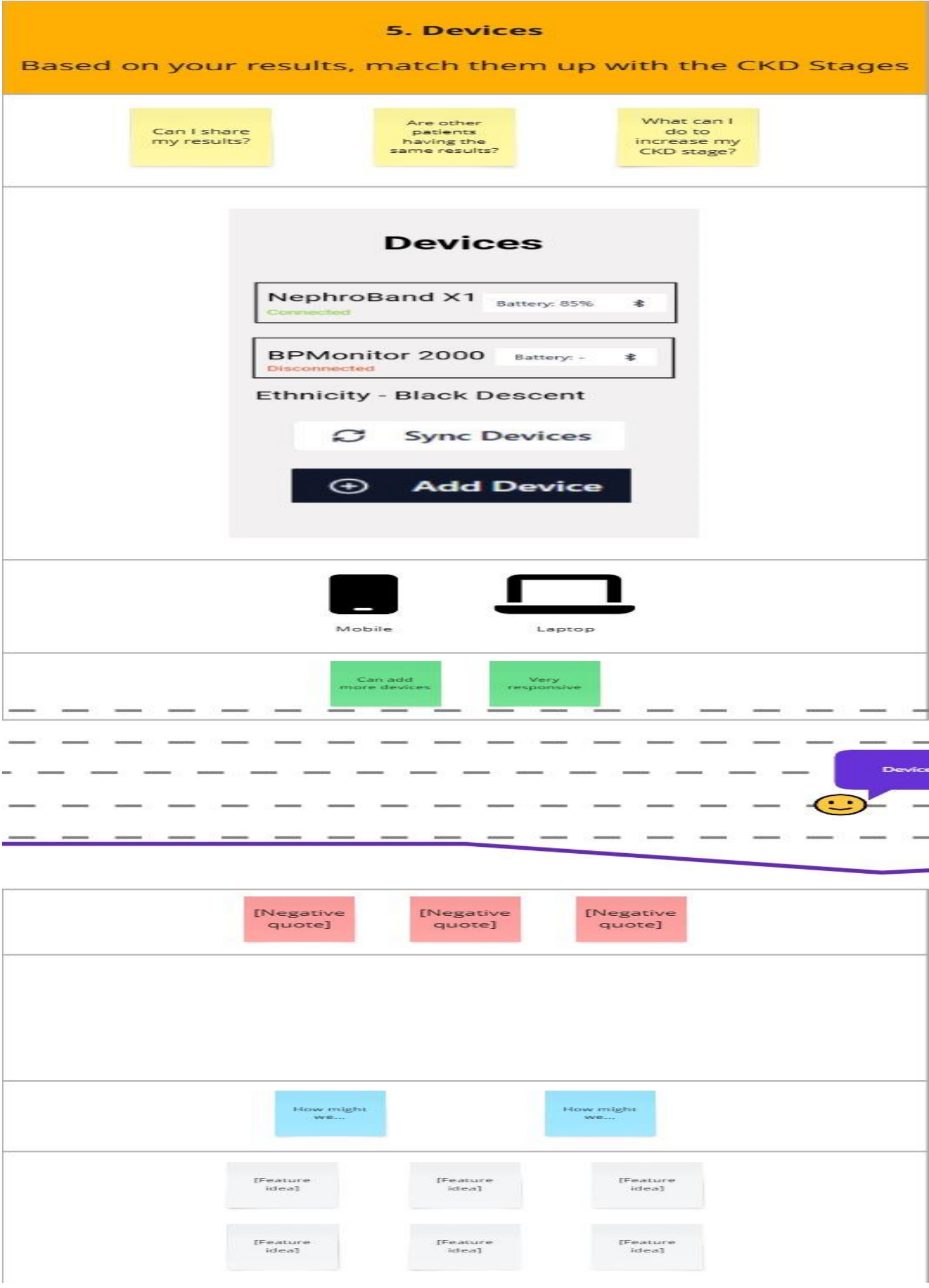


Figure 11: Jonah - Step 5: Device Integration

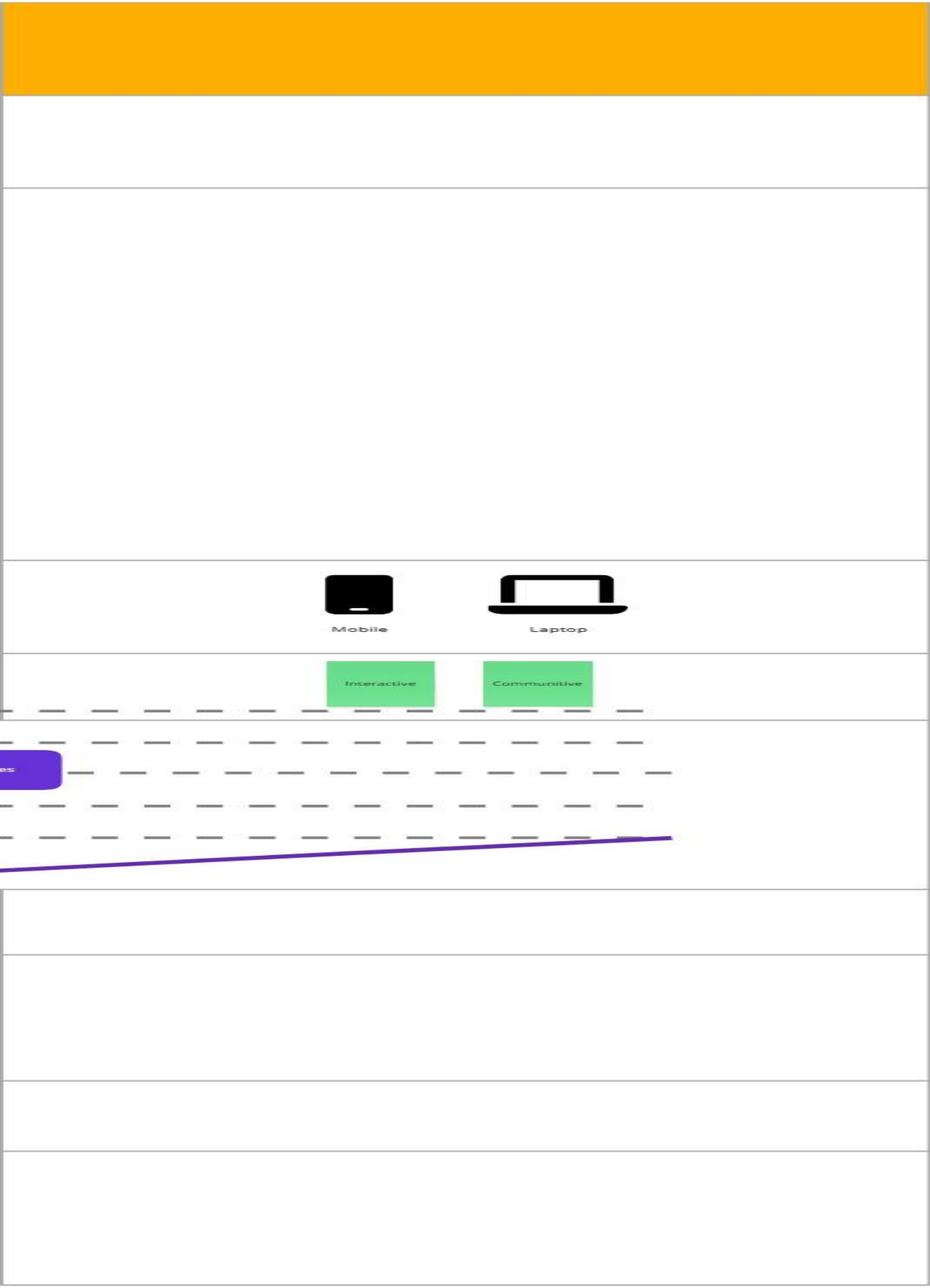


Figure 12: Jonah - Step 6: Export/Sync Options

Journey Step *Which step of the experience are you describing?*	**1. Login** Sign into the application
User stories *What is the user trying to do at this point? "I want to..."*	I want to sign into my account I want the process to be simple
Screen Shot *What are the key screens the user is interacting with here?*	
Touchpoints *What other ways do we interact with the user during this step? (e.g. email, call, notification, physical touchpoint)*	
Positive quotes *What is working really well here. What is making the user happy?*	Easy to navigate
Emotions *How does the user feel at this stage in the journey?*	
Insights *What does the data tell us at this stage in the journey?*	
Provocations *How might we address user needs and obstacles?*	How might we get user to log in? How might we get user to use resources?
Ideas *What feature ideas do we have for each stage?*	[Feature idea] [Feature idea] [Feature idea] [Feature idea] [Feature idea] [Feature idea]

