



## **CSE 545: Software Security**

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### **Secure Hospital System User Guide – Group 9**

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# 1. Technologies Used

With advances in healthcare informatics, one can provide better means to process patient records and therefore speed up the treatment, which in turn reduces the overall cost. Many tools exist for facilitating patient record processing: from assisting data entry to manipulating records, from generating output in required form to transferring it to other physicians for further examination, or to save it digitally for future use.

## 1.1 UI Design

Wireframes are used to design the secure hospital system functionality. A wireframe is a two-dimensional depiction of a page's interface that focuses on content priority and space allocation, as well as available features and planned behaviours. Because of this, wireframes rarely incorporate any styling, colour, or images.

Angular has a well-designed framework that makes it simple to use. It was created to enable working with web apps easier using the MVC architecture. It separates the model from the view and manages any data binding issues. Angular also includes two-way data binding, which means that when data in the model changes, the view is instantly updated, and vice versa. Angular was built with efficiency in mind. It is quick and efficient, making it an excellent choice for high-traffic websites. As a result, it is an excellent choice for public-facing websites.

## 1.2 Application Design

The framework used for backend development of the application is 'spring boot' (Java). Spring boot provides reliable performance with security for the application. JWT authentication is currently used for sign-up/sign-in for different user roles. The application uses the JDBC template for interaction with the database. Amazon SQS is used for interaction with the blockchain.

We employ a semi-supervised ML approach to group together malicious IPs. For each IP, we use the labels we must find features that are helpful in separating the good IPs from the bad ones. Another example of machine learning in this project is chatbot. Amazon Lex follows the basic chatbot architecture adhered to by all the big cloud based Conversational AI providers.

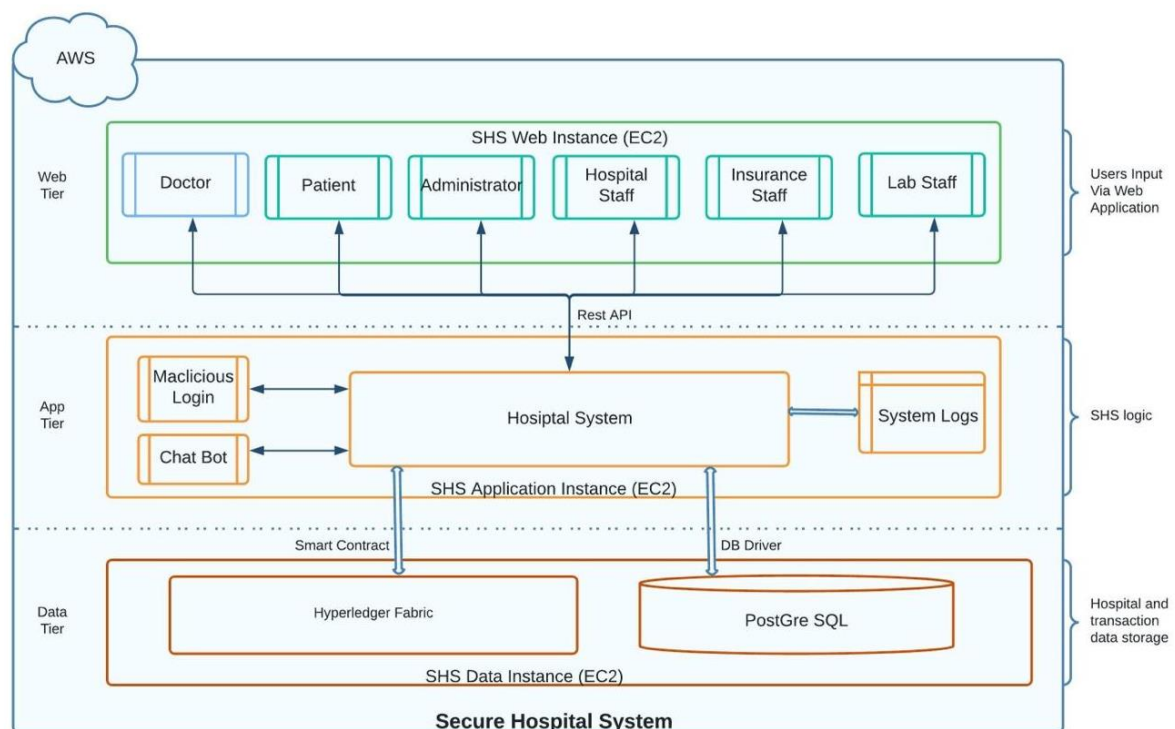
## 1.3 Database Design

The various transaction and user data are captured through the data in the Database. The relation between tables can be seen in the ER diagram below. Here, PostgreSQL will be

hosted in an AWS EC2 instance, with the access from the application for data processing. Hyperledger Fabric used as a solution to overcome the problems of traditional records management in hospital/medical system such as accessibility, security, and transaction/approval records.

## 2. What's new feature

SHS can be divided into a 3-tier architecture, involving web, app, and data tier. All tiers will be hosted on AWS. The app tier components developed in spring boot and services are up 24/7. The data tier has two components for storing the hospital data. Postgre SQL for storing the hospital data and Hyperledger blockchain to capture the approved transaction details.

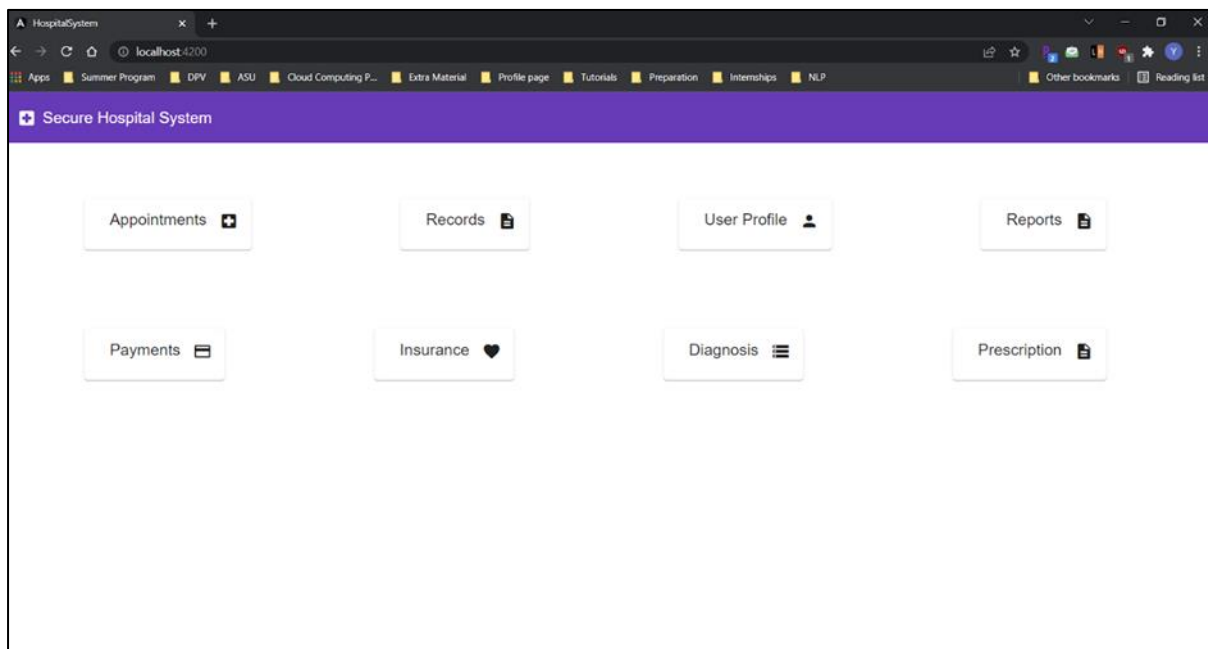


**Fig. Secure Hospital System Architecture**

The Web application are hosted as website. Web pages are designed using angular, as it is highly preferable as a robust frontend tool supplying components that assist people to write easy-to-use, readable, and maintainable code. Angular has built-in support to help prevent two common HTTP vulnerabilities, cross-site request forgery (CSRF or XSRF) and cross-site

script inclusion (XSSI). Both must be mitigated primarily on the server-side, but Angular provides helpers to make integration on the client-side easier.

