

# **Skin Conditions Diagnostic Tool**

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## **PHASE 1: Project Proposal**

### **Problem Statment:**

-Current hospital occupancy rates are reported to be between 3 to 8 hospital beds per 1,000 population, leading to 1.79% death rates due to late diagnosed skin condition diseases. Current hospital occupancy results in difficulty in booking and confirming appointments for skin condition carriers or people with a family history of skin cancer. Therefore, an application that helps diagnose malicious skin spots and spot precancerous skin speckles through your phone only is needed. The availability of such an application is helpful in reducing overcrowdedness in hospitals, saving time for patients and doctors, and reducing mortality rates.

### **Scope:**

-The scope of our project depends on the database provided by resources to train our software.

#### **1.1. Goals:**

-Mortality rate due to skin conditions in the world is 1.79% due to late diagnosis, therefore aim to reduce the percentage to 1.30%.

#### **1.2. Objectives:**

- Encourage and invigorate people/patients with a family history of skin cancer/ skin conditions to get the needed monthly checkup from the comfort of their own house.
- Avoid frequent hospital visits that overcrowd the hospitals and overwork the doctors and nurses.
- Help keep and maintain a buildable database that keeps track of newly found, undiscovered malicious spots that, later on, would be studied and understood.
- Connect all hospital databases to the database that our app generates.
- Help in the detection of early stages of cancer through suspicious-looking moles and spots, aiding in survival rates for skin cancer patients due to early-stage diagnosis.

### 1.3. Motivation:

-The motive behind the software is to merge AI and the healthcare industry to ensure the effectiveness of the cause and to create an accessible solution for people with limited income. While also proposing a low-cost alternative for in-person hospital appointments, to also reduce the workload on healthcare workers after the effects of COVID-19.

### 1.4. Contribution:

-Create a software to serve as a helpful tool for patients with frequent skin conditions/flare-ups to determine the intensity of the condition, as it will help to lessen hospital visits.

## **PHASE 2:** Project Scope and Work Plan

### 2.1. Project Schedule and Milestones:

Task Name	Duration	Start	Finish	Predecessors
<b>Project Development</b>	<b>56 Days</b>	<b>1/11/2022</b>	<b>27/12/2022</b>	-
<b>PLANNING(Specification and requirements)</b>	<b>6 Days</b>	<b>1/11/2022</b>	<b>6/11/2022</b>	-
A-Requirements collection meeting	2 Days	1/11/2022	2/11/2022	-
B-Communication with Stakeholders	1 Day	3/11/2022	3/11/2022	-
C-Documentation and Requirements Closure	3 Days	4/11/2022	6/11/2022	Communication with Stakeholders & Requirements collection meeting
<b>DESIGN</b>	<b>12 Days</b>	<b>7/11/2022</b>	<b>18/11/2022</b>	<b>PLANNING</b>
D-Back End Software Database Design	4 Days	7/11/2022	10/11/2022	Documentation and Requirements Closure
E-Front End Software Design	5 Days	11/11/2022	15/11/2022	Back End Software Database Design
F-Design Specification	3 Days	16/11/2022	18/11/2022	Front End Software

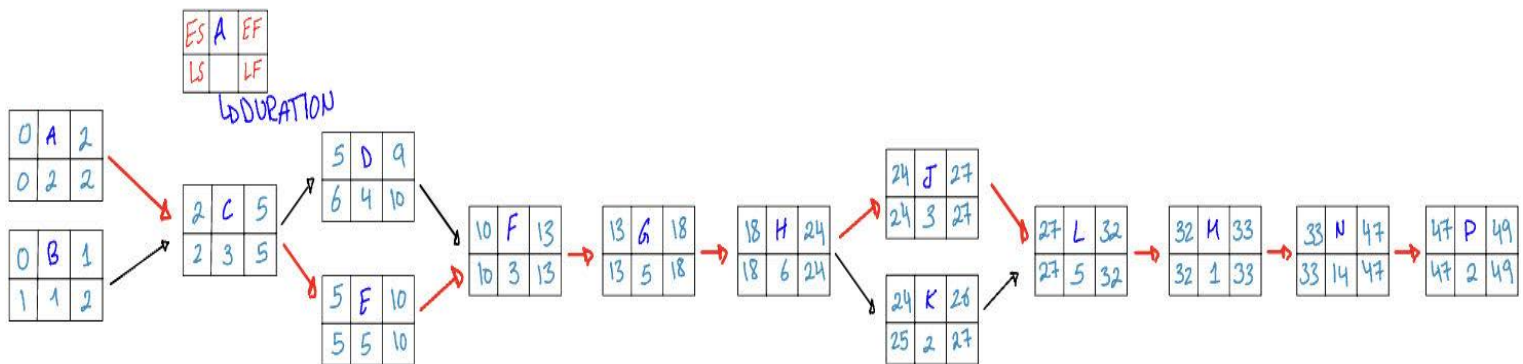
				Design & Back End Software Database Design
<b>IMPLEMENTATION</b>	<b>11 Days</b>	<b>19/11/2022</b>	<b>29/11/2022</b>	<b>DESIGN</b>
G-Skin Condition Recognition Collection	5 Days	19/11/2022	23/11/2022	Design Specification
H-Skin Condition Recognition Configuration	6 Days	24/11/2022	29/11/2022	Skin Condition Recognition Collection
<b>TESTING</b>	<b>10 Days</b>	<b>30/11/2022</b>	<b>9/12/2022</b>	<b>IMPLEMENTATION</b>
J-Perform Software Testing	3 Days	30/11/2022	2/12/2022	Skin Condition Recognition Configuration
K-Document Issues Found	2 Days	3/12/2022	4/12/2022	Perform Software Testing
L-Address Issue Found	5 Days	5/12/2022	9/12/2022	Document Issues Found & Perform Software Testing
<b>MAINTENANCE</b>	<b>17 Days</b>	<b>10/12/2022</b>	<b>27/12/2022</b>	<b>TESTING</b>
M-Software Publication	1 Day	10/12/2022	11/12/2022	Address Issue Found
N-2 Week Support	14 Days	12/12/2022	25/12/2022	Address Issue Found
P-Project Documentation	2 Days	26/12/2022	27/12/2022	Address Issue Found

