

# CSE611 - Health 360

Innovative Healthcare Data Collection and Prediction Platform

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# 1. Introduction and Motivation

This project introduces a revolutionary platform tailored for medical professionals, researchers, and practitioners with a global reach. The primary goal is to seamlessly collect and analyze data for clinical trials, focusing on predicting whether patients have a specific disease.

## 1.1 Project Overview

Health 360 is an established mobile application that has been augmented with a cutting-edge service known as Clinical Trials. This addition is facilitated through a dedicated website called the 'Doctor Portal.' The Doctor Portal serves as a pivotal component of Health 360, acting as a centralized hub for the creation, management, and analysis of clinical trials.

## 1.2 Clinical Trials Service

The core objective of the Clinical Trials service is to facilitate the seamless collection and analysis of data for clinical trials and to pass instructions and tasks to patients. This service is embedded within the existing Health 360 mobile application, leveraging its user base and functionality.

## 1.3 The Doctor Portal

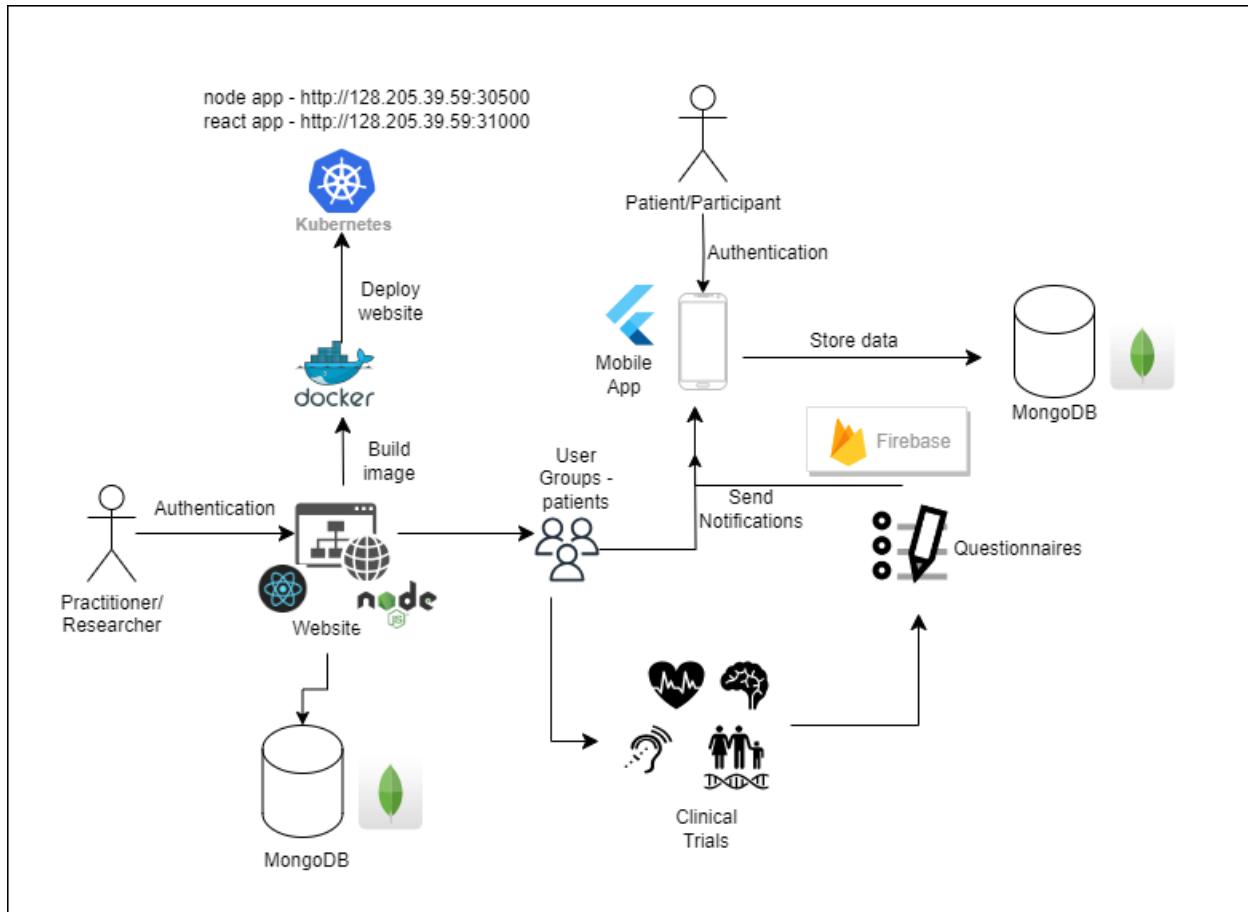
At the heart of the Clinical Trials service is the Doctor Portal—an innovative website meticulously crafted to empower doctors and researchers in designing and managing clinical trials. Within the Doctor Portal, Doctors and Researchers can effortlessly create trials, establish user groups, send targeted questionnaires, and analyze the collected data.

## 1.4 Seamless User Interaction

One distinctive feature of the Doctor Portal is its ability to seamlessly interact with Health 360 mobile application users. The portal notifies app users, directing them to the app interface where they can promptly enroll or reject participation in a clinical trial. This integration ensures that users remain informed and engaged, reducing the likelihood of missed questionnaires or opportunities for participation.

## 2. Technical Details

### 2.1 Design Architectures



### 2.2 Technology Stack

#### 1. Frontend:

Flutter 3.3.9: (<https://flutter.dev/>)

Flutter is an open-source mobile application development framework created by Google. It allows developers to build high-performance, beautiful, and natively compiled applications for mobile, web, and desktop platforms from a single codebase. Flutter has gained popularity among developers for its ease of use,

flexibility, and ability to produce high-quality mobile apps for multiple platforms with a single codebase. Dart programming language: Flutter uses the Dart programming language, also developed by Google, and provides a rich set of pre-built widgets that enable developers to build user interfaces quickly and easily. The framework enables fast development cycles, quick iteration, and high-quality results. Android Studio: Android Studio is an Integrated Development Environment (IDE) designed specifically for developing Android applications. It was developed by Google and is the official IDE for Android app development.

Pub:

Pub is a package manager for Dart and Flutter that is used to manage and share packages (i.e., libraries or dependencies) in Dart projects. Environment:  
minSdkVersion 21 targetSdkVersion 30 ext.kotlin\_version = '1.5.10'  
dependencies { classpath 'com.android.tools.build:gradle:4.1.0' classpath  
"org.jetbrains.kotlin:kotlin-gradle-plugin:\$kotlin\_version" }

React:

The frontend development of our application is primarily powered by React.js, a powerful and declarative JavaScript library. Leveraging React allows us to create modular and reusable components, facilitating a structured and maintainable codebase. The integration of React Hooks provides an efficient way to manage state within functional components, enabling dynamic and interactive user interfaces. For seamless navigation and routing within the application, we utilize React Router. In terms of styling, we employ a combination of CSS for basic styles and may use Styled Components or SCSS for advanced styling and component-level theming. Data fetching is accomplished using either the Fetch API or Axios, allowing us to make HTTP requests to backend services. Additionally, the form management aspect is handled by libraries such as Vite.js. The application's user interface may benefit from the Vite, Material-UI or Bootstrap libraries for pre-designed and customizable UI components. To ensure the application's robustness, we implement testing using Jest for unit testing and React Testing Library for testing React components. For efficient linting, we rely on ESLint, and version control is managed through Git, with repositories hosted on platforms like GitHub. The project is developed and built using Create React App, and dependencies are managed through npm.

## **2. Backend:**

Currently, this application's backend and data model is implemented using NodeJS and is hosted on the kubernetes cluster.

Framework:

We have used the Express framework which is a popular framework for building Node.js applications. Express is lightweight, flexible, and has a large community of developers.

Database:

We have used MongoDB, a NoSQL database for storing the data of the mobile and web application. MongoDB is a scalable, flexible, and document-oriented database that is well-suited for mobile applications. We have also used Firebase, provided by Google. Using FCM, you can notify a client app that new email or other data is available to sync. You can send notification messages to drive user re-engagement and retention. For use cases such as instant messaging, a message can transfer a payload of up to 4000 bytes to a client app.

## **3. Connectivity for Backend and Frontend:**

Flutter has built-in HTTP client packages such as http and dio that can be used to send HTTP requests to the backend. These packages can be used to send GET, POST, PUT, DELETE, and other types of HTTP requests.