Wireframe designs for the secure hospital functionality are provided below as a reference:



**Fig. Wireframe Design - Dashboard**

A security group acts as a virtual firewall for SHS EC2 instances to control incoming and outgoing traffic. Inbound rules control the incoming traffic to your instance, and outbound rules control the outgoing traffic from your instance. When component launched as an instance, you can specify same security groups. All components access across tier will be through secure protocol such as HTTPS. The secure hospital system will use a certificate for the web application for accessing webpages. A key pair, consisting of a public key and a private key, is a set of security credentials that you use to prove your identity when connecting to an Amazon EC2 instance. Amazon EC2 stores the public key on your instance, and you store the private key.

Blockchain technology is based on the principle of providing an individual control over their data and information, and hence potentially appropriate as part of a solution to patient ownership of their health data. Blockchain can create a decentralized identification that allows health care providers and patients to interact with one another directly without the need for an intermediary. The immutable audit trail which allows all changes of personal information to be tracked and traced. The increased security of patient's medical information. Not only is the data stored in multiple nodes across the distributed ledger; but it can also be encrypted with

the only key being in the hands of the patient. Due to limited functionality the feature of key with patient will be considered as future work. Blockchain applications may, therefore, provide solutions to the current problems of interoperability of medical records, incomplete patient data at the point of service, integrate insurance claim, and lack of access to personal records while ensuring security.

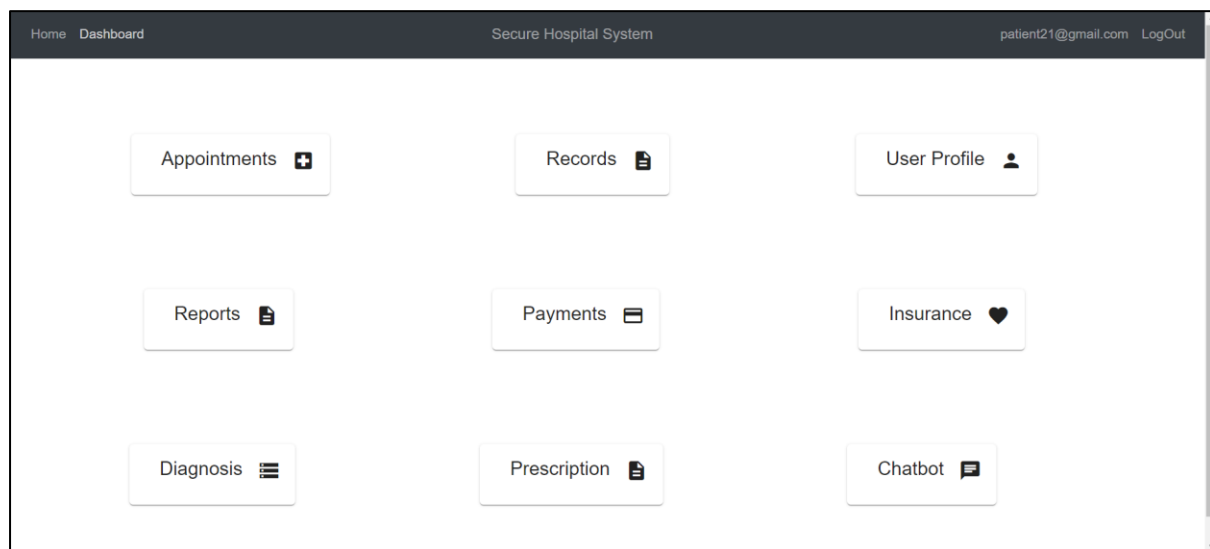
### 3. Workflow by User Operation

For accessing secure hospital system, user has to sign-up with relevant role. Login to the SHS using login authentication and two-factor authentication. Following subsection describes the functionality and navigation for various user roles.

#### 2.1 User: Patient

Login to the SHS webpage with the user role as patient. Below is the functionality and navigation through the patient user.

1. After logging in the patient can see the following dashboard for the patient along with patient name on the top:



2. Now, by clicking on the appointments tab the patient can book the appointment with the doctor and the next page demonstrates how we can book an appointment with the doctor

Home Dashboard Secure Hospital System patient\_1 Logout

### Appointments

Create Appointment View Appointment

Doctors:

- Doctor 2
- Doctor 4
- General
- Doctor 1

- Once the patient selects the doctor, we display all the available time and slots for the given patient. After which the patient can click on Submit to book an appointment. Once it's completed it gets a message saying appointment booked.

Home Dashboard Secure Hospital System patient\_1 Logout

### Appointments

Create Appointment View Appointment

Doctors: Select Doctor 2

Pick Your date: ☐ 03-31-2022 ☒ 04-01-2022 ☐ 04-02-2022 ☐ 04-03-2022 ☐ 04-04-2022 ☐ 04-05-2022 ☐ 04-06-2022

Pick Your time: ☐ 08:00:00-07 ☒ 09:00:00-07 ☐ 10:00:00-07 ☐ 11:00:00-07 ☐ 12:00:00-07 ☐ 13:00:00-07 ☐ 14:00:00-07 ☐ 15:00:00-07

Submit

Appointment Booked

- Also, after booking the appointment with doctor you can view your booked appointment on this page along with the status of your booked appointment by clicking on View appointment. Here the patient can also delete the booked appointment. Once the hospital staff approves the appointment the status changes and gets updated.

Home

Dashboard

Secure Hospital System



patient\_1

Logout

Appointments

Create Appointment

View Appointment

No.	Date	Time	Doctor	Status	Action
1	04-01-2022	09:00:00-07	Doctor 2		

- Now, the patient can go back on the Dashboard and click on any of the User Profile, Diagnosis, Prescription and Records. It will display the profile of the patient as well as its diagnosis details of any previous appointment as well as the prescription and record of the patient can be found on this page as given below:

Home

Dashboard

Secure Hospital System

patient\_1

LogOut

Patients Info

Name

patient\_1

Age

40

Gender

☐

Male

☐

Female

Address

1718 S. Jeebilly In

Email/Cont

2132142342342387

Phone Number

0000000000

18 / 18

18 / 18

Save

Edit

Diagnosis Details






No.	Date	Diagnosis	Doctor	Patient ID
1	03-08-2022	132312	doctor1	46
2	03-28-2022	Covid	doctor1	46
3	03-28-2022	Testing	doctor1@gmail.com	46
4	03-30-2022	1223123	doctor1@gmail.com	46
5	03-01-2022	23423423	doctor1@gmail.com	46
6	04-03-2022	Liver Failure	doctor1@gmail.com	46
7	03-31-2022	DGFG	doctor1@gmail.com	46
8	04-02-2022	Has issue with back pain	doctor1@gmail.com	46
9	04-01-2022	Sup	doctor1@gmail.com	46
10	05-30-2022	leg Problem	Shashank	46
11	03-31-2022	Alive	doctor123	46

Prescription Details

No.	Date	Prescription	Doctor	Patient ID
1	05-30-2022	Body Massage	doctor1	46
2	05-30-2022	Body Massage	doctor1	46
3	05-30-2022	B	doctor1	46
4	04-30-2022	Body Massage	doctor1	46
5	05-11-2022	Rest	doctor1	46
6	03-28-2022	Test	doctor1	46