Figure 13: Rebecca - Step 1:Login

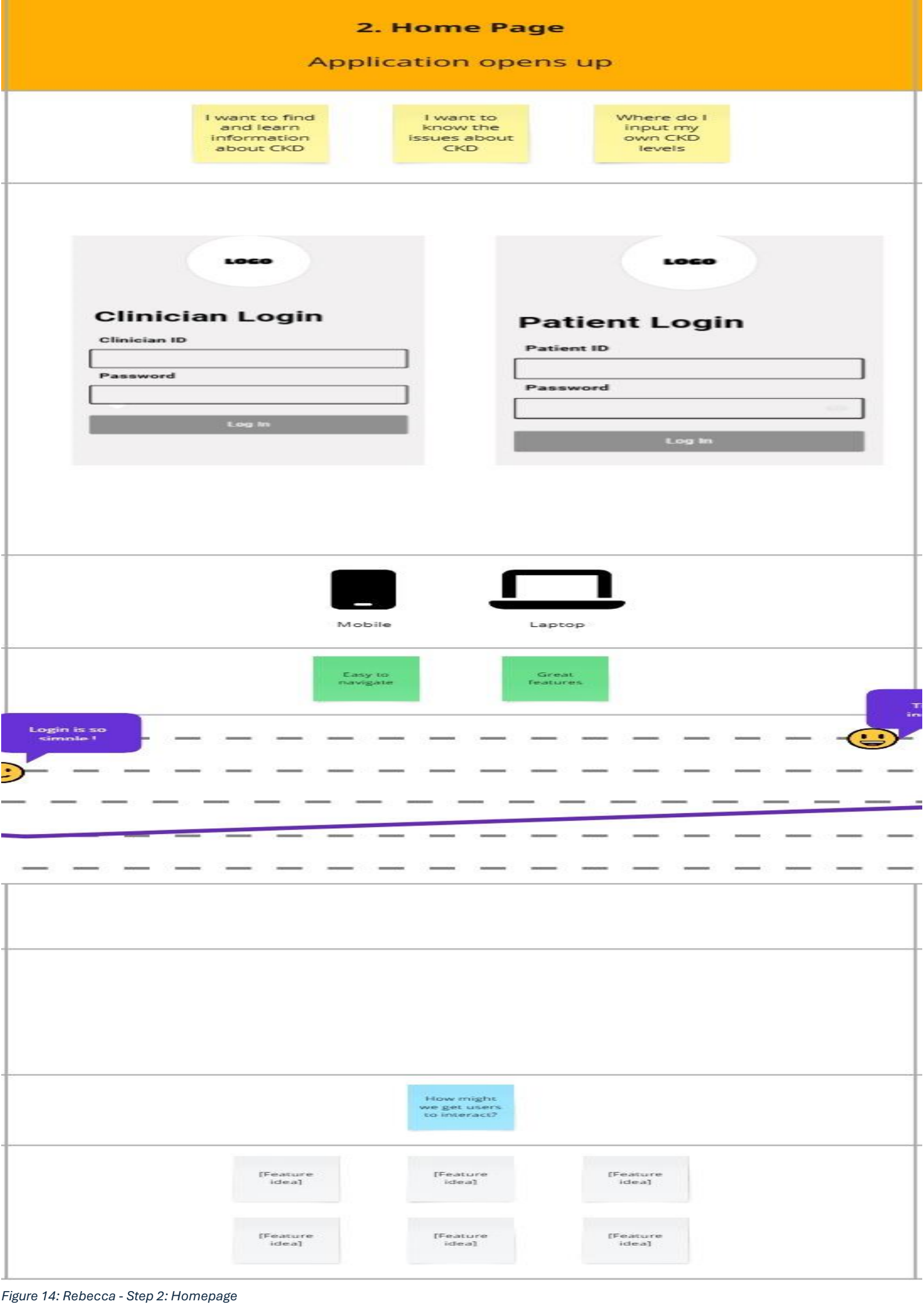


Figure 14: Rebecca - Step 2: Homepage

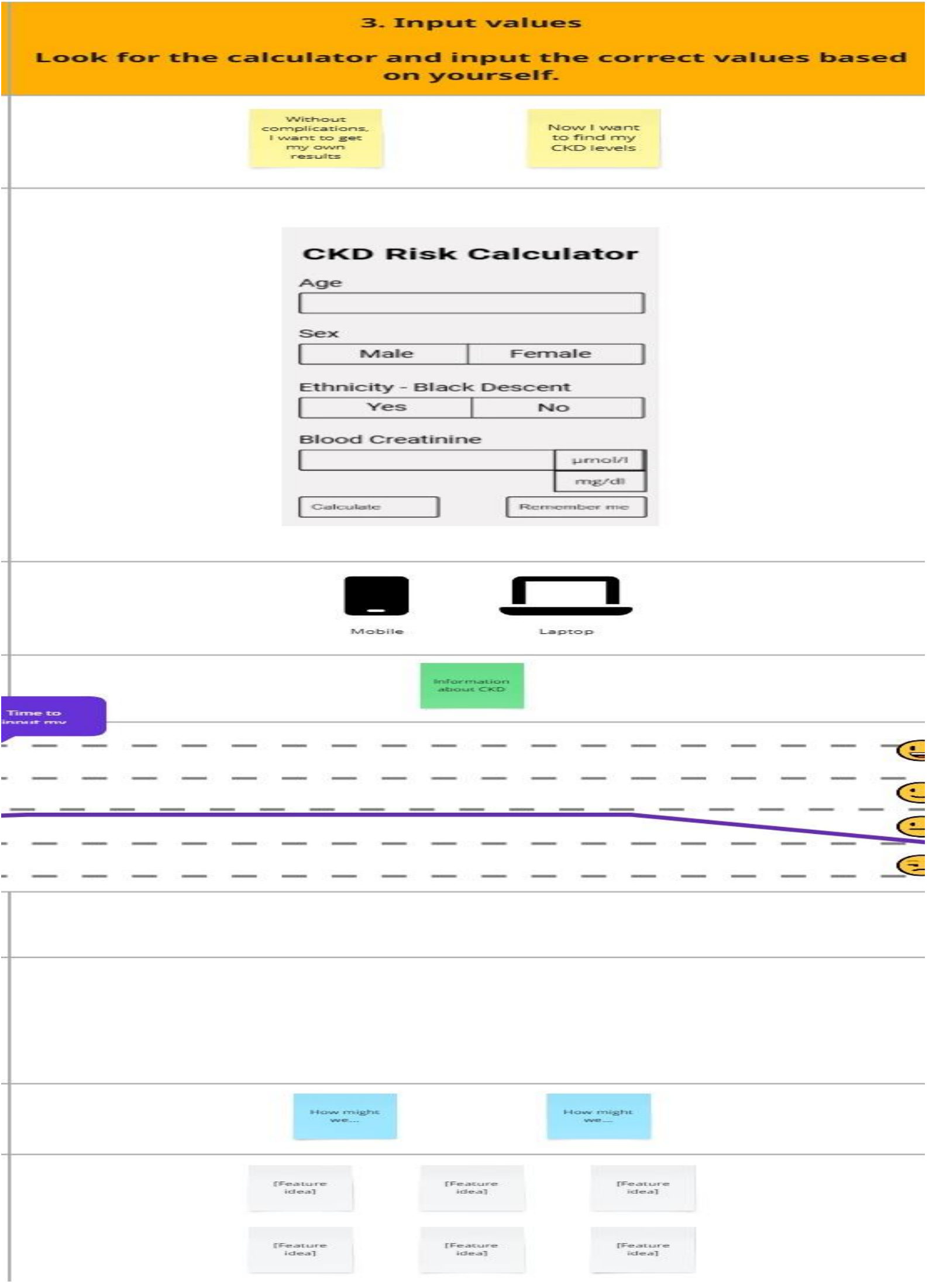


Figure 15: Rebecca - Step 3: Calculator Input

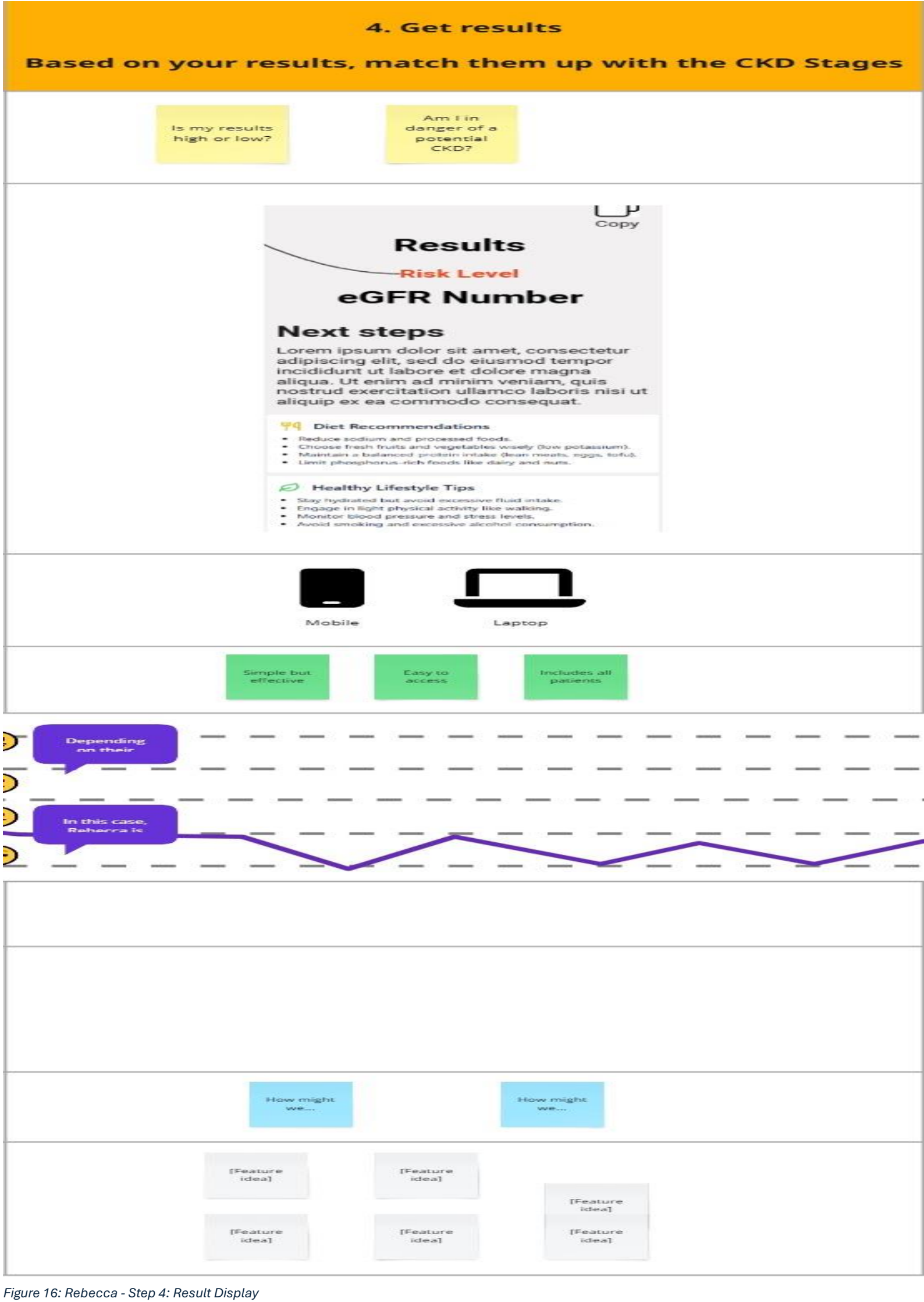


Figure 16: Rebecca - Step 4: Result Display

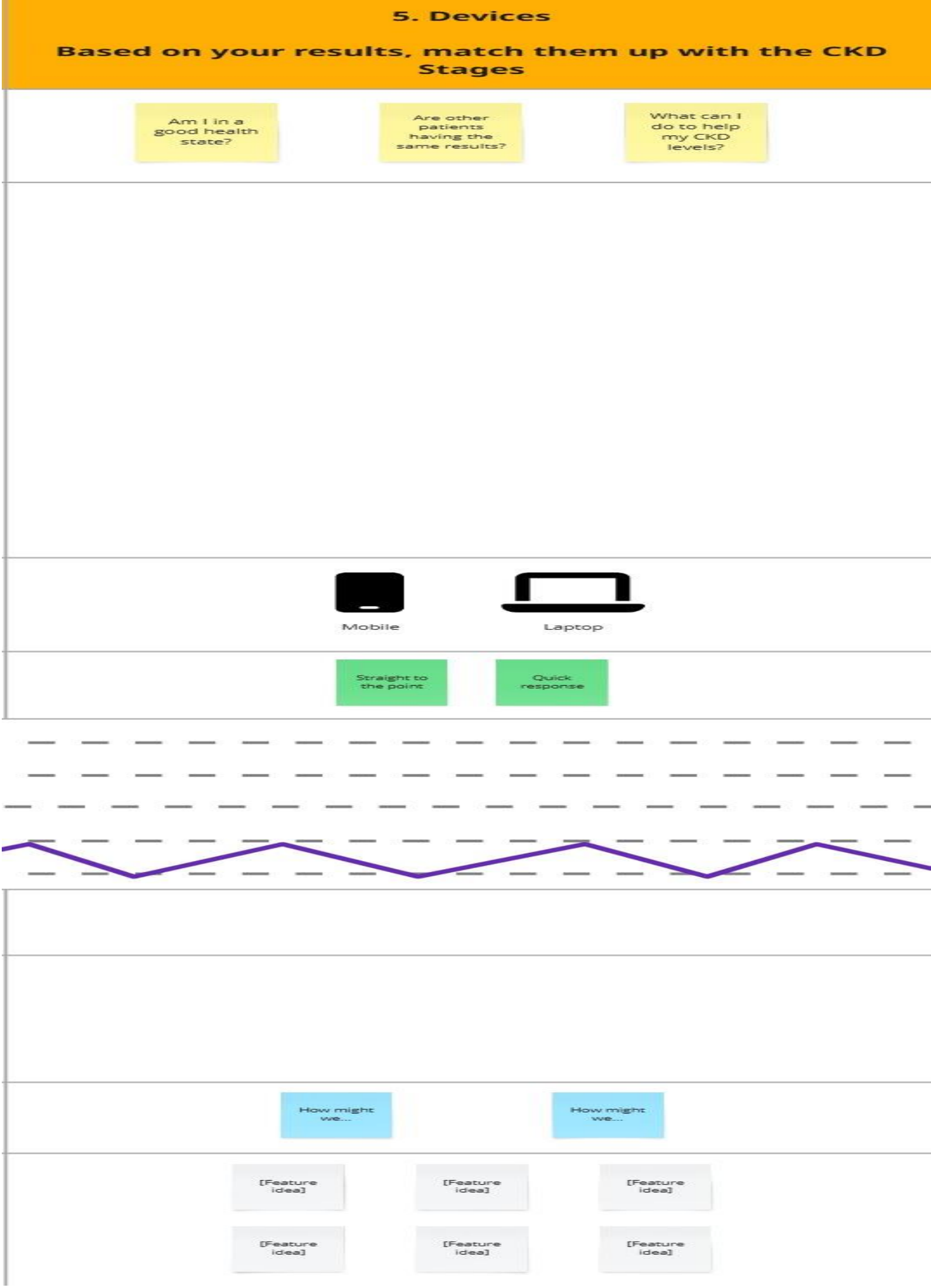