## **4. Deployment**

The deployment strategy for our website and Node.js application is orchestrated through Docker and Kubernetes, providing a scalable and efficient infrastructure. Docker containers encapsulate our application, its dependencies, and runtime environments, ensuring consistency across various development and deployment stages. This containerization allows for seamless deployment across different environments, mitigating potential issues related to dependencies and configurations.

Kubernetes, an open-source container orchestration platform, takes our containerized applications to the next level. It automates deployment, scaling, and management, offering a robust solution for container orchestration. Our Kubernetes deployment is structured into pods, which are logical groupings of containers, ensuring optimal resource utilization. The deployment configuration

includes specifications for services, ensuring consistent networking and load balancing.

Through Kubernetes, we achieve horizontal scaling by dynamically adjusting the number of running containers based on demand. This ensures optimal performance during periods of increased user traffic while minimizing resource wastage during periods of lower demand. Additionally, Kubernetes facilitates rolling updates, allowing us to deploy new versions of the application seamlessly without downtime.

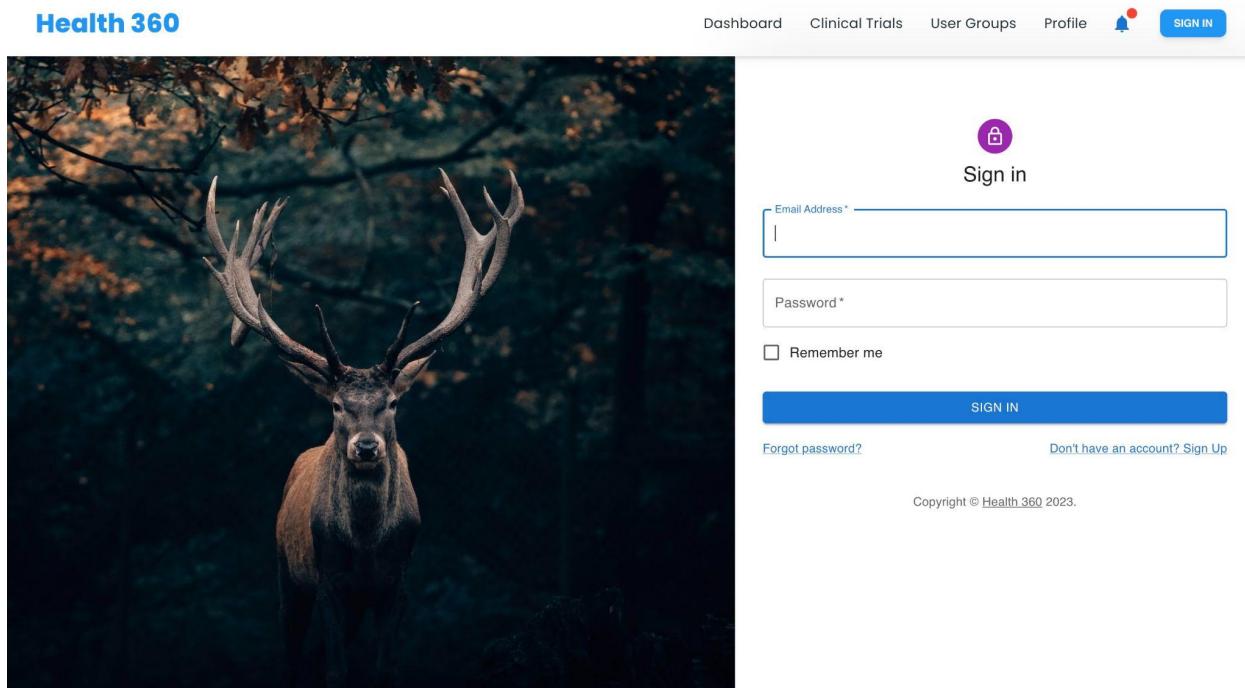
The deployment pipeline involves the continuous integration and continuous deployment (CI/CD) process using Github Actions, where changes to the code trigger automated builds, tests, and, upon successful validation, the deployment of the updated application to the Kubernetes cluster. This streamlined process enhances development velocity and ensures the reliability of each deployment.

Our choice of Docker and Kubernetes as deployment tools reflects a commitment to modern, scalable, and efficient infrastructure practices. This deployment strategy not only enhances the reliability and availability of our website and Node.js application but also provides a foundation for future growth and seamless integration with evolving technologies.

### 3. Feature Details

#### 3.1 Sign in Page for Doctor Portal

This is the Starting UI page for the Doctor Portal through which we can authenticate into the Doctor Portal using legit Credentials..



## 3.2 User Dashboard

This is the main Dashboard in which we can see the Statistics of Clinical Trials, Questionnaires User Groups and Notifications created so far. We can Navigate to DashBoard, Clinical trials and Global User Groups either through the side bar or the Top navigation Bar. Logout Is used to logout from the Doctor Portal. Clinical Trials Card help to navigate to the Clinical trials Page, Global User Groups Card help to navigate to the Global User Groups Page and Notifications card help to navigate to the Notifications Page.

The screenshot shows the Health 360 User Dashboard. At the top, there is a navigation bar with links for Dashboard, Clinical Trials, User Groups, Profile, a notification icon, and a LOG OUT button. On the left, a sidebar lists Dashboard, Clinical Trials, and Global User Groups. The main area contains several cards:

- Clinical Trials**: Shows 40 Clinical Trials. Description: These are the total number of Clinical trials created. Manage button.
- Questionnaire**: Shows 27 Questionnaire. Description: These are the total number of Questionnaire created. Manage button.
- User groups**: Shows 100 User groups. Description: These are the total number of User groups created. Manage button.
- Notification**: Shows 150 Notification. Description: These are the total number of Notification created. Manage button.
- Clinical Trials**: A card with an icon of three people and a chart, describing it as a place to manage clinical trials. Manage button.
- Global User Groups**: A card with an icon of three people, describing it as a place to manage user groups. Manage button.
- Notifications**: A card with an icon of a person interacting with a smartphone, describing it as a place to manage notifications. Manage button.

### 3.3 Clinical trials Home Page

The Clinical trial Page shows all the Clinical trials created by the Doctor. We can also create New Clinical trials. We can see more Details about the Clinical trial by clicking on the See Details Button and We can also Delete the Clinical trial by Clicking on the Trash bin Icon.

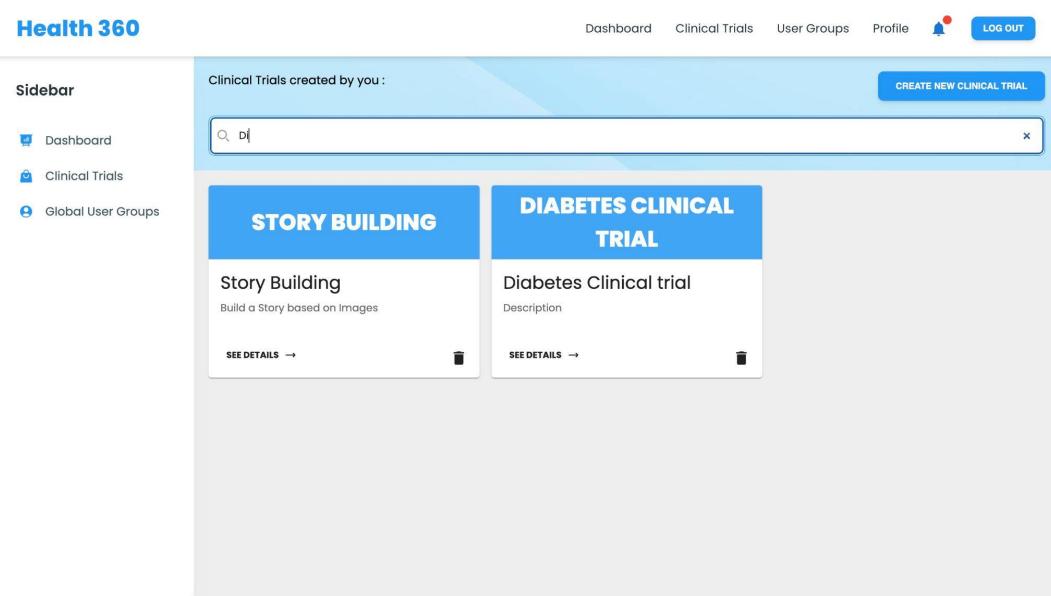
The screenshot shows the 'Health 360' clinical trials home page. On the left is a sidebar with links to Dashboard, Clinical Trials, and Global User Groups. The main area displays 'Clinical Trials created by you:' with a search bar. Five clinical trials are listed in a grid:

- NOTIFICATION CLINICAL**: Notification Clinical, Notification Clinical Description. Buttons: SEE DETAILS →, TRASH
- SENTENCE RECALL**: Sentence Recall, Sentence Recall Clinical Trial by Redmond. Buttons: SEE DETAILS →, TRASH
- STORY BUILDING**: Story Building, Build a Story based on Images. Buttons: SEE DETAILS →, TRASH
- COVID CLINICALTRIAL**: Covid clinicaltrial description. Buttons: SEE DETAILS →, TRASH
- DIABETES CLINICAL TRIAL**: Diabetes Clinical trial Description. Buttons: SEE DETAILS →, TRASH

A 'CREATE NEW CLINICAL TRIAL' button is located in the top right corner of the main area.