11		03-31-2022		Alive		doctor123		46	
Prescription Details									
No.	Date	Prescription			Doctor		Patient ID		
1	05-30-2022	Body Massage			doctor1		46		
2	05-30-2022	Body Massage			doctor1		46		
3	05-30-2022	B			doctor1		46		
4	04-30-2022	Body Massage			doctor1		46		
5	05-11-2022	Rest			doctor1		46		
6	03-28-2022	Test			doctor1		46		
7	04-28-2022	Stitches			doctor1		46		
8	03-30-2022	Eat Healthy food			doctor1@gmail.com		46		
9	03-29-2022	1234			doctor1@gmail.com		46		
10	05-30-2022	Dolo			Shashank		46		
Record Details									
No.	Date	Record			Inputter		Patient ID		
1	03-30-2022	Ligament Tear			6		46		
2	04-04-2022	Headache 2			6		46		
3	03-30-2022	Back Pain			90		46		
4	03-30-2022	Knee Problem			90		46		
5	04-03-2022	Stomach Issue			90		46		

6. Now, the report of the tests for the patient can be found on the page given below. Also, the patient can download the lab report in the form of the pdf as given below:

Reports					
Date Recommended	Requested	Test Name	Status	Report	Download
03-28-2022	doctor1@gmail.com	Diabetes	completed	Everything looks fine	
03-01-2022	doctor1@gmail.com	Liver	completed	Pkmarv Rt1	
04-03-2022	doctor1@gmail.com	Liver	completed	All good :)	
03-08-2022	doctor1@gmail.com	Urinalysis	completed	Testing	
03-30-2022	doctor1@gmail.com	Urinalysis	completed	Test1234	

7. Now the bills of the patient can be downloaded on this page as it has tabs to see what transactions are being performed by the patient and also the past payment made by the patient. Also, the status of the transaction and the amount is also given on this page.

Home

Dashboard

Secure Hospital System

patient11@gmail.com

LogOut

Transactions

Make Payment

View Transactions

Bills

No.	Patient	Transaction ID	Date	Status	Amount
1	134	35	04-04-2022	completed	2000

8. User can also make payment for the given amount by clicking the payment icon

Transactions							
Make Payment		View Transactions		Bills			
No.	Patient	Transaction ID	Date	Status	Amount	Make payment	
1	45	44	04-04-2022	approved_transaction	1000		

9. After the clicking the payment link it redirects to payment page where they can pay using cash, card, and insurance. After which the transaction table would be updated it, the transaction is completed.



Home
Dashboard
Secure Hospital System

### MAKE PAYMENT

Patient ID: 46


Amount to be Paid: 1000

Pick your payment method

☐ Cash
☒ Card
☐ Insurance

Enter Credit Card Number

#### 2-Step Verification



Enter the Verification code generated by your Google Authenticator Application

10. Now, the given below page shows the insurances claimed by the patient as well as current insurance policy of the patient.

Home
Dashboard
Secure Hospital System
patient11@gmail.com
LogOut

Current Insurance Policy
Past Claim Insurances

### Current Insurance Policy

Patient ID

134

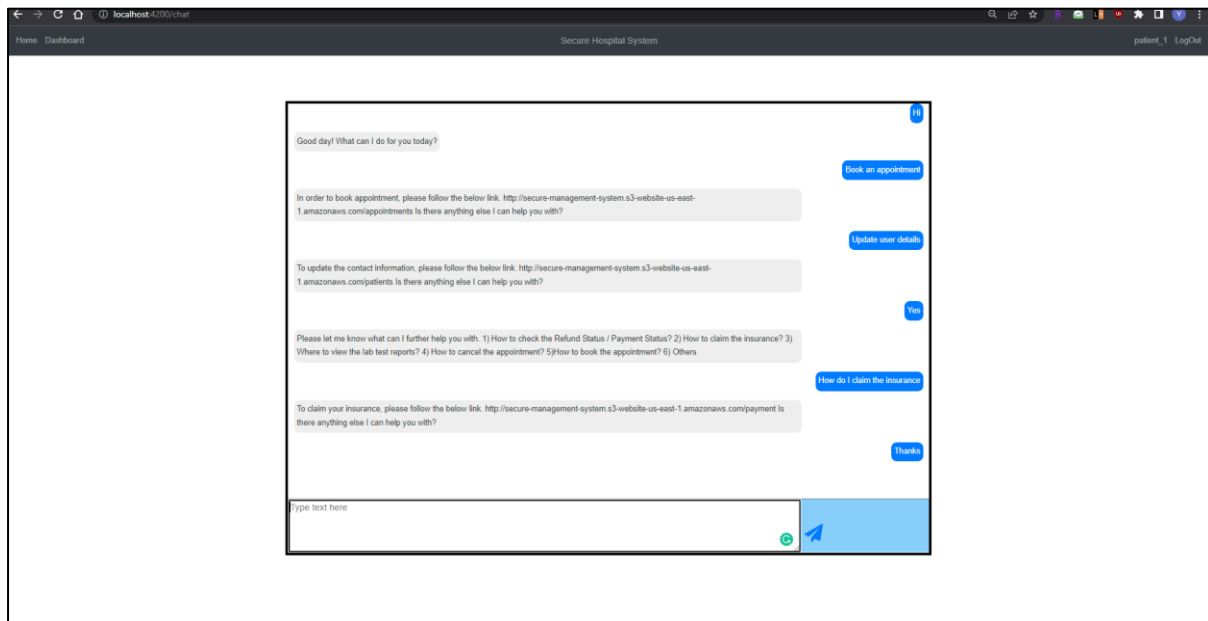
Policy Amount

10000

Policy Details

Checkup

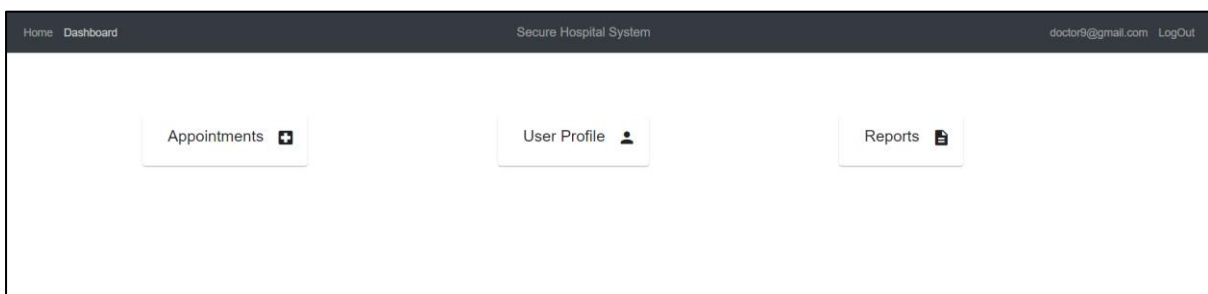
11. Now this page shows the chat bot which would help the user in getting the information it needs from the application.



## 2.2 User: Doctor

Login to the SHS webpage with the user role as doctor. Below is the functionality and navigation through the doctor user.

1. After logging in, the doctor will be able to see this dashboard:



2. Doctors can click on appointments to see their approved appointments.










Home Dashboard

Secure Hospital System

doctor9@gmail.com LogOut

Appointments

View Pending Appointments

No.	Patient	Date	Time	Doctor	Status	User Profile
1	134	04-02-2022	11:00:00-07	doctor1@gmail.com	approved	
2	101	04-01-2022	13:00:00-07	generaldoctor	approved	
3	46	04-01-2022	11:00:00-07	doctor2	approved	
4	46	03-31-2022	10:00:00-07	generaldoctor	approved	
5	46	03-31-2022	12:00:00-07	generaldoctor	approved	
6	46	03-31-2022	11:00:00-07	generaldoctor	approved	
7	46	03-31-2022	10:00:00-07	doctor1	approved	
8	99	03-31-2022	08:00:00-07	generaldoctor	approved	
9	99	03-31-2022	08:00:00-07	doctor2	approved	

- They can check the patient data of the patients who have approved appointments by clicking on the user profile button. They need to update the appointment status to complete the appointment and click submit button.