Figure 17: Rebecca - Step 5: Device Sync

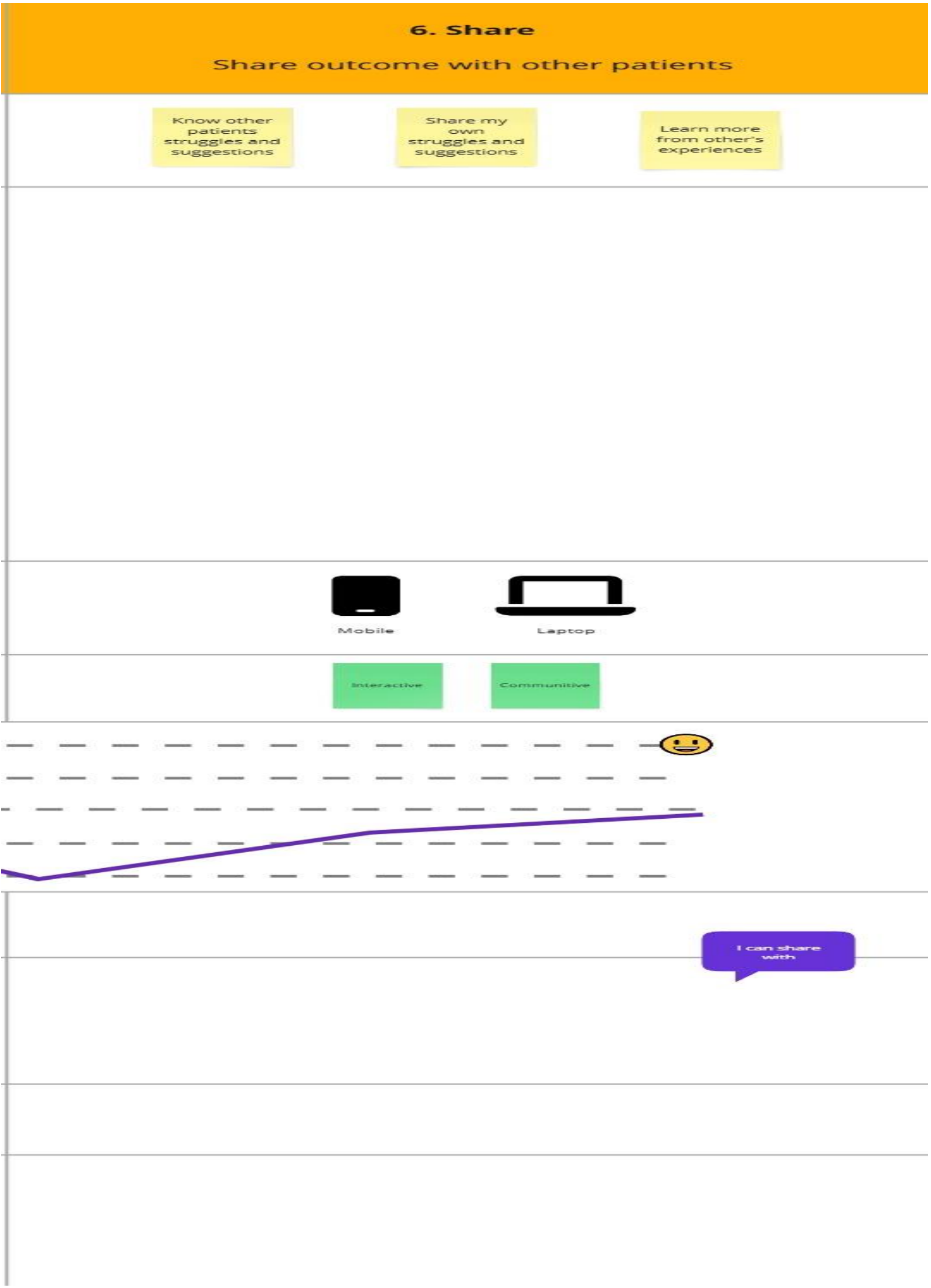


Figure 18: Rebecca - Step 6:Share Results

Journey Step

Which step of the experience are you describing?

1. Login

Sign into the application

User stories

What is the user trying to do at this point? "I want to..."

I want to sign into my >18 account

I want the process to be simple

Screen Shot

What are the key screens the user is interacting with here?

Touchpoints

What other ways do we interact with the user during this step? (e.g. email, call, notification, physical touchpoint)

Positive quotes

What is working really well here. What is making the user happy?