## 2.2. Team Organization:

Name	Role	Tasks
<b>Sarah AlJurbua</b>	Team Member	<ul style="list-style-type: none"> <li>● Collect requirements</li> <li>● Software design and implementation</li> <li>● Software development and validation</li> <li>● Software analysis and testing</li> <li>● Prototype diagram</li> <li>● Interface layout and UI</li> <li>● Stakeholder check-in</li> </ul>

<b>Nouf AlMuhaya</b>	Team Member	<ul style="list-style-type: none"> <li>• Hardware configuration and implementation</li> <li>• Process documentation</li> <li>• Project work plan</li> <li>• Acquire access to hospital databases</li> <li>• Risk analysis and management</li> <li>• Software evolution and maintenance</li> <li>• Prototype design and testing</li> </ul>
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### 2.3. Critical Path and Task Dependencies:



### 2.4. Technical Environment:

- I. Collect databases from hospitals.
- II. Designated worldwide servers with all saved data to allow the software to access different databases from different hospitals to have a wide range of possible diagnoses.
- III. Easy access app for fast recognition, storing, and retrieving.
- IV. High security against stored data.

## 2.5. Risk Management and Analysis:

Risk	Probability	Effect	Strategy
Software Shutdown	Moderate	High	On-call Software developers to address and solve issues found.
Lack of qualified team to develop the system	Low	High	Hiring people with previous experiences in the field of the system being built.
Lack of funding	Moderate	Moderate	Searching for investors who will fund the program/backup budget when necessary.
Wrong diagnosis	Moderate	High	Always issue out a disclaimer waving all legal and health responsibilities and advise patients to seek in-person appointments if unsure.
Lack of data for skin condition diagnosis	Low	High	Reach out to out of states hospitals for more access to different databases for more possible unknown diagnoses.

## **PHASE 3:** Requirements Elicitation and Documentation

### 3.1.1. Functional Requirements:

- I. Users should be able to diagnose their skin condition via. Pictures.
- II. The system should update its database daily to offer more possible diagnoses for future users/patients.
- III. The app should ask for permission to access a user's camera and get approval to keep their diagnosis in the database.

**3.1.2. Non-functional Requirements:**

- I. Memory usage shouldn't exceed 1M.
- II. Response time and net processing time shouldn't exceed 2S.
- III. Security and maintainability of the database.
- IV. The availability of the system must be above 95%.
- V. User interface must be usable (easy to use).

**Product Requirements:**

- I. The app/system should be available to all users 24/7.
- II. Downtime should not exceed ten seconds.
- III. The system/ app must provide feedback to the user within one second of issuing a command.
- IV. All possible and necessary communication between the system and the user is to be in natural language.

**Organizational Requirements:**

- I. Software engineers/ authorized access personnel shall authenticate themselves using an 8-digit employee number and password.
- II. The system development process and deliverable documents shall conform to the agreed process.

**External Requirements:**

- I. The system shall not disclose any personal information about users/ patients to other app users.
- II. The system shall implement patient privacy provisions.
- III. Without their approval, the system shall not save their personal information and pictures provided for diagnosis into the database.