Home Dashboard		Secure Hospital System				doctor9@gmail.com	LogOut																					
Appointment Date: Apr 2, 2022		Appointment Time: 11:00:00-07		Appointment Status: <span>Status</span> approved		<span>Submit</span>																						
<b>Patients Info</b>				<b>Diagnosis Details</b>																								
Name patient11 Age 22 Gender: <input type="radio"/> Male <input type="radio"/> Female Address 3r4gthjyu67 Credit Card 1234567890123412 Phone Number 999000888 16 / 16 <span>Save</span> <span>Edit</span>				<table> <tr> <th>Nos.</th><th>Date.</th><th>Diagnosis</th><th>Doctor</th><th>Patient ID</th><th>Action</th></tr> </table> <b>Prescription Details</b> <table> <tr> <th>Nos.</th><th>Date.</th><th>Prescription</th><th>Doctor</th><th>Patient ID</th></tr> </table> <b>Record Details</b> <table> <tr> <th>Nos.</th><th>Date.</th><th>Record</th><th>Inputter</th><th>Patient ID</th><th>Action</th></tr> </table>								Nos.	Date.	Diagnosis	Doctor	Patient ID	Action	Nos.	Date.	Prescription	Doctor	Patient ID	Nos.	Date.	Record	Inputter	Patient ID	Action
Nos.	Date.	Diagnosis	Doctor	Patient ID	Action																							
Nos.	Date.	Prescription	Doctor	Patient ID																								
Nos.	Date.	Record	Inputter	Patient ID	Action																							

- Doctor can edit the patient data.

Home Dashboard
Secure Hospital System
doctor9@gmail.com Logout

Enter Patient Id: 134
Submit

### Patients Info

Name \*

patient11

Numbers are not allowed

Age \*

22

Gender: ☐ Male ☐ Female

Address \*

home

Credit Card \*

1234567890123412

Phone Number \*

999000888

16 / 16

16 / 10

Save Edit

### Diagnosis Details

Nos.	Date.	Diagnosis	Doctor	Patient ID	Action
1	04-03-2022	Poor Health	doctor123	134	

### Prescription Details

Nos.	Date.	Prescription	Doctor	Patient ID
1	04-03-2022	Penicillin	doctor123	134

### Record Details

Nos.	Date.	Record	Inputter	Patient ID	Action
------	-------	--------	----------	------------	--------

Below is the post update view.

Home Dashboard
Secure Hospital System
doctor9@gmail.com Logout

Enter Patient Id: 134
Submit

### Patients Info

Name

patient11

Age

22

Gender: ☐ Male ☐ Female

Address

home

Credit Card

1234567890123412

Phone Number

999000888

16 / 16

16 / 10

Save Edit

### Diagnosis Details

Nos.	Date.	Diagnosis	Doctor	Patient ID	Action
1	04-03-2022	Poor Health	doctor123	134	

### Prescription Details

Nos.	Date.	Prescription	Doctor	Patient ID
1	04-03-2022	Penicillin	doctor123	134

### Record Details

Nos.	Date.	Record	Inputter	Patient ID	Action
------	-------	--------	----------	------------	--------

5. They can add and edit diagnoses and request lab tests.

Home Dashboard
Secure Hospital System
doctor9@gmail.com Logout

Appointment Date: Apr 1, 2022
Appointment Time: 13:00:00-07
Appointment Status: approved
Submit

### Patients Info

Name

Shashank

Age

16

Gender: ☐ Male ☐ Female

Address

Amalapuram

Credit Card

I wont tell you

Phone Number

4807914607

15 / 16

15 / 10

Save Edit

Date \*

4/4/2022

Diagnosis \*

Good health

Lab Test \*

Complete Blood Count

Save Cancel

### Diagnosis Details

Diagnosis	Doctor	Patient ID	Action
sda	doctor1@gmail.com	101	

### Prescription Details

Prescription	Doctor	Patient ID
--------------	--------	------------

### Record Details

Record	Inputter	Patient ID	Action
Head pain	6	101	

6. They can prescribe medicine.

The screenshot shows a doctor's dashboard with a patient's appointment details. A modal is open for prescribing medicine.

**Appointment Details:**

- Appointment Date: Apr 2, 2022
- Appointment Time: 11:00:00-07
- Appointment Status: approved

**Patients Info:**

- Name: patient11
- Age: 22
- Gender: ☐ Male ☐ Female
- Address: 3r4gthjyu67
- Credit Card: 1234567890123412
- Phone Number: 999000888

**Prescription Modal:**

- Date: 4/4/2022
- Prescription: Penicillin
- Buttons: Save, Cancel

**Diagnosis Table:**

Diagnosis	Doctor	Patient ID	Action
Good health	doctor123	134	<a href="#">Edit</a> <a href="#">Delete</a>

**Prescription Table:**

Prescription	Doctor	Patient ID

**Record Table:**

Record	Inputter	Patient ID	Action

7. They can view lab test reports of the patient with the patient ID.

The screenshot shows a doctor's dashboard with a patient's lab test reports.

**Enter Patient Id:** 134 [Submit](#)

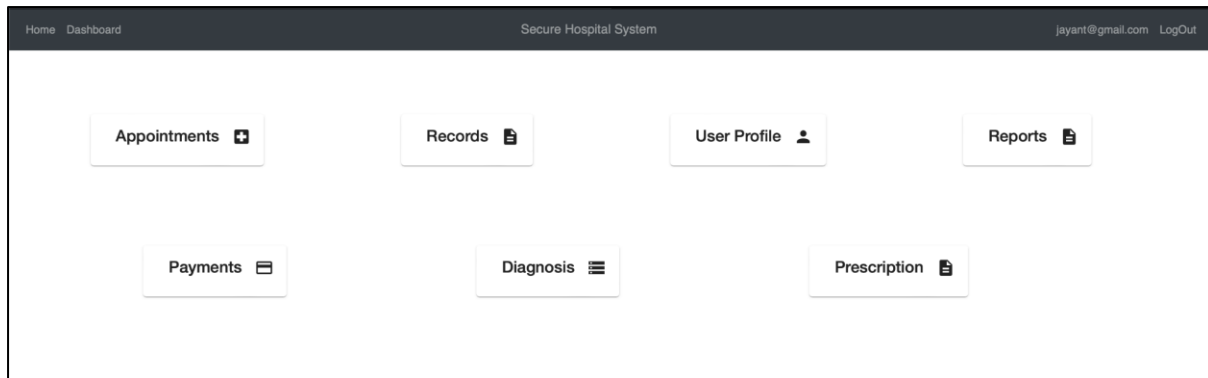
**Reports Table:**

Date Recommended	Requested	Test Name	Status	Record	Download
04-03-2022	doctor123	Complete Blood Count	completed	looks good	<a href="#">Download</a>

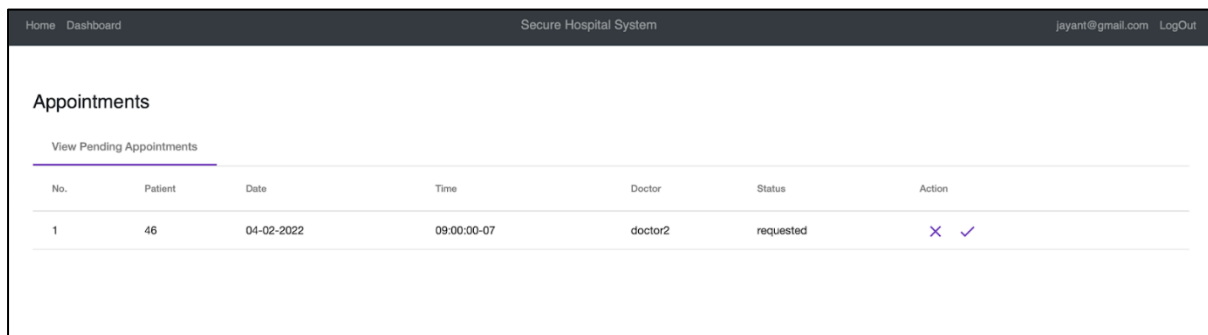
## 2.3 User: Hospital Staff

Login to the SHS webpage with the user role as hospital staff. Below is the functionality and navigation through the hospital staff user.