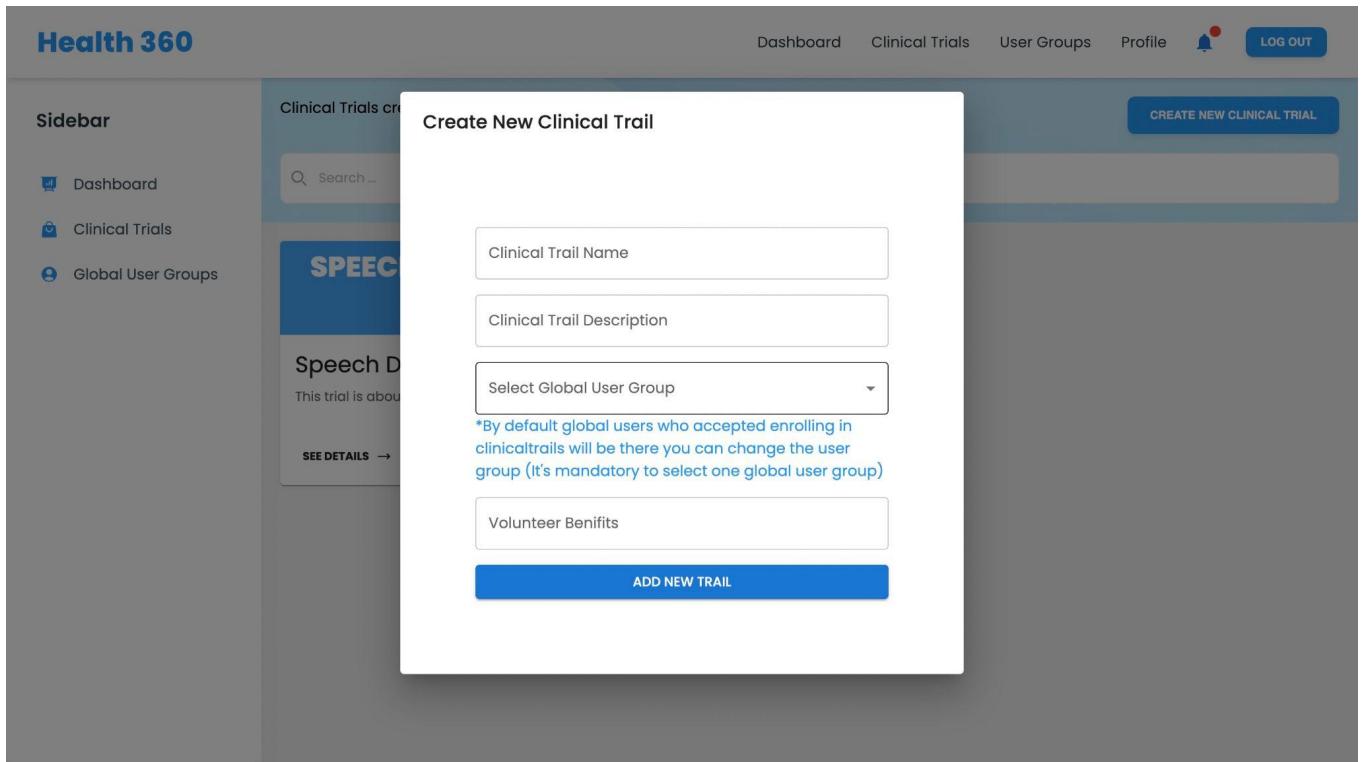
### 3.4 Clinical Trial Search Implementation

We have implemented the Search Functionality to locate the trials with ease.



### 3.5 Clinical Trial Creation

We can create new clinical trial by giving the name of Clinical trial, Description of teh CLinical trial and select the Global User Group for sending the Notification to the members in the Group selected and Volunteer Benefits. Filling all Details and Clicking Add New trial Button will creates a New Clinical trial and New Clinical trial will be added to the Clinical trials Page and in the App. User gets a notification stating that a new clinical trial is created.



## 3.6 Clinical Trial Details

On Clicking a specific clinical Trial, You will directed to page which shows number of Questionnaires and Number of local sub groups created within the clinical trial so far. On Clicking on See all Questionnaires we can see the Questionnaires page and Clicking on User groups we can see the Local User Groups created in the clinical trial.



## Story Building

- Story Building Trial
- Questionnaire
- Trial User Groups
- Trial Members

## Story Building

Build a Story based on Images

**4**  
Total Number of Questionnaires

**4**  
Total Number of Sub groups

[SEE ALL QUESTIONERS](#)[SEE ALL USER GROUPS IN THIS CLINICAL TRAIL](#)

## 3.7 Questionnaire in Clinical Trial

Now Questionnaires can be created in the clinicaltrials. In this page you can see all questionnaires that were created so far in clinical trial and can create a new Questionnaire by clicking on 'create new questionnaire' button

The screenshot shows the 'Health 360' platform interface. At the top, there is a navigation bar with links for Dashboard, Clinical Trials, User Groups, Profile, and Log Out. A notification bell icon with a red dot is also present. On the left, a sidebar titled 'Story Building' contains links for Story Building Trial, Questionnaire, Trial User Groups, and Trial Members. The main content area displays a list of four questionnaires under the heading 'Questionnaire of this Clinical Trial created by you':

- Giraffe Elephant Ball**  
Build a story based on your understanding  
5 Questions  
[SEE RESPONSES →](#)
- Rabbit Dog Sand**  
Based on Your Understanding, Build a story  
5 Questions  
[SEE RESPONSES →](#)
- Giraffe Elephant Ball Story Telling**  
Record an audio about the Image  
5 Questions  
[SEE RESPONSES →](#)
- Giraffe Elephant Ball Questionnaire**  
Questionnaire about the creativity  
5 Questions  
[SEE RESPONSES →](#)

A search bar is located at the top of the main content area, and a 'NEW QUESTIONNAIRE' button is visible in the top right corner.

## 3.8 Create New Questionnaire in the Clinical Trial

You need to give the name of the questionnaire , description of the questionnaire and select one local sub group which was created within the clinical trial. After creation of the questionnaire all the users in that subgroup will be notified about the clinical trial creation.

The screenshot shows the 'Health 360' application interface. On the left, there is a sidebar titled 'Story Building' with four items: 'Story Building Trial', 'Questionnaire', 'Trial User Groups', and 'Trial Members'. The main area is titled 'Story Building Clinical Trial New Questionnaire creation'. It contains three input fields: 'Select User Group' (a dropdown menu), 'Questionnaire Name:' (a text input field), and 'Questionnaire Description:' (a text input field). Below these is a blue 'ADD QUESTION' button. At the bottom, there is a section for 'Question 1' with a text input field, a 'Question Type:' dropdown menu, and a small 'ADD OPTION' button. The top right of the screen has a navigation bar with 'Dashboard', 'Clinical Trials', 'User Groups', 'Profile', a notification icon with a red dot, and a 'LOG OUT' button.

## 3.9 Choosing to which group the Questionnaire will be sent

Here is where we will select the local user group from questionnaire

## Story Building

-  Story Building Trial
-  Questionnaire
-  Trial User Groups
-  Trial Members

Story Building Clinical Trial New Questionnaire creation

Select User Group:

- Story Building Subscribed
- Story Building Non-Subscribed
- Story Building Not Responded
- test

Questionnaire Description:

Question 1:

Question Type:

### 3.10 Multi Option Type Questionnaire

You can also send multi choice questions and can add options using add options button

## Story Building

-  Story Building Trial
-  Questionnaire
-  Trial User Groups
-  Trial Members

Question 2:

Question Type:



Option 1:

Option 2:

Option 3:

Option 4:

## 3.11 Media Type Questionnaire

Doctor can also add Media to question as shown in the picture below by clicking on add media

The screenshot shows the 'Story Building' section of the Health 360 interface. On the left, there's a sidebar with options: 'Story Building Trial', 'Questionnaire', 'Trial User Groups', and 'Trial Members'. The main area is titled 'Question 1:' and contains a text input field with 'Question 1 text'. Below the text field is a placeholder image featuring three people and medical icons. To the right of the image are two small icons: a camera and a red X. Underneath the image is a dropdown menu labeled 'Question Type:' with 'Media' selected. At the bottom right of the form is a blue 'SUBMIT' button.