Easy navigation

Simple layout

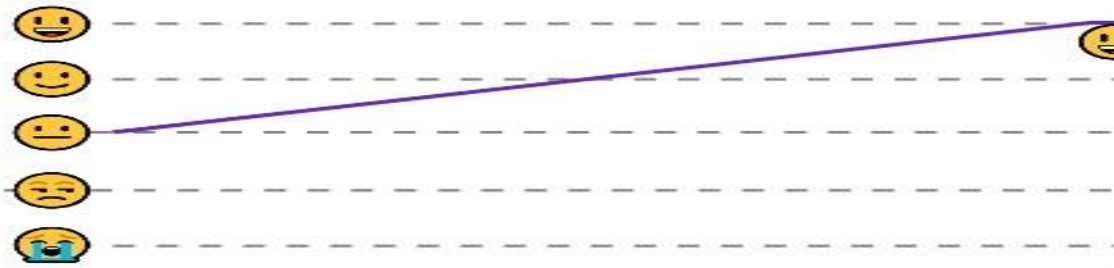
Negative quotes

What is getting in the way of the user achieving their goal?

[Negative quote]

Emotions

How does the user feel at this stage in the journey?



Insights

What does the data tell us at this stage in the journey?

Provocations

How might we address user needs and obstacles?

How might we...

Ideas

What feature ideas do we have for each stage?

[Feature idea]

[Feature idea]

[Feature idea]

[Feature idea]

[Feature idea]

[Feature idea]