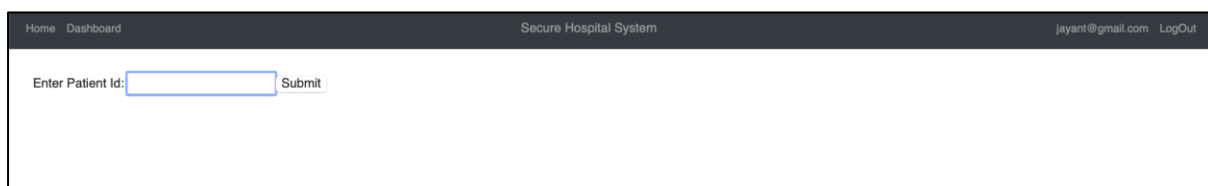
1. After logging in the hospital staff can see the following dashboard:



- Now, by clicking on the appointments tab, hospital staff can review the appointments that were booked by the patients and approve them depending upon the priority and availability of the doctor.



- Now, we have a records section which requires the patient id to check or add information of a patient.



- After the patient id is given, the hospital staff will have the option to add and update the patient details. They have the option to view the diagnosis, prescription and record details and the hospital staff will have the option to add the record details. All of the above 3 features have the same webpage to make the required changes.

Home Dashboard
Secure Hospital System
jayant@gmail.com Logout

Enter Patient Id: 46 Submit

Patients Info

Name  
patient\_1

Age  
40

Gender: ☐ Male ☐ Female

Address  
1718 S Jentilly In 4

Credit Card  
2132142342342 13 / 16

Phone Number  
0000000000 13 / 10

Save Edit

Diagnosis Details

Nos.	Date.	Diagnosis	Doctor	Patient ID
1	03-08-2022	132312	doctor1	46
2	03-29-2022	Covid	doctor1	46
3	03-28-2022	Testing	doctor1@gmail.com	46
4	03-30-2022	1223123	doctor1@gmail.com	46
5	03-01-2022	23423423	doctor1@gmail.com	46
6	04-03-2022	Liver Failure	doctor1@gmail.com	46
7	03-31-2022	DGFG	doctor1@gmail.com	46
8	04-02-2022	Has issue with back pain	doctor1@gmail.com	46
9	04-01-2022	Sup	doctor1@gmail.com	46
10	05-30-2022	leg Problem	Shashank	46
11	03-31-2022	Alive	doctor123	46

Prescription Details Screenshot

- In the user profile section of the hospital staff, we will be asked the patient id to have the option to update the patient's personal info upon the request of the patient.

Home Dashboard
Secure Hospital System
jayant@gmail.com Logout

Enter Patient Id: Submit

- This page will help us to update the data of the patient upon their request.

Home Dashboard
Secure Hospital System
jayant@gmail.com Logout

Enter Patient Id: 134 Submit

Patients Info

Name  
patient11

Age  
22

Gender: ☐ Male ☐ Female

Address  
home 4

Credit Card  
1234567890123412 16 / 16

Phone Number  
999000888 16 / 10

Save Edit

Diagnosis Details

Nos.	Date.	Diagnosis	Doctor	Patient ID
1	04-03-2022	Poor Health	doctor123	134

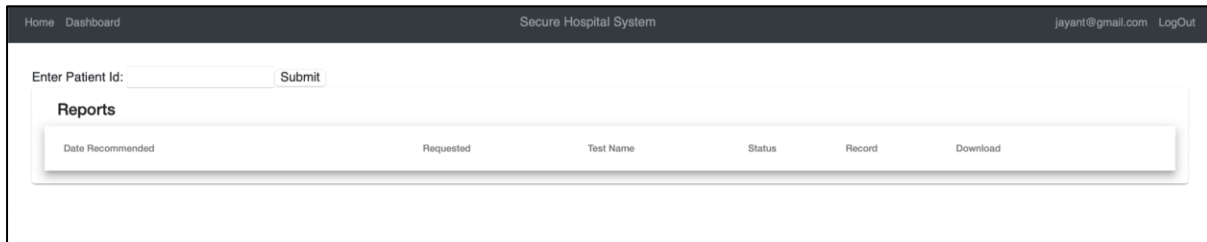
Prescription Details

Nos.	Date.	Prescription	Doctor	Patient ID
1	04-03-2022	Penicillin	doctor123	134

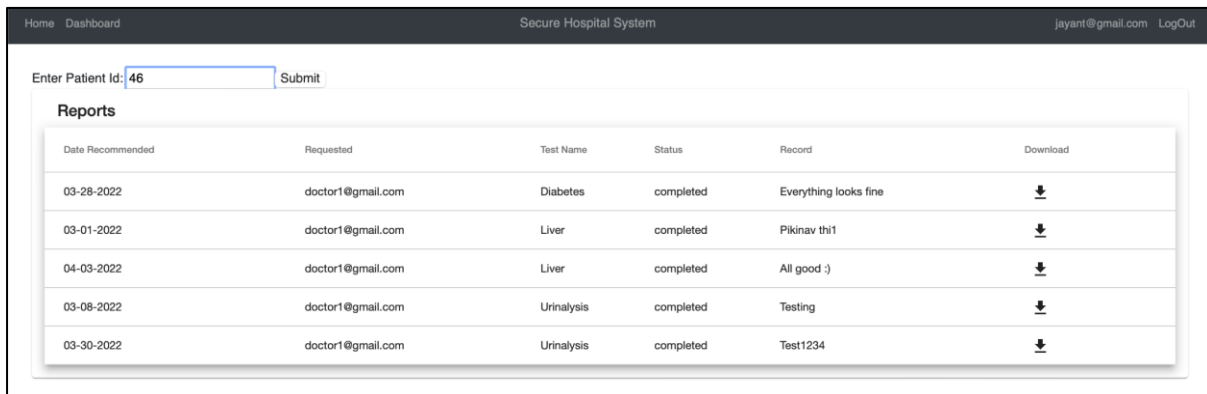
Record Details +

Nos.	Date.	Record	Inputter	Patient ID
------	-------	--------	----------	------------

- Then there is a reports tab which helps to see the reports of the patient after entering the patient id.

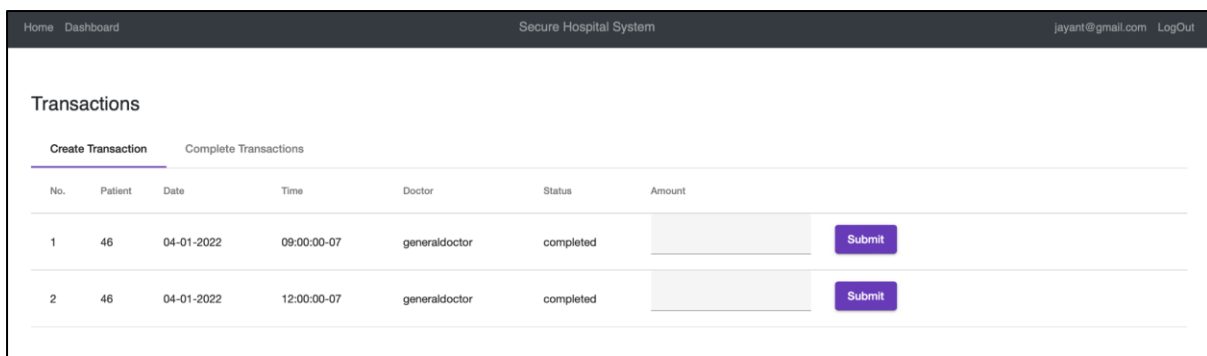


Down below is the screenshot which shows different reports concerning a patient id



Date Recommended	Requested	Test Name	Status	Record	Download
03-28-2022	doctor1@gmail.com	Diabetes	completed	Everything looks fine	<a href="#">Download</a>
03-01-2022	doctor1@gmail.com	Liver	completed	Piknav thi1	<a href="#">Download</a>
04-03-2022	doctor1@gmail.com	Liver	completed	All good :)	<a href="#">Download</a>
03-08-2022	doctor1@gmail.com	Urinalysis	completed	Testing	<a href="#">Download</a>
03-30-2022	doctor1@gmail.com	Urinalysis	completed	Test1234	<a href="#">Download</a>

- Now, we have a payment tab where we have two options: create transaction and complete transaction. First, we can see the create transaction tab. Here, if the appointment with a doctor is confirmed, we can add the respective fee to consult the doctor and submit the transaction request.