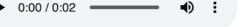
## 3.12 Responses Page

Doctor can see responses of questionnaire by clicking on 'See responses' button

**Clinical Trail's Questionnaire 1 Responses:**

This is the response of users

[DOWNLOAD RESPONSE](#)

User	what you found funny in this picture	Draw and Upload the picture of your drawing	What animals are in this Picture	What are they doing here ???	What is your favourite Cartoon Show in your Childhood?
viswanath	Cartoon Ambiance made me laugh		Rabbit,Rat	0:00 / 0:11 	Tom and Jerry
viswanath	vb		Rat,Elephant	0:00 / 0:02 	text

### 3.13 In Detail Response View

Doctor can expand the row and can see user responses in detail as shown in the picture

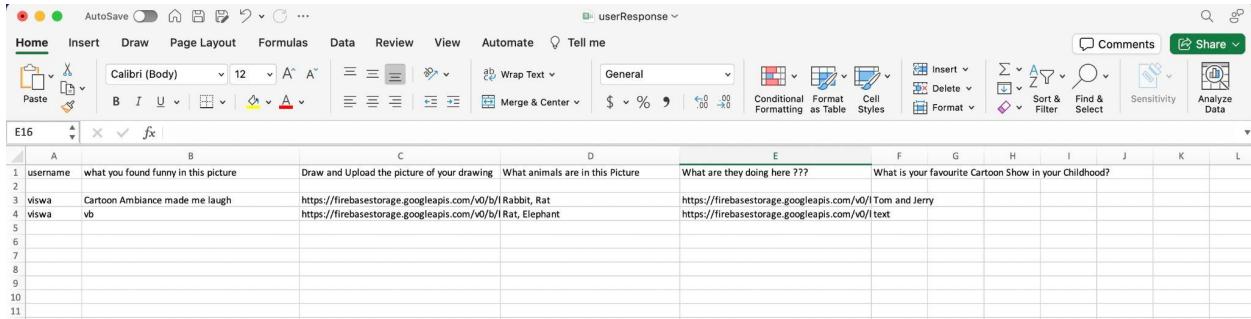
Health 360

Dashboard Clinical Trials User Groups Profile  LOG OUT

viswanath	Cartoon Ambiance made me laugh		Rabbit,Rat	0:00 / 0:11 	Tom and Jerry
what you found funny in this picture		Cartoon Ambiance made me laugh			
Draw and Upload the picture of your drawing					
What animals are in this Picture		Rabbit,Rat			
What are they doing here ???		0:00 / 0:11 			
What is your favourite Cartoon Show in your Childhood?		Tom and Jerry			

## 3.14 Response Download in Excel Format

Doctor can download the responses in excel file by clicking on ‘Download response’ button

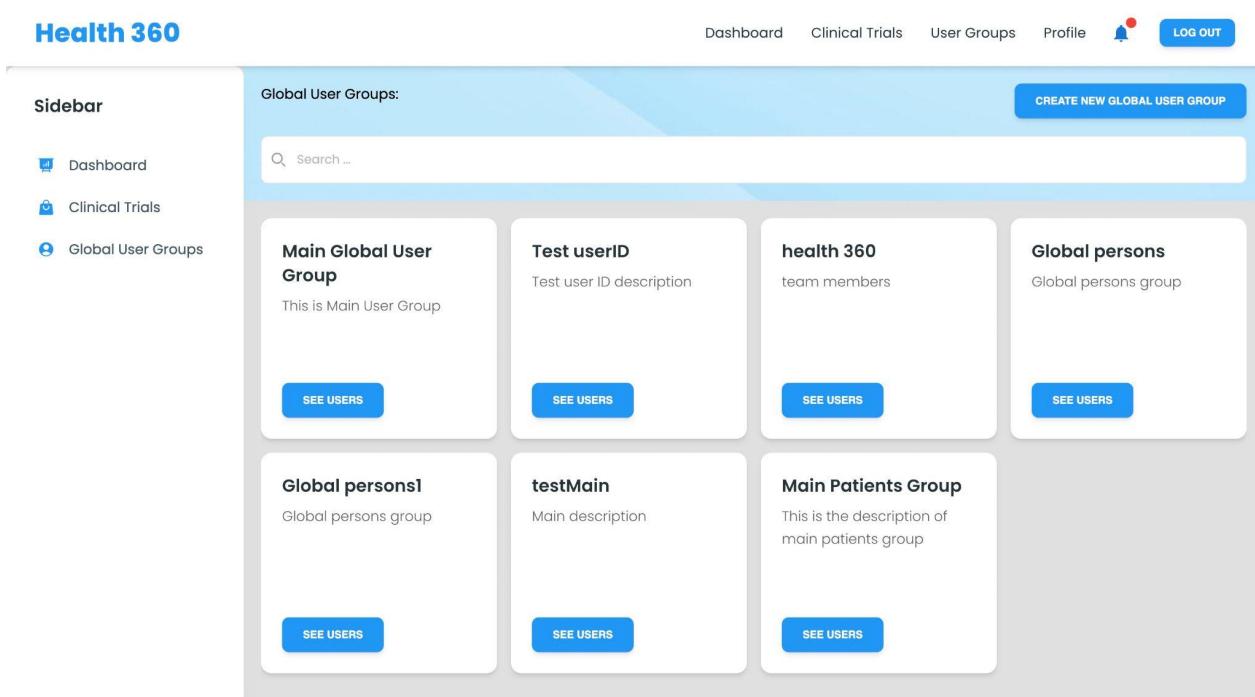


A screenshot of a Microsoft Excel spreadsheet titled "userResponse". The table has columns A through L. Column A contains user IDs (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11). Column B contains responses to "what you found funny in this picture". Column C contains responses to "Draw and Upload the picture of your drawing". Column D contains responses to "What animals are in this Picture". Column E contains responses to "What are they doing here ???". Column F contains responses to "What is your favourite Cartoon Show in your Childhood?". Row 3 shows examples of responses, such as "Cartoon Ambiance made me laugh" and URLs for drawings and animals. Row 4 shows another set of responses, including URLs for Tom and Jerry and Rat, Elephant.

E16	A	B	C	D	E	F	G	H	I	J	K	L
1	username	what you found funny in this picture	Draw and Upload the picture of your drawing	What animals are in this Picture	What are they doing here ???	What is your favourite Cartoon Show in your Childhood?						
2												
3	viswa	Cartoon Ambiance made me laugh			https://firebasestorage.googleapis.com/v0/b/lRabbit, Rat							
4	viswa	vb			https://firebasestorage.googleapis.com/v0/b/lRat, Elephant							
5					https://firebasestorage.googleapis.com/v0/l/Tom and Jerry							
6					https://firebasestorage.googleapis.com/v0/l/text							
7												
8												
9												
10												
11												

## 3.15 Global User Groups

This is the homepage of Global user group , where Doctors can create user groups which are global and can be given as input to new clinical trial creation. Here “Main Global User Group” will have all users of app whenever a new user signups the user will automatically present in this group.



The screenshot shows the "Health 360" application interface. At the top, there is a navigation bar with links for Dashboard, Clinical Trials, User Groups, Profile, a notification bell icon, and a LOG OUT button. On the left, a sidebar lists Dashboard, Clinical Trials, and Global User Groups. The main content area is titled "Global User Groups:" and features a search bar. Below the search bar is a blue button labeled "CREATE NEW GLOBAL USER GROUP". The page displays a grid of six user group cards:

- Main Global User Group**: Description: This is Main User Group. Button: SEE USERS.
- Test userID**: Description: Test user ID description. Button: SEE USERS.
- health 360**: Description: team members. Button: SEE USERS.
- Global persons**: Description: Global persons group. Button: SEE USERS.
- Global persons1**: Description: Global persons group. Button: SEE USERS.
- testMain**: Description: Main description. Button: SEE USERS.
- Main Patients Group**: Description: This is the description of main patients group. Button: SEE USERS.