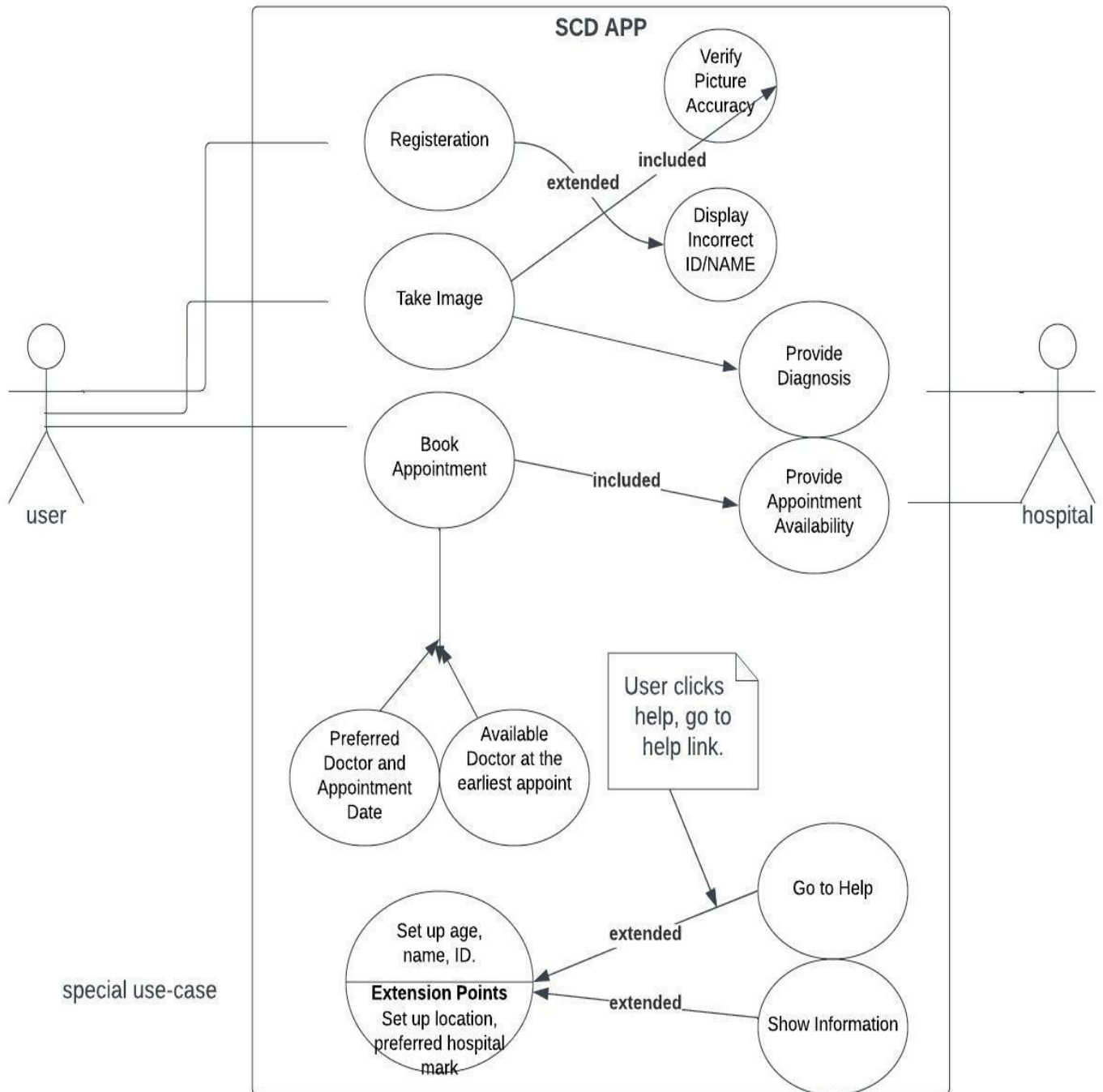
### 3.2. Use Case Scenarios:

#### Use-Case Scenario:

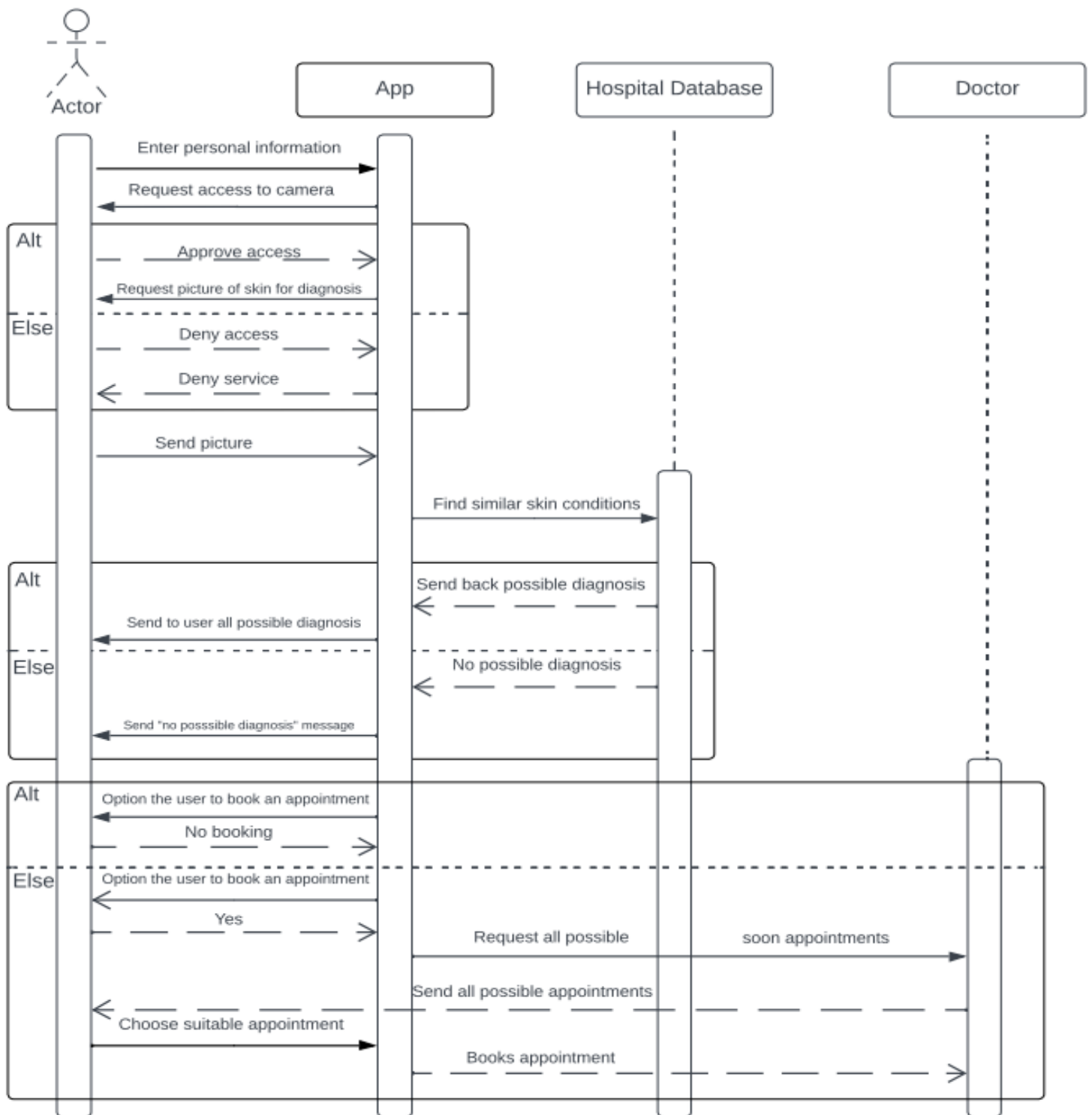
<b>ID:</b>	<b>SCD_PSU_22</b>
<b>Title:</b>	<b>Skin Conditions Diagnostic</b>
<b>Primary Actor:</b>	User
<b>Preconditions:</b>	System with built-in database (pictures) equipped to receive images and input from user.
<b>Postconditions:</b>	Image and input sent by user is analyzed by system and compared to images API
<b>Main Success Scenario:</b>	User observes flare-up of skin condition, then proceeds to open SCD software to register general personal information, Then user accepts software permission to access camera. Then uploads image to software. Then (after successfully identifying the image) software reveals diagnosis that includes 1. Name of condition 2. Urgency of condition. Then software enables user to choose if an appointment with a doctor is needed. If so, it is successfully booked and confirmed at the hospital and doctor of user choice depending on options provided by software. If not, software exists and saves.
<b>(alt) Extensions:</b>	<p><b>Alt flow 1A : User entering name with special characters.</b></p> <p>1A1 : Software will return error with reason (no special character in name)</p> <p>1A2 : User will enter name without using special characters.</p> <p><b>Alt flow 1B : User entering age under 12 or above 100.</b></p> <p>1B1 : Software will return error with reason (seek guardian).</p> <p>1B2 : User will enter age within limit.</p> <p><b>Alt Flow 1C : User entering incomprehensive image to software.</b></p> <p>1C1 : Software will return error (take picture again within parameters, please assure brightness)</p> <p>1C2 : User retakes image.</p> <p><b>Alt Flow 1D : Unavailable appointment at desired date.</b></p> <p>1D1 : Software will return error (with option to be notified at the earliest availability is the required time).</p> <p>1D2 : User approves or declines.</p>
<b>Status:</b>	In development
<b>Owner:</b>	Nouf Almuhaya – Sara Aljarbua
<b>Priority:</b>	Medium