No.	Patient	Date	Time	Doctor	Status	Amount
1	46	04-01-2022	09:00:00-07	generaldoctor	completed	<input type="text"/> <a href="#">Submit</a>
2	46	04-01-2022	12:00:00-07	generaldoctor	completed	<input type="text"/> <a href="#">Submit</a>

- Now, we can look at the second tab which is the complete transaction. Here we have the option to complete the transaction upon approval of the appointment with the doctor. The bill is generated, and we will have the option to download and print the bill upon the request of the patient.



Home

Dashboard

Secure Hospital System


jayant@gmail.com

LogOut

Transactions

Create Transaction

Complete Transactions

No.	Patient	Transaction ID	Date	Status	Amount	Approval Action	Generate Bill
1	46	29	04-03-2022	finished_transaction	200		
2	46	31	04-03-2022	completed_transaction	300	✓	
3	1	6	04-01-2022	completed_transaction	75	✓	
4	1	8	04-01-2022	completed_transaction	75	✓	

## 2.4 User: Insurance Staff

The insurance staff has the privileges to manage the Insurance Claims of the patients and also add individual Insurance Policies to any of the required patients. Insurance staff has the access to view, review and validate claim requests received from the patients. They can create new insurance policies and insurance records of patients whenever necessary. They have the power to review the insurance claims and approve/deny any insurance claim.

1. Once logged in as an Insurance Staff member, the staff member has his individual Staff bar in the dashboard, where he can perform all of his activities related to Insurance Claims and Policies.

Home


Dashboard

Secure Hospital System

insur12@gmail.com

LogOut

InsuranceStaff



2. Once he selects the Insurance Staff Bar, they get to choose from the list of tasks they want to perform, such as reviewing new Claims, and also the ability to create new insurance policies.

Under the New Insurances section, they will have all the list of Insurance Claims that have been requested by various patients. The staff will be able to review and verify the Claims requested by the patients. If the staff chooses to deny the request of a particular claim, they can just click on the corresponding 'X' remove it from the list.

Home

Dashboard

Secure Hospital System

insur12@gmail.com

LogOut

New Insurances

Past Approved Insurances

Policies

Create Insurance Policy

Insurance Pending Approval

Transaction Id	Claim Amount	Approval Amount	Claim Request Date	Action
7	100	0	Apr 1, 2022	<div><div>✓</div><div>✗</div></div>
8	100	0	Apr 1, 2022	<div><div>✓</div><div>✗</div></div>
9	100	0	Apr 1, 2022	<div><div>✓</div><div>✗</div></div>
10	100	0	Apr 1, 2022	<div><div>✓</div><div>✗</div></div>
33	0	0	Apr 4, 2022	<div><div>✓</div><div>✗</div></div>

- If the insurance staff choose to approve a particular request, they just need to click on the 'Tick' and a new window pops up where they can enter the amount they wish to approve.

Home

Dashboard

Secure Hospital System

insur12@gmail.com

LogOut

New Insurances

Past Approved Insurances

Policies

Create Insurance Policy

Insurance Pending Approval

Transaction Id	Claim Amount	Approval Amount	Claim Request Date	Action
7	100	0	Apr 1, 2022	<div>✓</div> <div>✗</div>
8	100	0		<div>✓</div> <div>✗</div>
9	100	0		<div>✓</div> <div>✗</div>
10	100	0		<div>✓</div> <div>✗</div>
33	0	0		<div>✓</div> <div>✗</div>

Enter the amount to be approved for the claim

100

↑

↓

Approve

- On approval of insurance claims, it will be moved to the Past Approved Insurances, where they will be able to access the record of all the approved insurance claims. Once the insurance staff approves/denies an insurance request, it gets reflected in the patient profile as well, so that the patient will be able to view the status of their insurance claims.

Home

Dashboard

Secure Hospital System

insur12@gmail.com

LogOut

New Insurances

Past Approved Insurances

Policies

Create Insurance Policy

Approved Insurances

Transaction Id.	Claim Amount	Approval Amount	Claim Request Date	ApproverID
1	75	65	Jan 31, 2022	8
2	70	34	Jan 31, 2022	8
3	5	0	Feb 4, 2022	8
4	75	75	Mar 26, 2022	8
5	100	24	Mar 30, 2022	8
20	20	20	Apr 2, 2022	8
21	100	100	Apr 3, 2022	106
22	200	200	Apr 3, 2022	106
30	20	0	Jan 1, 2020	129
6	100	100	Apr 1, 2022	129

- The Policies section contains all the records of the insurance policies associated with the patients. This lets the insurance staff an estimate of how much amount they can approve for an insurance claim.

Home

Dashboard

Secure Hospital System

insur12@gmail.com

LogOut

New Insurances

Past Approved Insurances

Policies

Create Insurance Policy

Past Policies

Policy ID	Patient ID	Amount	Policy Details
2	2	1000	checkup
3	2	1000	checkup
4	46	1000	chechup
5	1	12346	checkup
6	46	12345	checkout
7	1	7645	checkoupt
8	46	2000	surgery
9	2	50000	New testing
10	1	1234	12345

- Under the Create Insurance Policy section, the staff will be able to create new insurance policies for patients based on their requirements and eligibility.

Home Dashboard Secure Hospital System insur12@gmail.com LogOut

New Insurances Past Approved Insurances Policies Create Insurance Policy

**Create Policies**

Patient ID \*  
134

Policy Amount \*  
10000

Policy Details \*  
checkup

Save

Error the policy already there for the patient

## 2.5 User: Lab Staff

Login to the SHS webpage with the user role as lab staff. Below is the functionality and navigation through the lab staff user.

1. After logging in as a lab staff, this is the dashboard the lab staff will have access to:

Home Dashboard Secure Hospital System lab07@gmail.com LogOut

Lab Requests Reports Diagnosis

2. After going into the lab requests, we can see all the pending lab requests that were requested by the doctor. Now, the lab staff will have the option to approve those requests they get from the doctors for patients.

Home

Dashboard

Secure Hospital System

lab07@gmail.com

LogOut

Pending Lab Requests

No.	Patient	Date	Recommender	Test Name	Action
1	46	03-29-2022	doctor1@gmail.com	Urinalysis	<div><div></div><div></div></div>
2	46	03-31-2022	doctor1@gmail.com	Urinalysis	<div><div></div><div></div></div>
3	46	04-02-2022	doctor1@gmail.com	Complete Blood Count	<div><div></div><div></div></div>
4	46	03-31-2022	doctor1@gmail.com	Complete Blood Count	<div><div></div><div></div></div>
5	46	04-01-2022	doctor1@gmail.com	Complete Blood Count	<div><div></div><div></div></div>
6	46	03-08-2022	doctor1@gmail.com	Diabetes	<div><div></div><div></div></div>
7	46	03-31-2022	doctor1@gmail.com	Diabetes	<div><div></div><div></div></div>
8	46	04-02-2022	doctor1@gmail.com	Diabetes	<div><div></div><div></div></div>
9	46	06-23-2022	Shashank	Ila katha mafilia	<div><div></div><div></div></div>
10	101	04-01-2022	generaldoctor	X-Ray	<div><div></div><div></div></div>

- After the lab staff approves the pending requests, it is moved to the report section of the lab staff, where the lab staff have to fill in the details depending on the status of the lab test that is performed. Down below is the report section of the lab staff where they can edit and update the status of the test. Once the report is finalized, the lab staff will have the option to download the report.