## 3.16 Main Global User Group

Here the Doctor can see all the users present in the Global user group and Doctor can also send notifications to complete user group or individual user using 'Send Notification' button

Main Global User Group

This Global sub group that you are creating can be accessed from every clinical trial

**Members list**

See information about all members

FILTERS  EXPORT

username	firstname	lastname	typeof...	age	region	gender	height	weight	disease
s@gmail.com	shalmalee	shen-oli-kar	PATIENT						
testl@gmail...	test	1	PATIENT						
hari	Hariharan	Seelam	PATIENT						
viswa	viswanath	matukumalli	PATIENT	23	buffalo	male	165	67	Diabetes
Hariharan	Hariharan	Seelam	PATIENT	23	Dallas	male	172	143	asthma

Rows per page: 100 ▾ 1-5 of 5 < >

CLOSE

## 3.17 Creation of new Global Group

Doctor can also create a new Global user group by clicking on 'Create New Global User Group' button

**Create Global Sub Group**

This Global sub group that you are creating can be accessed from every clinical trial

**CREATE**

Subgroup Name *																																																																																										
Subgroup Description *																																																																																										
<b>FILTERS</b> <b>EXPORT</b> <table border="1"> <thead> <tr> <th>username</th> <th>firstname</th> <th>lastname</th> <th>typeofuser</th> <th>age</th> <th>region</th> <th>gender</th> <th>height</th> <th>weight</th> <th>disease</th> </tr> </thead> <tbody> <tr><td>testuser</td><td>test</td><td>tester</td><td>PATIENT</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>testuser1</td><td>testuser</td><td>tester</td><td>PATIENT</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>testuser2</td><td>testuser</td><td>tester</td><td>PATIENT</td><td>23</td><td>Buffalo</td><td>Male</td><td>165</td><td>75</td><td>Diabetes</td></tr> <tr><td>test@email.c...</td><td>test first name</td><td>test last name</td><td>PATIENT</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>dfd</td><td>sjfhs</td><td>dfdfddd</td><td>PATIENT</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>saikiran</td><td>sai</td><td>kiran</td><td>PATIENT</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>viswa</td><td>viswanath</td><td>matukumalli</td><td>PATIENT</td><td>23</td><td>buffalo</td><td>male</td><td>165</td><td>67</td><td>Diabetes</td></tr> <tr><td>Hariharan</td><td>Hariharan</td><td>Seelam</td><td>PATIENT</td><td>23</td><td>Dallas</td><td>male</td><td>172</td><td>143</td><td>asthma</td></tr> </tbody> </table>	username	firstname	lastname	typeofuser	age	region	gender	height	weight	disease	testuser	test	tester	PATIENT							testuser1	testuser	tester	PATIENT							testuser2	testuser	tester	PATIENT	23	Buffalo	Male	165	75	Diabetes	test@email.c...	test first name	test last name	PATIENT							dfd	sjfhs	dfdfddd	PATIENT							saikiran	sai	kiran	PATIENT							viswa	viswanath	matukumalli	PATIENT	23	buffalo	male	165	67	Diabetes	Hariharan	Hariharan	Seelam	PATIENT	23	Dallas	male	172	143	asthma
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### 3.18 Filtering users while creating Global Group

He can filter out patients based on requirement that he has and give name and description of group and create a new global user group

**Create Global Sub Group**

This Global sub group that you are creating can be accessed from every clinical trial

**CREATE**

Subgroup Name *																																																																						
Subgroup Description *																																																																						
<b>FILTERS</b> <b>EXPORT</b> <table border="1"> <thead> <tr> <th>username</th> <th>firstname</th> <th>lastname</th> <th>typeofuser</th> <th>age</th> <th>region</th> <th>gender</th> <th>height</th> <th>weight</th> <th>disease</th> </tr> </thead> <tbody> <tr> <td>testuser2</td> <td>testuser</td> <td>tester</td> <td>PATIENT</td> <td>23</td> <td>Buffalo</td> <td>Male</td> <td>165</td> <td>75</td> <td>Diabetes</td> </tr> <tr> <td>test@email.c...</td> <td>test first name</td> <td>test last name</td> <td>PATIENT</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>dfd</td> <td>sjfhs</td> <td>dfdfddd</td> <td>PATIENT</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>saikiran</td> <td>sai</td> <td>kiran</td> <td>PATIENT</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>viswa</td> <td>viswanath</td> <td>matukumalli</td> <td>PATIENT</td> <td>23</td> <td>buffalo</td> <td>male</td> <td>165</td> <td>67</td> <td>Diabetes</td> </tr> <tr> <td>Hariharan</td> <td>Hariharan</td> <td>Seelam</td> <td>PATIENT</td> <td>23</td> <td>Dallas</td> <td>male</td> <td>172</td> <td>143</td> <td>asthma</td> </tr> </tbody> </table>	username	firstname	lastname	typeofuser	age	region	gender	height	weight	disease	testuser2	testuser	tester	PATIENT	23	Buffalo	Male	165	75	Diabetes	test@email.c...	test first name	test last name	PATIENT							dfd	sjfhs	dfdfddd	PATIENT							saikiran	sai	kiran	PATIENT							viswa	viswanath	matukumalli	PATIENT	23	buffalo	male	165	67	Diabetes	Hariharan	Hariharan	Seelam	PATIENT	23	Dallas	male	172	143	asthma
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## 3.19 Local groups

Like Global user groups there are Local user groups which are present within Clinical trials , these local user groups can be created in Trial User groups page of Clinical trials. Local User Groups are restricted within the specific Clinical Trial.

The screenshot shows the 'Usergroups you created will be accessed only by this Clinical Trial' section. It includes a search bar and three categories: 'Speech Deficiency Trial Subscribed', 'Speech Deficiency Trial Non-...', and 'Speech Deficiency Trial Not Responded'. Each category has a 'SEE USERS' button.

Health 360

Speech Deficiency Trial

Speech Deficiency Trial Trial

Questionnaire

Trial User Groups

Trial Members

Usergroups you created will be accessed only by this Clinical Trial :

CREATE NEW USER GROUP

Search ...

Speech Deficiency Trial Subscribed

The place is close to Barceloneta Beach and bus stop just 2 min by...

SEE USERS

Speech Deficiency Trial Non-...

The place is close to Barceloneta Beach and bus stop just 2 min by...

SEE USERS

Speech Deficiency Trial Not Responded

The place is close to Barceloneta Beach and bus stop just 2 min by...

SEE USERS

Dashboard Clinical Trials User Groups Profile LOG OUT

## 3.20 Local Sub Group Creation

Doctors can create a Local user group using the 'create Local user group' button. He can filter out people and these people are input from Global user groups.

**Create Clinical Trial Sub Group**

This Local Sub group that you are creating will be only accessed by this clinical trial

**CREATE**

Subgroup Name \*

Subgroup Description \*

**FILTERS** **EXPORT**

username	firstname	lastname	typeof...	age	region	gender	height	weight	disease
s@gmail.com	shalmalee	shen-oli-kar	PATIENT						
test1@gmail.c...	test	1	PATIENT						
hari	Hariharan	Seelam	PATIENT						

**CLOSE**

## 3.21 Subscribed User Group

By default there will be three user groups created. Subscribed user group, not subscribed user group and not responded user group and Doctor can see members of each user group

**Subscribed User Group**

This Global sub group that you are creating can be accessed from every clinical trial

**Members list**

See information about all members

**CREATE A NEW SUB GROUP** **SEND NOTIFICATIONS** **ADD MEMBER**

**FILTERS** **EXPORT**

username	firstname	lastname	typeof...	age	region	gender	height	weight	disease
shenolik@buf..	shalmalee	shenolikar123	PATIENT	23			164	35	
viswa	viswanath	matukumalli	PATIENT	23	buffalo	male	165	67	Diabetes

2 rows selected

Rows per page: 100 ▾ 1–2 of 2 < >

**CLOSE**

## 3.22 Unsubscribed User Group

Doctors can see members of unsubscribed user groups.

The screenshot shows a modal window titled "Not Subscribed". It contains a sub-group description: "This Global sub group that you are creating can be accessed from every clinical trial". Below this is a "Members list" section with a sub-sub-group description: "See information about all members". At the top right are two buttons: "SEND NOTIFICATIONS" and "ADD MEMBER". Below these are two filter buttons: "FILTERS" and "EXPORT". The main area is a table with the following data:

username	firstname	lastname	typeof...	age	region	gender	height	weight	disease
s@gmail.com	shalmalee	shen-oli-kar	PATIENT						
test@gmail...	test	1	PATIENT						
hari	Hariharan	Seelam	PATIENT						

At the bottom right of the table are pagination controls: "Rows per page: 100", "1-3 of 3", and arrows for navigation. A "CLOSE" button is located at the bottom right of the modal.