Figure 19: Trent - Step1: Login

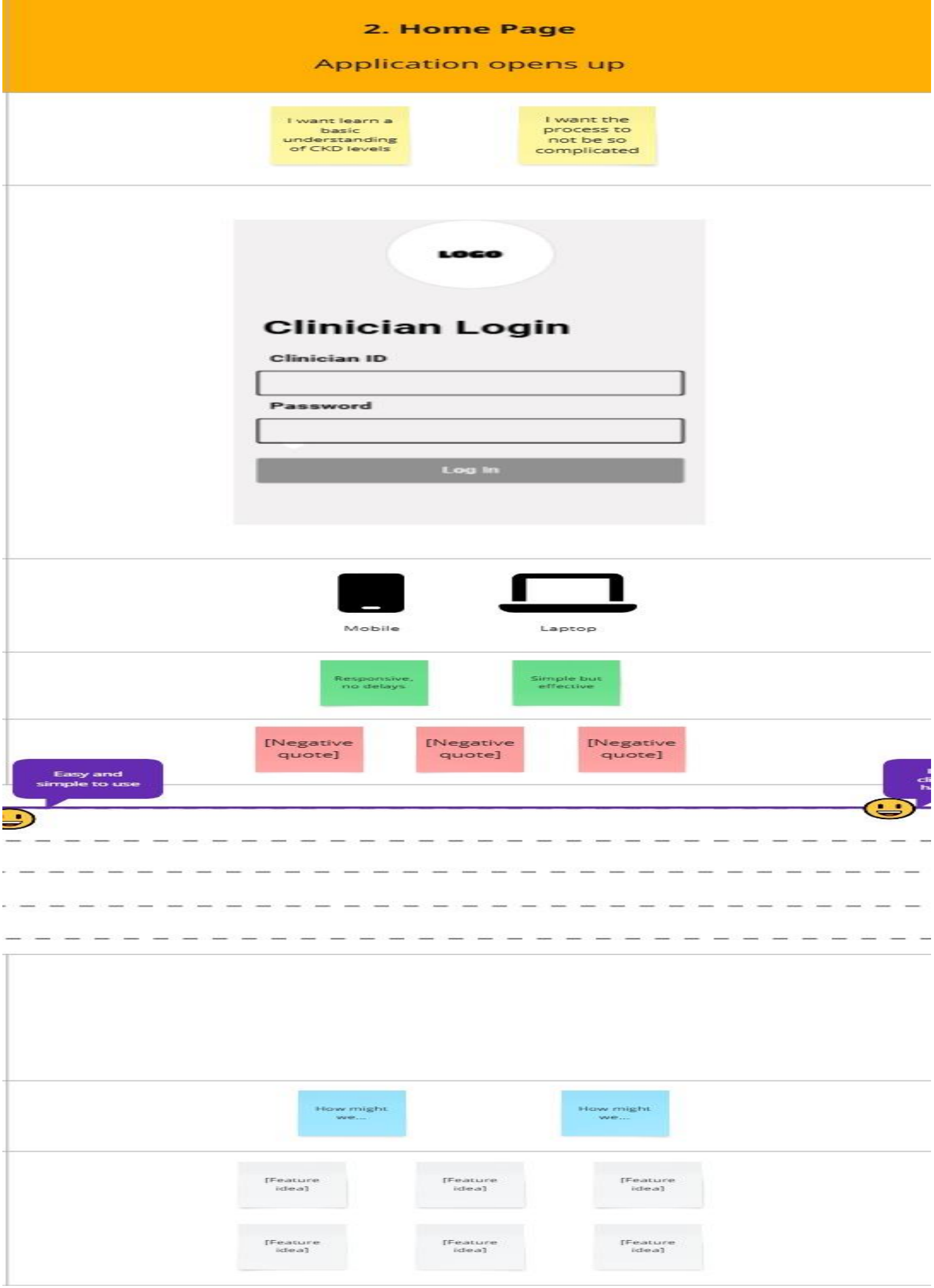


Figure 20: Trent - Step 2: Homepage

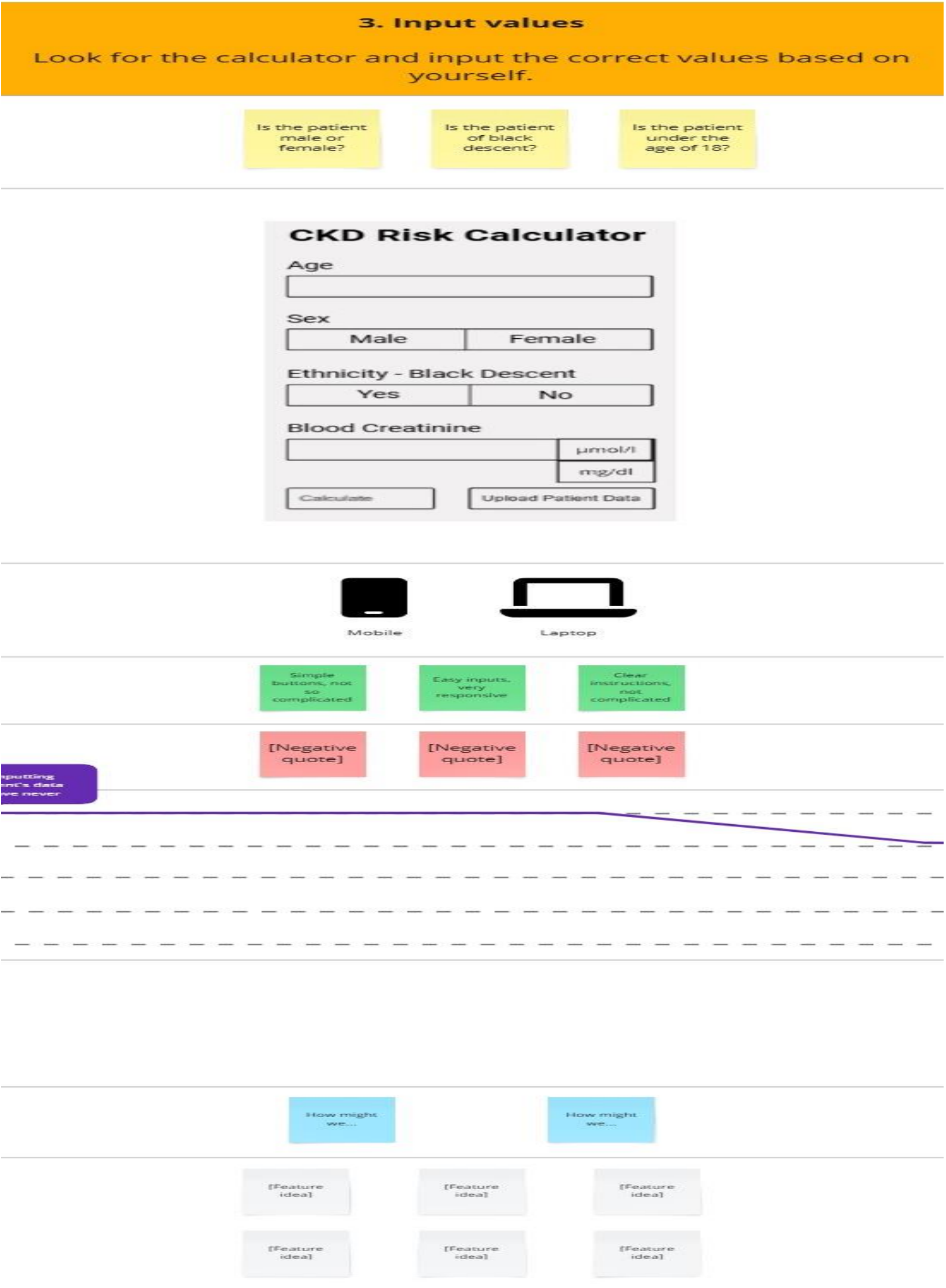