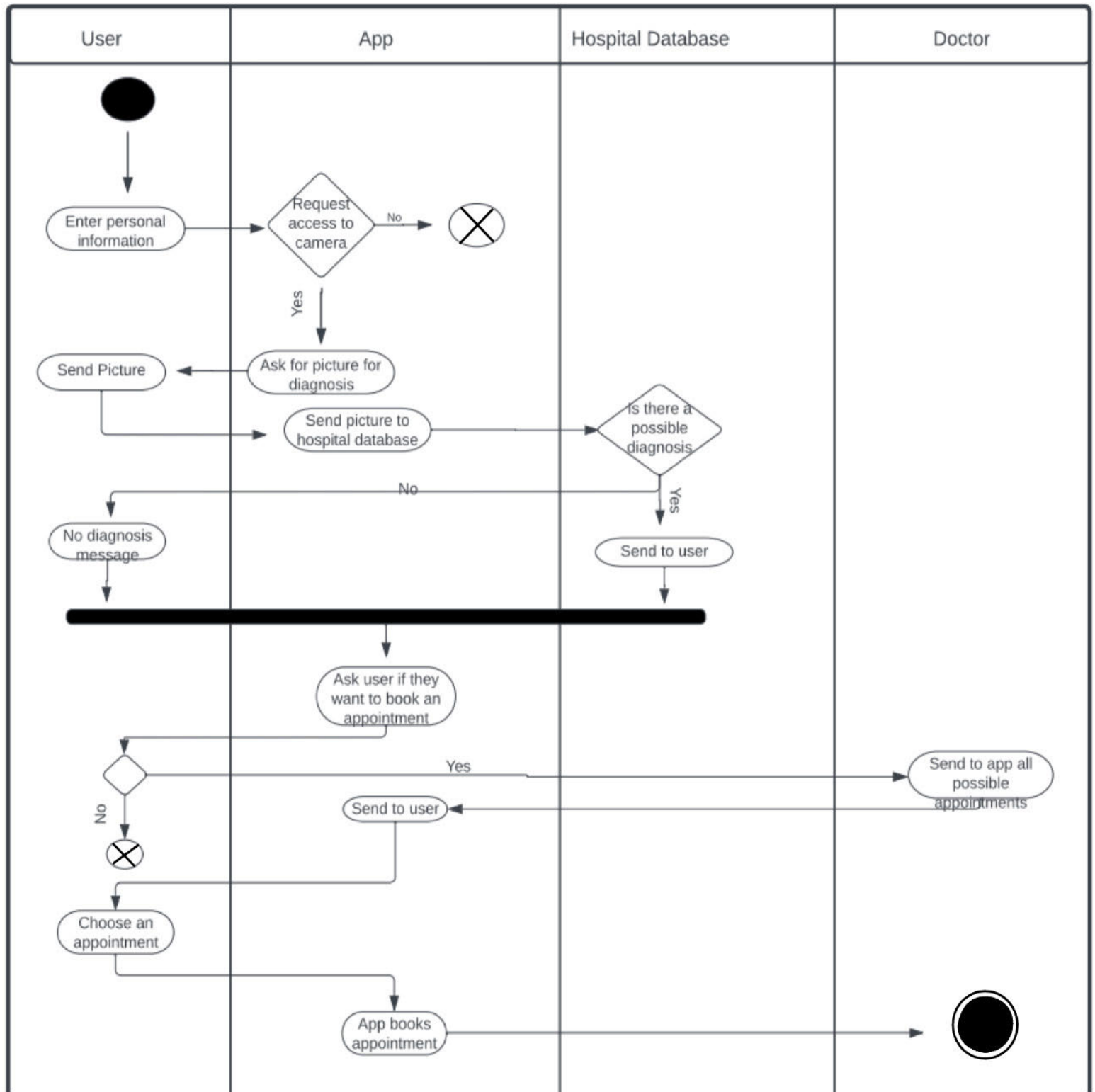
### 3.3. Use Case Diagram:



### 3.5. System Sequence Diagram:



### 3.6. Activity Diagram:



## **PHASE 4:** Software Design

### **4.1. Fundamental Concepts:**

1. Data Source: It consists of a data-dependent system where information is received and processed through the skin condition diagnostic camera. Hospital databases and previous assessments are used as data sources.
2. Aspect: The software adapts to appointment availability changes made by the hospital.
3. Refinement: The software uses hardware and case-scenario.