## 3.23 Responded Trial Members

On the Trial Members page, doctors can see a consolidated view of people who have enrolled, who have rejected, and who have not responded to the trial, making it easier to manage.

## Story Building

-  Story Building Trial
-  Questionnaire
-  Trial User Groups
-  Trial Members

## Members list

See information about all members

 SEND NOTIFICATIONS ADD MEMBER

ENROLLED REJECTED NOT RESPONDED

 FILTERS 

## 3.25 Notifications Page

In this page Doctor can send notifications and can see all the notifications that he has sent so far

The screenshot shows the 'Notifications' page within the 'Health 360' application. At the top, there is a navigation bar with links for 'Dashboard', 'Clinical Trials', 'User Groups', 'Profile', and a 'LOG OUT' button. To the right of the navigation bar is a small bell icon with a red notification dot. On the left, a sidebar menu lists 'Dashboard', 'Clinical Trials', and 'Global User Groups'. The main content area displays a list of notifications, each with a user profile picture, a title, a description, and two small blue icons (trash and refresh). A 'CREATE NEW NOTIFICATION' button is located at the top right of the notification list.

Title	Description	Action
Test Notification Title	Test Notification Description	Trash
Test Notification Title	Test Notification Description	Trash
Test Notification	Test Description	Trash
Back Pain Clinical Trial	Back Pain Clinical Trial Created Enroll in it	Trash
Back Pain Clinical Trial	Back Pain Clinical Trial Created Enroll in it	Trash
Mouth Ulcer		Trash

## 3.26 Notification Creation

Doctors can click on the 'Create Notification' button, provide a title and description, select the clinical trial, and send notifications to particular user groups

The screenshot shows a 'Create Notification' dialog box overlaid on the 'Notifications' page. The dialog box has a white background and a title 'Create Notification'. It contains instructions: 'Create a notification by entering the following fields'. Below this are four input fields: 'Notification Title' (a text input field), 'Notification Description' (a text input field), 'Select Recipient User Group' (a dropdown menu), and 'Select Clinical Trial' (another dropdown menu). At the bottom of the dialog box are two buttons: 'CANCEL' and 'SUBMIT'.

## 3.27 Custom Notification Creation in user groups

In Global user groups and local user group Doctor can send notifications to users by simply selecting them and clicking on 'Send Notification' button and needs to give title and body

The screenshot shows a 'Subscribed User Group' interface. At the top, there's a message: 'This Global sub group that you are creating can be accessed from every clinical trial'. Below it is a 'Members list' section with a table showing two rows of data:

username	firstname	lastname
shenolik@buf...	shalmalee	shenolikar123
viswa	viswanath	matukumalli

On the right side of the screen, there are three buttons: 'CREATE A NEW SUB GROUP', 'SEND NOTIFICATIONS', and 'ADD MEMBER'. A 'Create Notification' modal is open in the center, containing the following fields:

- 'Create a notification by entering the following fields'
- 'Notification Title' (empty input field)
- 'Notification Description' (empty input field)
- 'CANCEL' and 'SUBMIT' buttons at the bottom

At the bottom of the main interface, there are pagination controls: 'Rows per page: 100', '1–2 of 2', and arrows for navigation.

## 3.28 Profile Page

This is the profile page where Doctor can update his profile

**Sidebar**

-  Dashboard
-  Clinical Trials
-  Global User Groups



Hi, Viswanath Matukumalli

**SAVE  
CHANGES**

**First Name**

**Last Name**

**User Type**

**E-Mail**

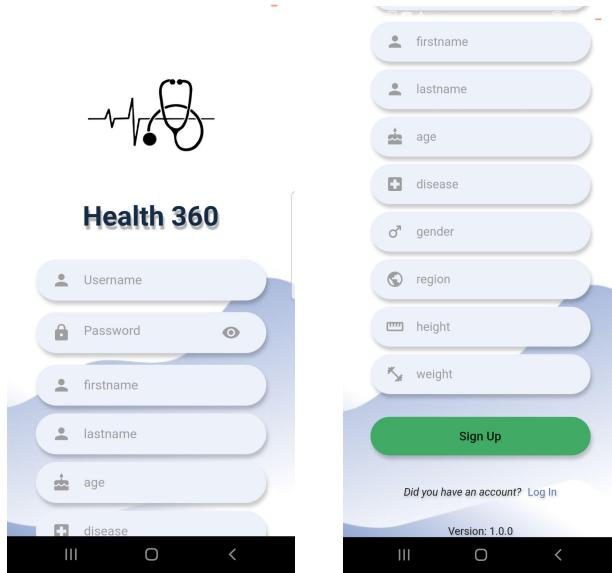
**Age**

**Height (in cm)**

**Weight (in lbs)**

**Profile Picture**  
 No file chosen

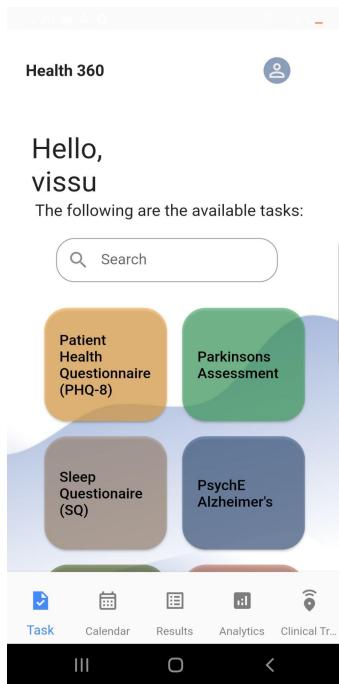
3.29 App New User Signup page



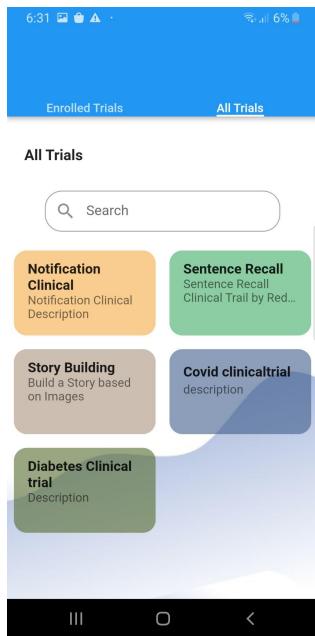
This is new App User Signup page so that we can store the data of the patient which is helpful for filtering the patients in the Doctor Portal.

### 3.30 App Home Page

On the homepage, we have added a 'Clinical Trial' button at the bottom right corner for navigating to the Clinical Trial page in the app.

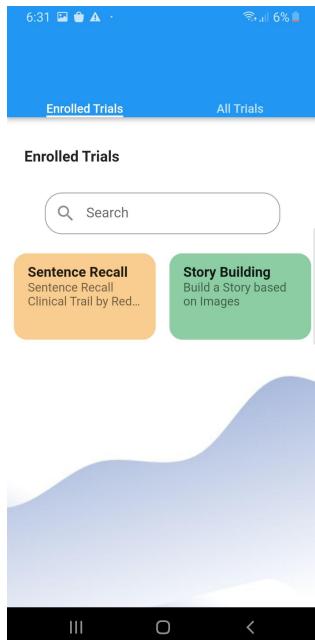


### 3.31 All Trails



This is the All Trails Page which consists of all the trails created from the Doctor Portal. By Clicking on a specific Trail we can direct to the Enroll Page to Enroll or Reject.

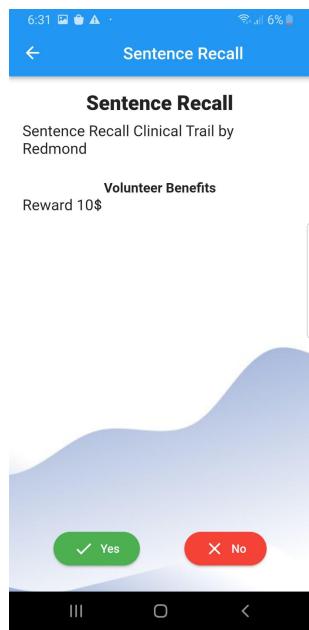
### 3.32 Enrolled Trials



This page only shows the trails for which you enrolled.