Figure 21: Trent - Step 3: Calculator Input

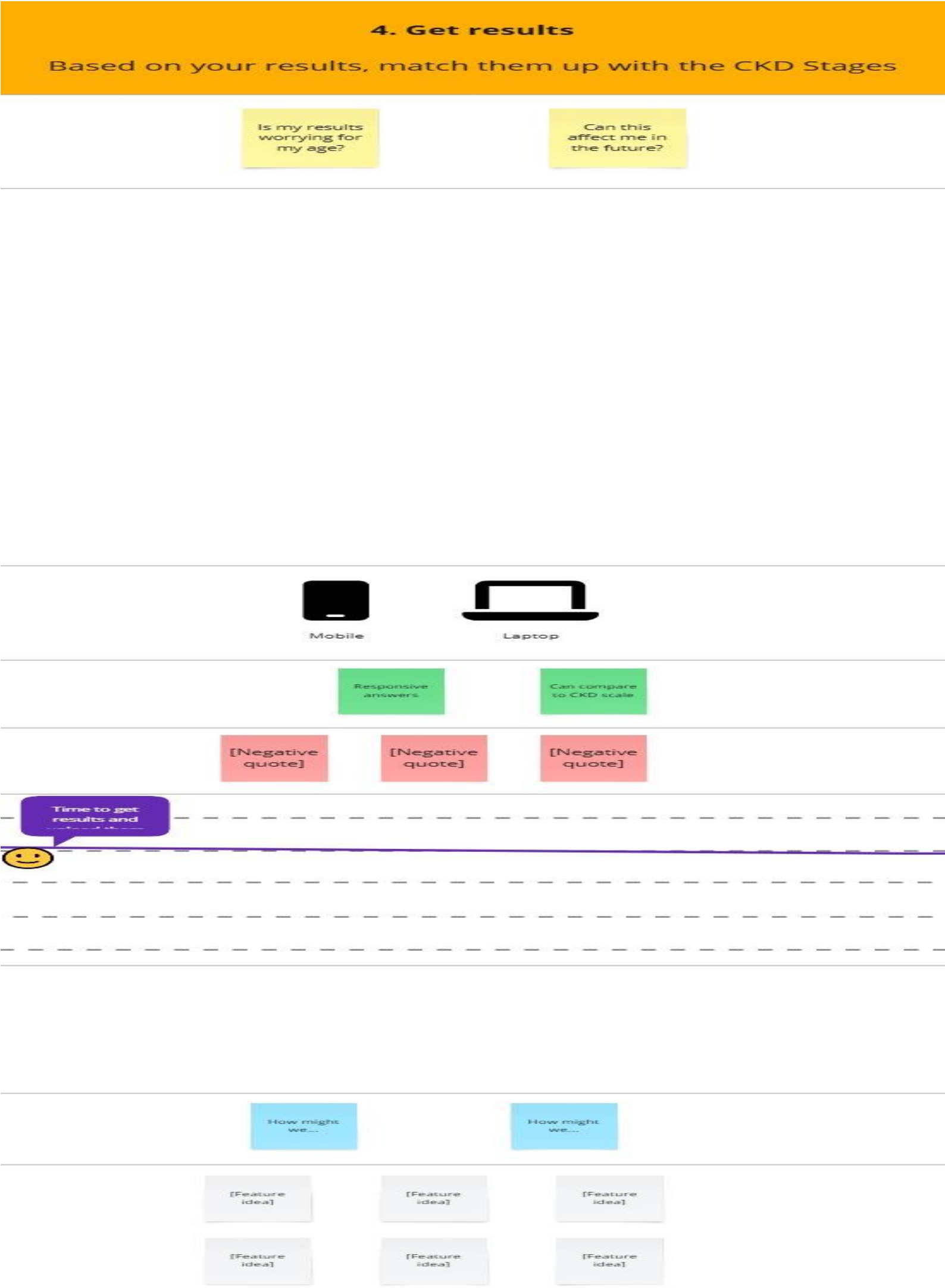


Figure 22: Trent - Step 4: Result Display