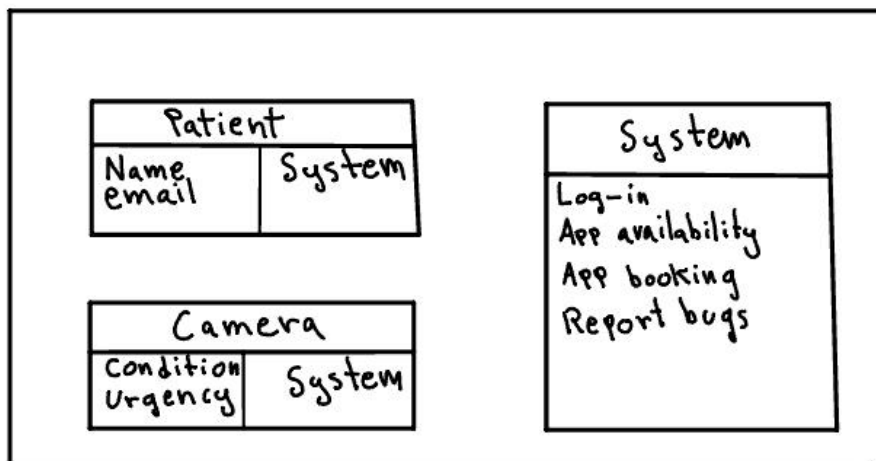
### **4.2. Architecture Genre:**

The genre of the software is an iOS application with access to the camera. The sub-genre is an appointment booking system configured to the hospital's pre-existing appointments calendar.

### **4.3. Architecture Style:**

Using the Data Centered/Repository architecture. It is considered a central/main and primary system ( hospital diagnosis database and appointment calendar ) with numerous users ( patients ). The architecture style is ideal because it provides us with stabilization of the software while keeping it centered.