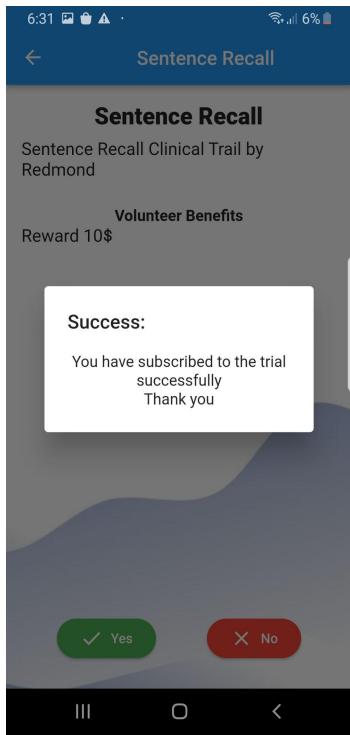
### 3.33 Enroll Page

This is the enroll page for enrolling in a clinical Trial.



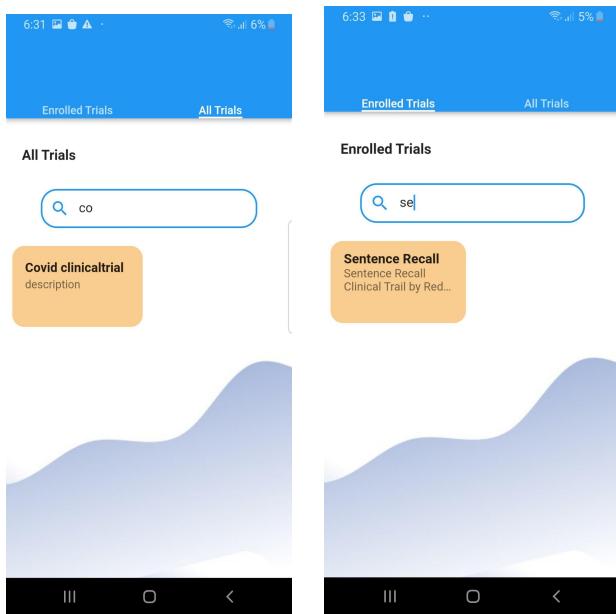
### 3.34 Success message for Enrolling

After Subscribing in CLinical Trial User can see the Success Dialogue box.



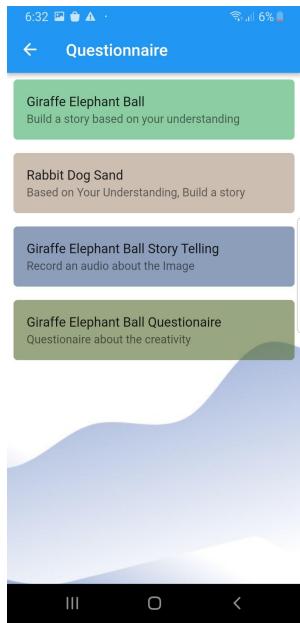
### 3.35 Search Implementation

We can directly search and locate any clinical trial in both All Trials and Enrolled Trials pages.

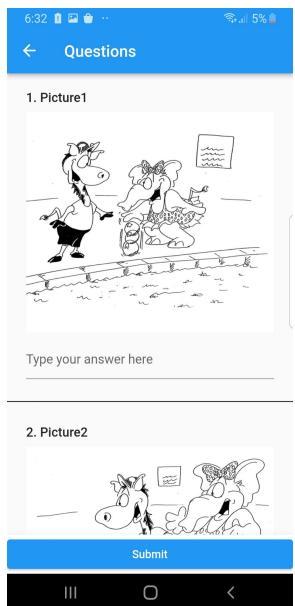


### 3.36 Questionnaires in Clinical Trial

In Enrolled Clinical Trial User can see the Questionnaires created So far and need to answer the Questionnaires.



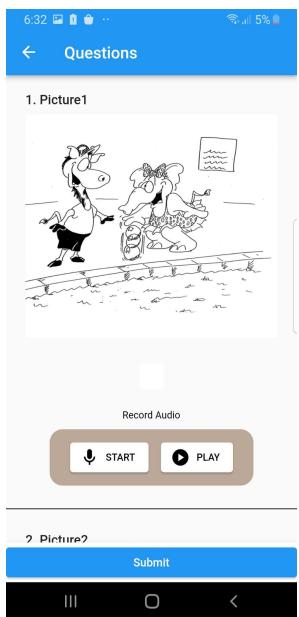
### 3.37 Questions of Text Type



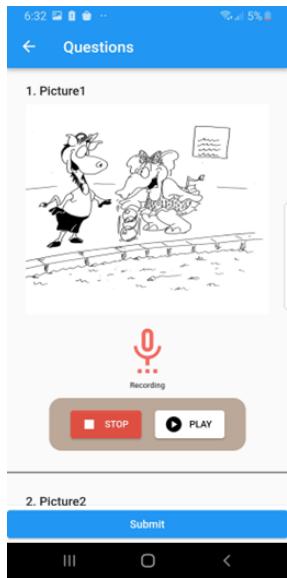
In Questionnaire Text based questions can be seen in this way.

### 3.38 Questions of Voice Recording

Audio Recording Type Questions will be displayed in this format. Start button is used to record the Audio.



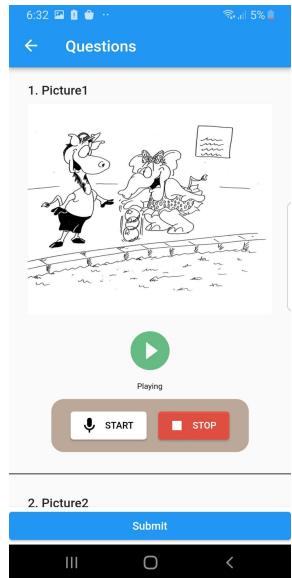
### 3.39 Recording Audio



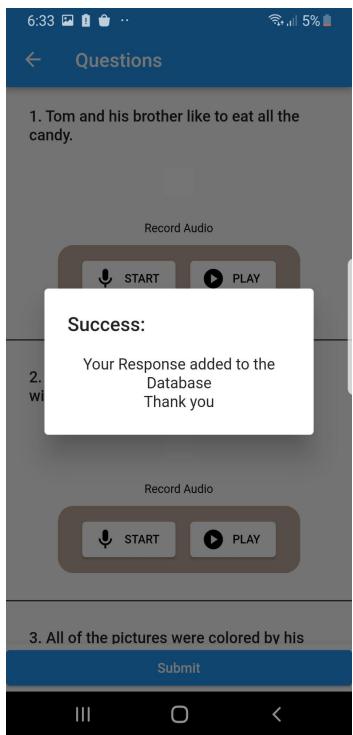
Stop button to stop the recording.

### 3.40 Playing the Recorded Audio

You can replay and confirm your answer once again before submitting.



### 3.41 Success Message after answering the Questionnaire



Access to Cloud and Storage:

Email: [ubhealth60@gmail.com](mailto:ubhealth60@gmail.com)

Password: HealthGuardian@360

Firebase , this is Firebase home screen here we need to select 'Health 360' project

This is the Home page of 'Health 360' project

The screenshot shows the Firebase Project Overview page for the 'Health360' project. The left sidebar contains navigation links for Project Overview, Storage, Product categories, Build, Release & Monitor, Analytics, Engage, and All products. A 'Customize your nav!' section allows users to focus on specific console experiences. The main content area features a large 'Health360' logo with a yellow flame icon above two 3D characters (a man and a woman) looking at a tablet. Below them is the text 'Waiting for Analytics data...'. At the bottom, there's a banner with the text 'Store and sync app data in milliseconds' and two blue cards showing icons related to storage and sync.

Select Storage option to see all the media of the application.

The screenshot shows the Firebase Storage interface for the project 'health360'. On the left, there's a sidebar with navigation links like Project Overview, Storage (which is selected), and various product categories. A message box says 'Customize your nav!' with a 'Learn more' and 'Got it' button. At the bottom, there are upgrade options for 'Spark' (No-cost \$0/month) and 'Upgrade'. The main area is titled 'Storage' and shows a list of files under 'gs://health360-25343.appspot.com'. There is one item: a folder named 'images/'. A prominent 'Upload file' button is at the top right of the list.

The Backend of the application is deployed in Google cloud which the App is currently using to get the data. Go to google cloud with the credentials provided above (same email)

The screenshot shows the Google Cloud Welcome page for the project 'My First Project'. It features a 'Welcome, Health 360' header. Below it, there are three main sections: 'You're in Free Trial' (with a circular icon showing a camera), 'You're working on project My First Project' (with details like Number: 2111635162, ID: midyear-castle-408217, and links to Add people to your project, Set up budget alerts, and Review product spend), and 'Experience Gemini, the multimodal model from Google DeepMind, now available in Vertex AI' (with a right-pointing arrow). At the bottom, there's a section titled 'Recommended based on your interest in Web, Mobile, Game, Storage' with three cards: 'Deploy a three-tier web app', 'Create a dynamic web app with Python and JS', and 'Create a serverless ecommerce platform'. A 'View all Solutions' button is at the bottom left.