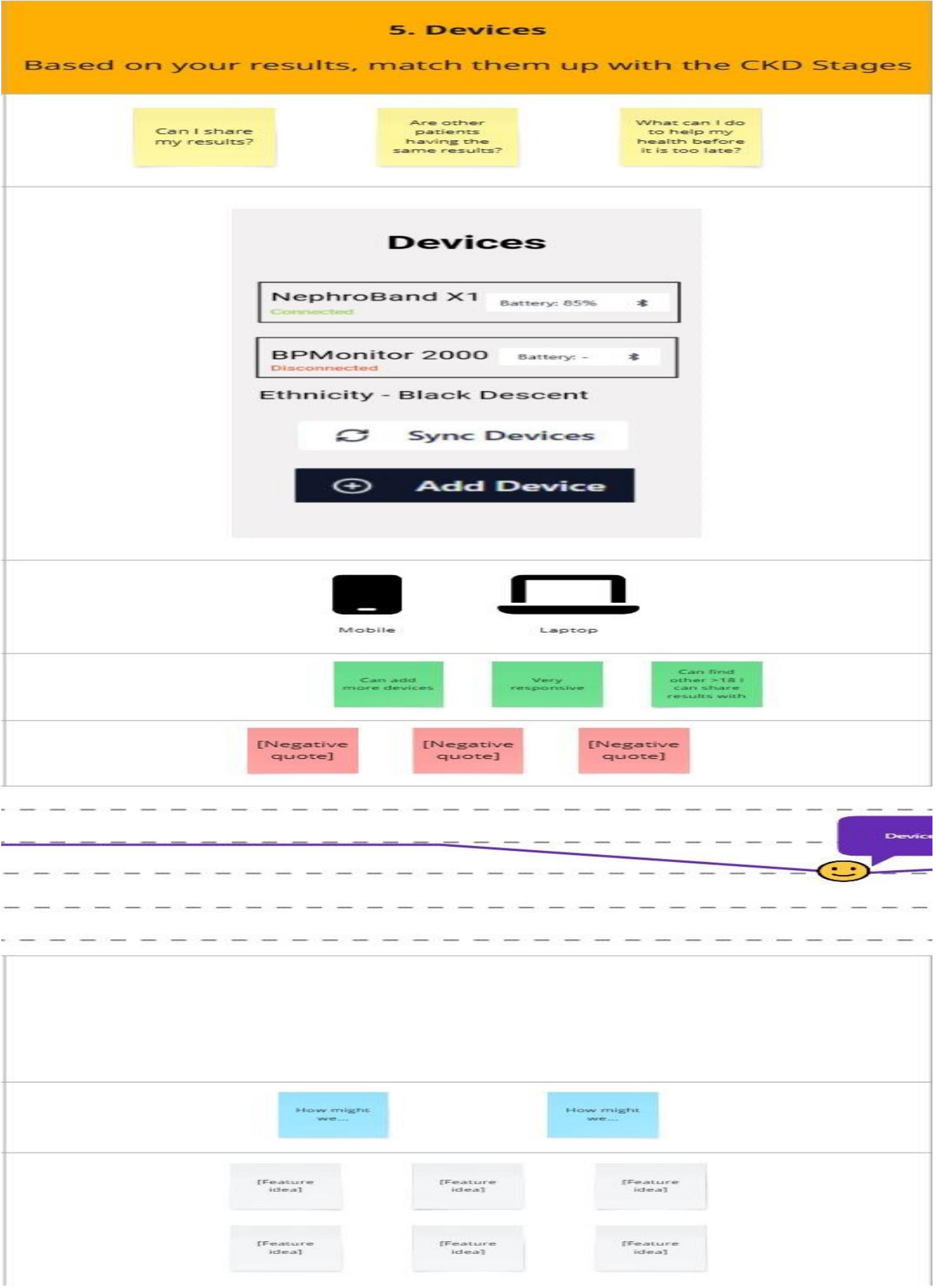


Figure 23: Trent - Step 5: learn About CKD

Figure 24: Trent - Step 6: Parental Guidance or Exit