Home

























Dashboard

Secure Hospital System

lab07@gmail.com

LogOut

Reports

No.	Patient	Date Recommended	Requested	Test Name	Status	Date Completed	Record	Created By	Action	Download
1	2	03-10-2022	doctor3	COVID test	completed	03-28-2022	Negative	7	 	
2	46	03-28-2022	doctor1@gmail.com	Diabetes	completed	04-02-2022	Everything looks fine	96	 	
3	46	03-01-2022	doctor1@gmail.com	Liver	completed	09-22-2022	Piknav thi1	96	 	
4	46	04-03-2022	doctor1@gmail.com	Liver	completed	04-03-2022	All good :)	96	 	
5	46	03-08-2022	doctor1@gmail.com	Urinalysis	completed	03-31-2022	Testing	96	 	
6	46	03-30-2022	doctor1@gmail.com	Urinalysis	completed	03-31-2022	Test1234	96	 	
7	133	04-03-2022	doctor123	Complete Blood Count	completed	04-03-2022	looks good	130	 	
8	134	04-03-2022	doctor123	Complete Blood Count	completed	04-03-2022	looks good	130	 	

- In the action bar of the report, we have three sections which is status, date and the record which can be edited by the lab staff whenever possible.

The screenshot shows the 'Reports' section of the 'Secure Hospital System'. A table lists patient reports with columns: No., Patient, Date Recommended, Requested, Test Name, Status, Date Completed, Record, Created By, Action, and Download. A modal form is open over the table, allowing updates to a specific report. The modal contains fields for Status (set to 'completed'), Date Completed (set to '3/28/2022'), and Record (set to 'Negative'). 'Save' and 'Cancel' buttons are at the bottom of the modal.

No.	Patient	Date Recommended	Requested	Test Name	Status	Date Completed	Record	Created By	Action	Download
1	2	03-10-2022	doctor3	COVID	Negative			7		
2	46	03-28-2022	doctor1@gmail.com	Diabet	completed		Everything looks fine	96		
3	46	03-01-2022	doctor1@gmail.com	Liver			Pikinav thi1	96		
4	46	04-03-2022	doctor1@gmail.com	Liver			All good :)	96		
5	46	03-08-2022	doctor1@gmail.com	Urinaly			testing	96		
6	46	03-30-2022	doctor1@gmail.com	Urinaly			test1234	96		
7	133	04-03-2022	doctor123	Compi			looks good	130		
8	134	04-03-2022	doctor123	Compi			looks good	130		

- Another functionality of the lab staff is diagnosis, where the lab staff has the option to view the patient diagnosis. After, clicking the diagnosis tab in the dashboard we will be asked for a patient id.

The screenshot shows the 'Diagnosis' section of the 'Secure Hospital System'. It features a simple form with a label 'Enter Patient Id:' followed by a text input field and a 'Submit' button.

- After entering the patient id, the diagnosis data of the patient given by the doctor is available for the lab staff for viewing.

Home Dashboard

Secure Hospital System

lab07@gmail.com

LogOut

Enter Patient Id: 46

Submit

Diagnosis Details

Nos.	Date.	Diagnosis	Doctor	Patient ID
1	03-08-2022	132312		46
2	03-29-2022	Covid		46
3	03-28-2022	Testing		46
4	03-30-2022	1223123		46
5	03-01-2022	23423423		46
6	04-03-2022	Liver Failure		46
7	03-31-2022	DGFG		46
8	04-02-2022	Has issue with back pain		46
9	04-01-2022	Sup		46
10	05-30-2022	leg Problem		46
11	03-31-2022	Alive		46

Screenshot

## 2.6 User: Admin

The administrator role has all the highest privileges on the application, as he can create, edit, and delete any records, must authorize transactions, and has access to all log files. The admin is responsible for the smooth functioning of the hospital system.

1. After logging in to his profile a dashboard as below is displayed, where he can navigate to the respective pages.

Home Admin Board User		Secure Hospital System		admin_1@gmail.com	LogOut
Registration		Profiles		Pending Transactions	
Appointments		Records		User Profile	
				Reports	
Diagnosis		Prescription			

- When the admin navigates to the “Registration” page, he will be able to register a employees of the hospital like doctor, lab staff, insurance staff, hospital staff by providing their details

### Registration

Name

Email

Password

Role

Doctor
▼

Sign Up

- Admin can edit the profiles of the employees by navigating to the profiles page












All Users					
No.	User ID	Name	Email	Account Type	Action
1	0	generaldoctor	fake_email@gmail.com	doctor	✕
2	1	user1	user1@gmail.com	patient	✕
3	2	user2	user2@gmail.com	patient	✕
4	3	doctor1	user3@gmail.com	doctor	✕
5	4	doctor2	user4@gmail.com	doctor	✕
6	5	doctor3	user5@gmail.com	doctor	✕
7	6	hstaff	user6@gmail.com	hospital_staff	✕
8	7	lstaff	user7@gmail.com	lab_staff	✕
9	8	istaff	user8@gmail.com	insurance_staff	✕
10	9	admin	user9@gmail.com	admin	✕
11	12	shashank	shasankrddy@gmail.com	admin	✕
12	19	shash1	shash1@gmail.com	admin	✕
13	20	shash2	shash2@gmail.com	patient	✕
14	21	shash3	shash3@gmail.com	patient	✕

- Admin should approve transactions by navigating to the transactions page



Transactions						
View Transactions						
No.	Patient	Transaction ID	Date	Status	Amount	Approval Action
1	46	44	04-04-2022	approved_transaction	1000	

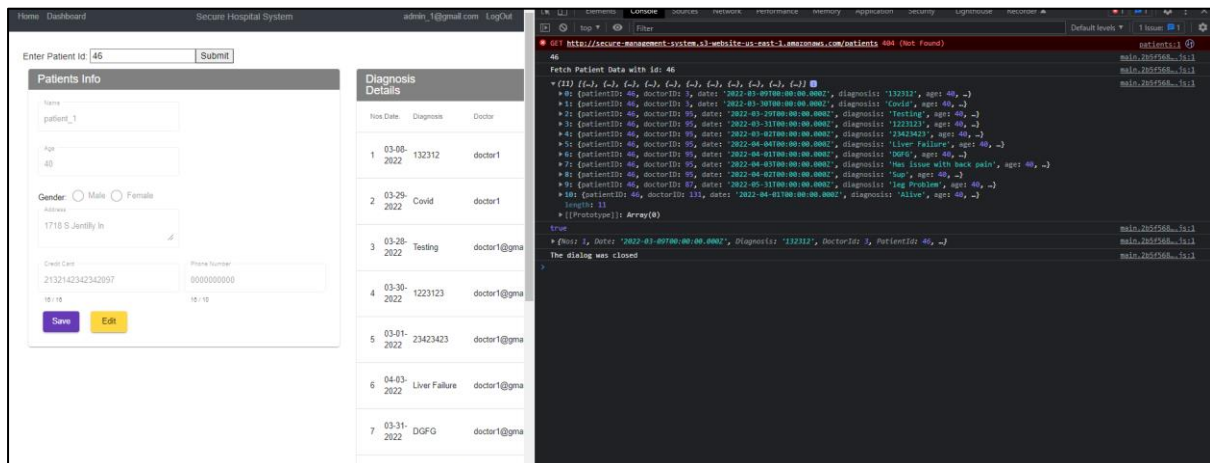
5. The admin can take action on appointments by navigating to the “appointments” page

Appointments						
View Pending Appointments						
No.	Patient	Date	Time	Doctor	Status	User Profile
1	101	04-29-2022	12:00:00-07	generaldoctor	requested	
2	46	04-19-2022	13:00:00-07	doctor1	requested	
3	46	04-17-2022	08:00:00-07	generaldoctor	completed	
4	46	04-08-2022	09:00:00-07	generaldoctor	denied	
5	46	04-07-2022	13:00:00-07	doctor3	approved_transaction	
6	99	04-07-2022	08:00:00-07	doctor3	approved_transaction	
7	46	04-02-2022	12:00:00-07	generaldoctor	requested	
8	101	04-01-2022	11:00:00-07	generaldoctor	requested	
9	101	04-01-2022	08:00:00-07	generaldoctor	requested	
10	46	04-01-2022	11:00:00-07	doctor2	requested	
11	101	04-01-2022	14:00:00-07	generaldoctor	requested	

6. The admin can access patient profiles and update each of their prescriptions, diagnosis, and records by providing the patient's id

Enter Patient Id:

## 7. System Logs: Admin can access and view the system log files.



The screenshot displays the SHS interface. On the left, the 'Patients Info' section shows a form for patient details, including Name (patient\_1), Age (40), Gender (Male), Address (1718 S. Jendly Ln), and a 'Submit' button. The 'Diagnosis Details' section shows a table of diagnoses for patient 46.