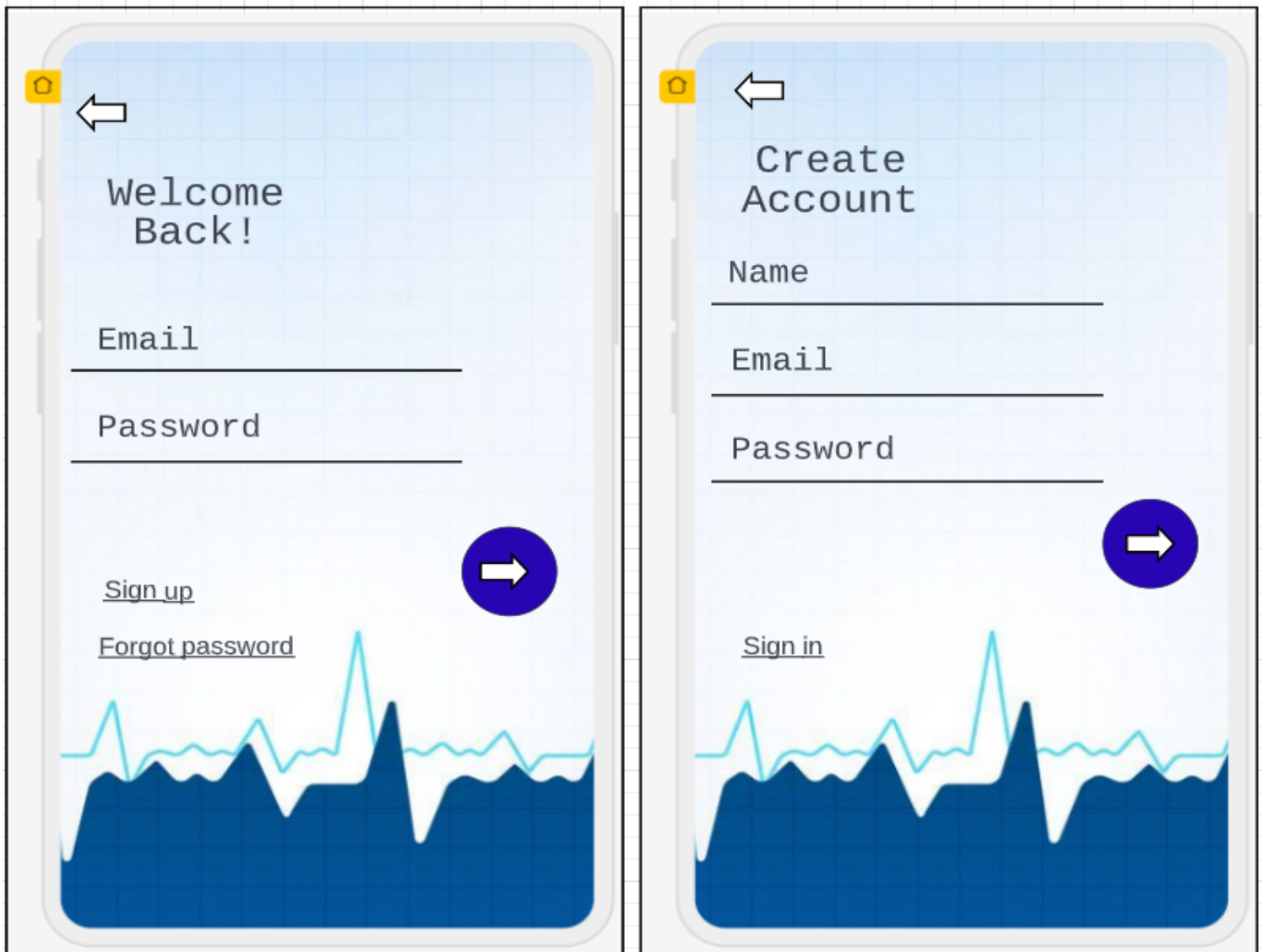
### **4.4. CRC Class Diagram:**



## **PHASE 5:** Prototype ( UI )

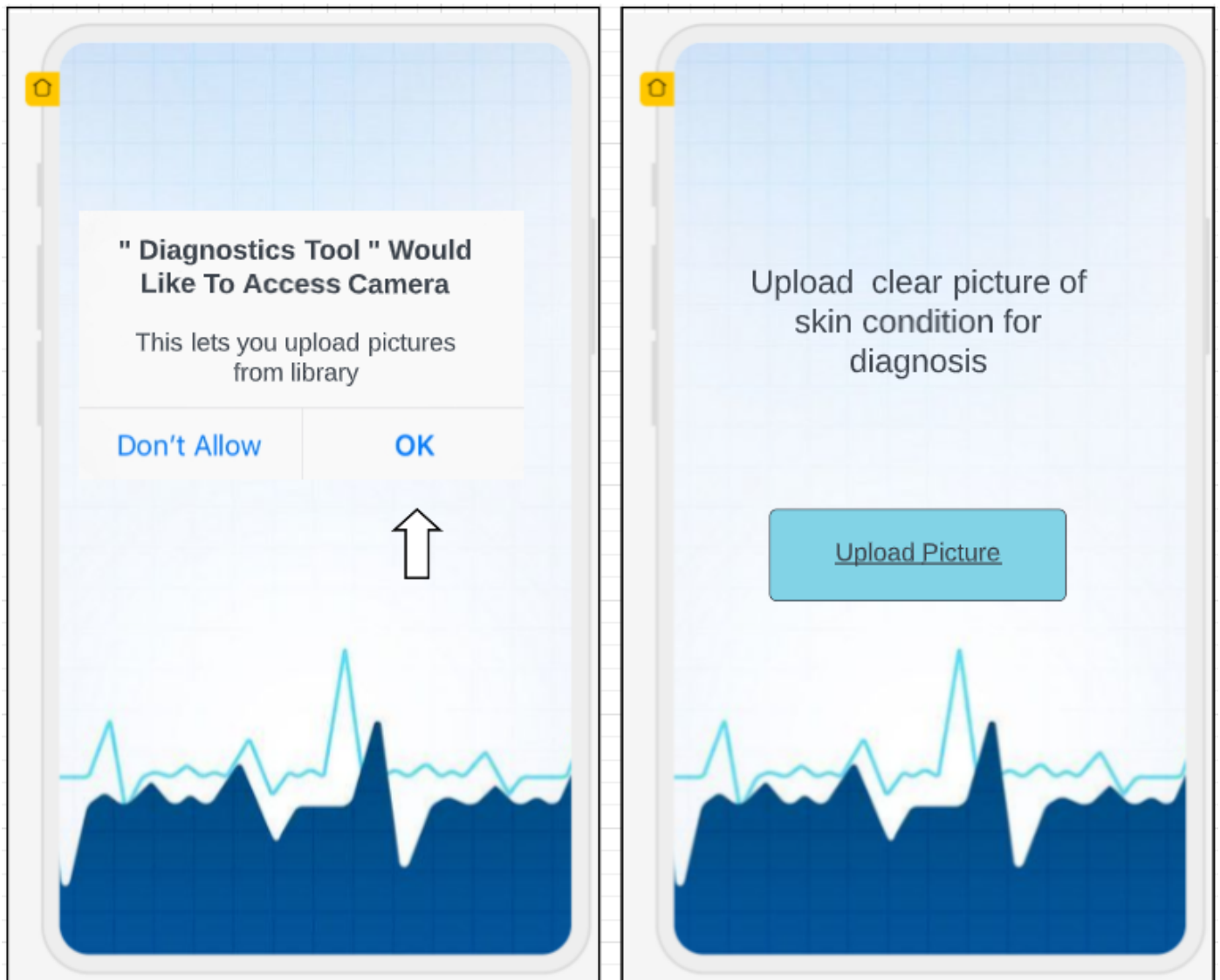
### **5.1. User Interface:**

#### **5.1.1. Main Screen:**



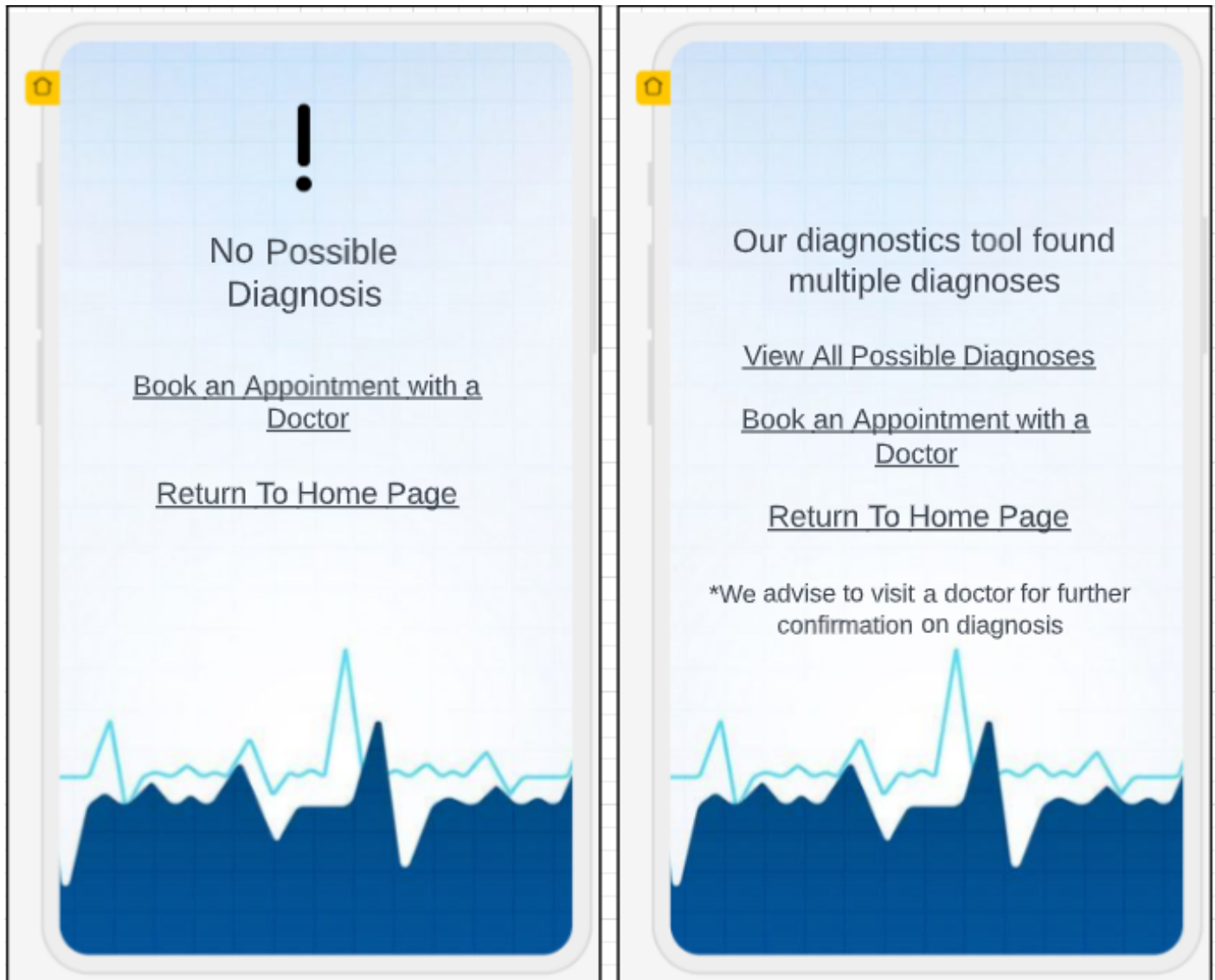
The above display is the first screen that appears to the user, two options would appear depending on the user's choice to either log in with a previous account or sign up with a new account.

### 5.1.2. Access page:



After logging in/ signing up, the user will be asked for access to the camera/ camera roll. This allows the app to look at the picture of the skin condition and give out possible diagnoses. If the user denies access to the camera/ camera roll, the user will be automatically rerouted to the main page (log-in/sign-up page ).

### 5.1.3. Diagnosis Page:



After the user has uploaded the picture of said skin condition, the app compares it to all possible and available skin conditions stored in the app's database as well as comparing it to possible diagnoses from the hospital database that the app has access to. If the app can't find a possible diagnosis, an error "no possible diagnosis" message would appear, opting the user to either book an appointment with a doctor through the app or return to the main page. If multiple possible diagnoses are found, the user can either view them all, book an appointment with a doctor through the app or return to the main page.