Recommended based on your interest in Web, Mobile, Game, Storage

Pre-built solution templates

Deploy a three-tier web app  
Web app, rich media site, ecommerce website, database-backed website

Create a dynamic web app with Python and JS  
Dynamic web app, ecommerce website, database backend, django rest framework...

Create a serverless ecommerce platform  
Ecommerce web app, database backend, django

[View all Solutions](#)

The Backend code is deployed in App Engine service in google cloud

The screenshot shows the Google Cloud Console interface for the 'My First Project' under the 'app engine' service. The left sidebar lists various services like Dashboard, Services, Instances, Task queues, Cron jobs, Security scans, Firewall rules, Quotas, Memcache, Search, and Settings. The 'Versions' option is selected. The main content area displays a table of deployed versions:

Version	Status	Traffic Allocation	Instances	Runtime	Environment	Size	Service Account
20231215t135436	Serving	100%	0	nodejs14	Standard	101.3 MB	midyear-castle-408217@appspot.gservicea
20231215t132814	Serving	0%	0	nodejs14	Standard	101.3 MB	midyear-castle-408217@appspot.gservicea
20231215t132357	Serving	0%	0	nodejs14	Standard	101.3 MB	midyear-castle-408217@appspot.gservicea

In backend repo the app.yaml is already defined so if there is any change to backend just run gcloud app deploy command from terminal (you need to install gcloud)

The screenshot shows a code editor with a sidebar containing files: Dockerfile, package.json, pythonrunner.js, and server.js. The main area shows the app.yaml file with the following content:

```
viswanathmatukumalli@ViswanathsAir4 Health_Guardian % ls
Dockerfile      app.yaml      package.json    server.js
api            data          python_scripts  uploads
app.js        node_modules  pythonrunner.js

viswanathmatukumalli@ViswanathsAir4 Health_Guardian % gcloud app deploy
Services to deploy:
descriptor:          [/Users/viswanathmatukumalli/Documents/611_Project/611_final/
Health 360/Backend/Health_Guardian/app.yaml]
source:             [/Users/viswanathmatukumalli/Documents/611_Project/611_final/
Health 360/Backend/Health_Guardian]
target project:     [midyear-castle-408217]
target service:     [default]
```

The terminal also shows the current directory as '/Users/viswanathmatukumalli/Documents/611\_Project/611\_final/Health 360/Backend/Health\_Guardian'.

The Database is deployed in MongoDb cloud and to access MongoDb cloud login to mongodb atlas using same email provided above (Google login) and you see dashboard

This screenshot shows the MongoDB Atlas dashboard for a project named 'Project 0'. The main section is titled 'Database Deployments' under 'HEALTH'S ORG - 2023-12-15 > PROJECT 0'. On the left, there's a sidebar with various service links like Data Lake, Device Sync, Triggers, etc. The central area features a 'Load sample datasets to Cluster0' button with a green icon. Below it, there's a chart for 'Cluster0' showing metrics such as R 0, W 0, Connections 2.0, In 0.0 B/s, Out 119.5 B/s, and Data Size 162.2 KB / 512.6 MB. At the bottom, there's a table with details like Version 6.0.12, Region AWS / N. Virginia (us-east-1), Cluster Tier M0 Sandbox (General), Type Replica Set - 3 nodes, Backups Inactive, Linked App Services None Linked, Atlas SQL Connect, and Atlas Search Create Index.

Here select see collections where you can see all the collections of the application and can also see the data in that collection

This screenshot shows the MongoDB Atlas dashboard for the 'Cluster0' database. The main section is titled 'Cluster0' under 'HEALTH'S ORG - 2023-12-15 > PROJECT 0 > DATABASES'. The left sidebar includes a 'Collections' link. The central area shows a list of databases and collections: 'test' with 'clinicaltrials', 'diags', 'notifications', 'questionnaires', 'responses', 'usergroups', and 'users'. A 'Find' query is displayed: '\_id: ObjectId('657ca03c7087d4e236f57182') name: "Speech Deficiency Trial" userL...'. Below the query results, there's a table with columns like Filter, Type a query: { field: 'value' }, Reset, Apply, and Options.

## 4. Future Work

Looking forward, the project envisions a significant expansion in its capabilities through the integration of advanced machine learning techniques, further elevating the platform's impact on healthcare research and predictive analytics. The current implementation lays the groundwork for this evolution, with specialized data structures already accommodating machine learning model parameters, training data, and prediction outputs. In the future, the project aims to refine and extend these capabilities, incorporating more sophisticated algorithms and models. The team plans to explore the integration of cutting-edge libraries and frameworks, such as PyTorch and XGBoost, to enhance the accuracy and efficiency of predictive analytics. The refinement of existing machine learning models will be complemented by the exploration of emerging technologies like federated learning, enabling collaborative model training across multiple healthcare institutions while ensuring data privacy and security. Additionally, the platform will be designed to seamlessly incorporate real-time data streams and wearables, enhancing the depth and timeliness of the insights generated. This forward-looking integration of machine learning aligns with the project's commitment to staying at the forefront of technological advancements, ensuring that the healthcare platform continues to be a catalyst for innovation in clinical trial management and healthcare analytics.

As part of the project's forward-looking vision, the incorporation of existing voice, media, and text inputs into questionnaires stands poised to contribute significantly to ongoing speech and language studies, particularly in collaboration with the University at Buffalo's National AI Institute. The existing capability for users to seamlessly provide responses through various modalities opens up a unique opportunity to contribute valuable data for research aimed at understanding and supporting children with speech and language disorders. The questionnaires, designed to capture diverse forms of communication, can serve as a powerful tool for researchers and clinicians at UB's National AI Institute. This collaboration holds the potential to accelerate advancements in the study of speech and language disorders, fostering a deeper understanding of linguistic development, communication patterns, and innovative therapeutic interventions. By leveraging the platform's flexibility in accommodating multimodal inputs, the project aims to make meaningful contributions to the ongoing research initiatives at the National AI Institute, ultimately supporting the well-being and development of children facing speech and language challenges. This collaborative endeavor underscores the project's commitment to societal impact and the utilization of technology for the betterment of healthcare and education.

## 5. Team Contribution

Hariharan	Shalmalee	Viswanath
Firebase Account creation and account initialisation with Web app and android, and messaging service installation	User Group CRUD APIs - create nested groups, delete, update, get by clinical trial id, get users by group id, get all, get by id	Clinical trials page in Mobile App
User responses - excel download feature	User groups and user group table UI	Modified Pages in Basic Doctorportal (website) with TailwindCss + Vite
MongoDB account creation and setup	Docker image creation and Kubernetes deployment	Clinical trials CRUD APIs
Promotional Video creation	Login , Sign up APIs and user token generation (Authentication)	Handling user Voice and media response and Responses APIs creation
Poster design	Notification creation, deletion, read/unread UI - website	Questionnaire CRUD APIs, UI and Model creation
Firebase Storage setup	Notifications CRUD APIs	Backend Google cloud mobile app deployment
Contributed to Report	User Profile Page UI	User Signup page in Mobile app
	User profile CRUD API- update user details	All Clinical trials page and enrollment logic - mobile app
	User CRUD APIs - get by id, get all users,	Clinical Trial Subscription APIs
	Creation of user subgroups with clinical trial - UI, API	Displaying user responses table in Doctor portal
	Mobile app - display questionnaire	Handling mobile App notifications and redirecting to clinical trials page

## 6. Conclusion

In conclusion, we have successfully developed a comprehensive portal that enables doctors to perform a range of tasks seamlessly. This includes creating user groups, initiating clinical trials, designing tailored questionnaires for each trial, collecting user responses, and conveniently downloading the data in .xlsx format. Furthermore, doctors have the capability to send notifications to users as reminders.

The app allows users to enroll in trials, access detailed trial information, and submit responses to questionnaires. Notably, doctors can efficiently manage user groups through the utilization of both Global user groups and Local user groups, ensuring effective organization. The notification system is adeptly handled to keep users informed.

Looking ahead, the collected data will serve as a valuable resource for training machine learning models and conducting analytics. This forward-thinking approach positions the portal as a robust tool for both current clinical trial management and future data-driven insights.