No.	Date	Diagnosis	Doctor
1	03-08-2022	132312	doctor1
2	03-29-2022	Covid	doctor1
3	03-28-2022	Testing	doctor1@gmail
4	03-30-2022	1223123	doctor1@gmail
5	03-01-2022	23423423	doctor1@gmail
6	04-03-2022	Liver Failure	doctor1@gmail
7	03-31-2022	DGFG	doctor1@gmail

On the right, a terminal window shows the system log for patient 46, displaying a list of diagnoses and their corresponding dates and doctors.

```


Fetch Patient Data with Id: 46
[{"id": 46, "name": "patient_1", "age": 40, "gender": "Male", "address": "1718 S. Jendly Ln", "diagnosis": "132312", "date": "2022-03-08T00:00:00.000Z", "doctor": "doctor1"},
{"id": 46, "name": "patient_1", "age": 40, "gender": "Male", "address": "1718 S. Jendly Ln", "diagnosis": "Covid", "date": "2022-03-29T00:00:00.000Z", "doctor": "doctor1"},
{"id": 46, "name": "patient_1", "age": 40, "gender": "Male", "address": "1718 S. Jendly Ln", "diagnosis": "Testing", "date": "2022-03-28T00:00:00.000Z", "doctor": "doctor1@gmail"},
{"id": 46, "name": "patient_1", "age": 40, "gender": "Male", "address": "1718 S. Jendly Ln", "diagnosis": "1223123", "date": "2022-03-30T00:00:00.000Z", "doctor": "doctor1@gmail"},
{"id": 46, "name": "patient_1", "age": 40, "gender": "Male", "address": "1718 S. Jendly Ln", "diagnosis": "Liver Failure", "date": "2022-04-03T00:00:00.000Z", "doctor": "doctor1@gmail"},
{"id": 46, "name": "patient_1", "age": 40, "gender": "Male", "address": "1718 S. Jendly Ln", "diagnosis": "DGFG", "date": "2022-03-31T00:00:00.000Z", "doctor": "doctor1@gmail"}]
  
```

## 4. Security Workflow

### 4.1 Login to SHS

Login page to for the secure hospital system.


Login



Email Id


Password

☐ I'm not a robot

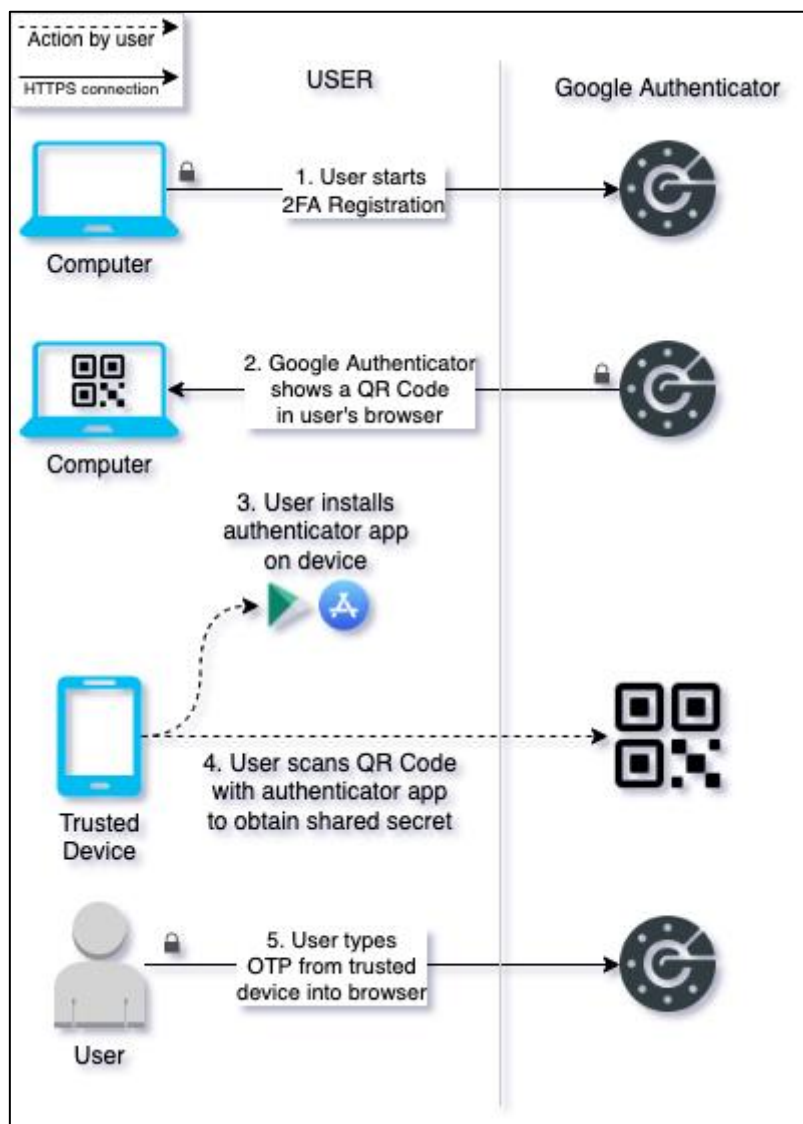


reCAPTCHA  
Privacy - Terms

Login

<div style="text-align: center;"> <p>2-Step Verification</p>  <p>Enter the Verification code generated by your Google Authenticator Application</p> <input type="text"/> <p>Submit</p> </div>	
--	--

Below diagram describes the process flow of the user login authentication.




## 4.2 User Registration

The user can click on the Signup page on top right corner and it will redirect to Registration page.

1. User needs to fill in all details with unique email id which is not already present.

Secure Hospital System Sign Up

Registration



Name

Email

Password

Address

Mobile Number

Age

Gender

Credit Card Number


Sign Up

2. Click on Sign up which would take him to the registration of 2FA and the scan the QR code and click Submit.

Secure Hospital System

Setup TFA

Scan the QR code in the Google Authenticator



Auth Type - Time Based - OTP

Submit


## 4.2 Setup 2FA

Setup the 2 Factor Authentication using Google Authenticator for secure Login.

1. Install the Authenticator app by Google from the Play Store (Android) or from the AppStore (IOS).
2. We need to link the Website Login with the Google Authenticator during registration.
3. On the Registration page, once the user enters the details and clicks the Sign-Up Button, a unique QR code will be generated which is used to link the user with the Google Authenticator

Setup TFA

Scan the QR code in the Google Authenticator

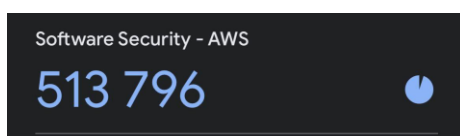


Auth Type - Time Based - OTP

Submit

Note\*: This is a onetime generated QR Code, please make sure to scan it.

4. Now, scan the QR code using the Google Authenticator app. On scanning, the app starts to generate the new code every 30 seconds.



5. Enter the code within the timeframe into the website to initiate a secure login.