# GUJARAT TECHNOLOGICAL UNIVERSITY

Chandkheda, Ahmedabad

Affiliated


## G H PATELCOLLEGE OF ENGINEERING & TECHNOLOGY

**A Project Report**

**On**

# Electronic Health Records

B. E. IV, Semester – VII

## COMPUTER ENGINEERING

Submitted by:

Group:28070d

**1. Prit Patel (140110107047)**

Internal Guide:

**Prof. Krushna Pandit**

Head of the Department:

**Dr. Maulika Patel**

Academic Year

(2017-2018)

# AKNOWLEDGEMENT

In performing our project, we had to take help and guideline of some respected persons, who deserve our greatest gratitude. The completion of this assignment gives us much pleasure. We would like to show our gratitude to **Prof. Krushna Pandit, G H PATEL COLLEGE OF ENGINEERING AND TECHNOLOGY** for giving us a worthy guideline for assignment throughout numerous consultations. We would also like to expand our deepest gratitude to all those who have directly and indirectly guided us in doing this project.

In addition, a thank you to **Prof. Priyang Bhatt**, who introduced us to the Methodology of Work, and whose passion for the "*PROJECT*" has lasting effect. We also thank the G H PATEL COLLEGE OF ENGINEERING AND TECHNOLOGY for consent to include copyrighted pictures as a part of our paper. Many people, especially our classmates and team members itself, have made valuable comment suggestion on this proposal which gave us an inspiration to improve our project. We thank all the people for their help directly and indirectly to complete our project.

We would also like to thank our Department of Computer Engineering to kindly support us in performing and evaluating this project.

Thanking you,

Prit Patel

# CERTIFICATE

This is certifying that **Mr. Prit Patel** of Computer Engineering fourth year 8th Semester, Enrolment number: **140110107047** respectively has satisfactorily completed his term work in project (2180706) under the title **"Electronic Health Record"**for the term ending April 2018.

Date:

Guide By: Head CE Dept.

Prof. Krushna Pandit Dr. Maulika Patel

# GUJARAT TECHNOLOGYCAL UNIVERSITY

## UNDERTAKING ABOUT ORIGINALITY OF WORK

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Team:

| Name of Student | Enrollment number | Signature |
|---|---|---|
| Prit N Patel | 140110107047 | |

Place: Anand Date: _____

Name of Guide: Prof. Krushna Pandit

Signature of Guide:_____

# ABSTRACT

Electronic Medical Records are now creating significant impact on healthcare practices than ever before. Even though most of the reasons for implementing EMRs focus on improving medical care as a whole, individual should also consider the effective increased EMR use may have been at the level of the patient physician encounters.

Software's of ERMS are changing rapidly. Some healthcare organizations do not understand some functions of EMRs, even though they have many functionalities and uses which can be used to improve the relationship between patient and physician and the quality of patient's healthcare.

EMR stores approximately all the medical history of the patient maintained by patient and at the central database as well, which can be used in future to take care of the patient. Storing the medical records electronically can reduce the paper work, which can also be time efficient. EMR can contain the records such as x-Ray, medicines, physician consulted, family history etc.

# INDEX

# CHAPTER 1: INTRODUCTION

## 1.1 PROJECT SUMMARY

EHR is an App for electronic medical record. It is compatible with any android phone owned by the patient, and contains entire medical record. It is tamperproof it is infinitely more HIPPA compliant compared to current system and it is patient controlled. It is a cloud/web based system with a simple word platform. EHR is designed to empower the patient to control their own healthcare by providing state of the art medical information at their fingertips.

EHR is designed to restore the sanctity of patient physician relationship and reduce the influences of third parties such as insurance and government regulations from day to day patient care. Currently such interferences are causing havoc resulting in severely frustrated healthcare providers and nurses leading to poorer outcomes and patient satisfaction.

EHR is designed so the physician time with the patient will increase substantially. Under current system providers are barely able to spend few minutes with the patient face to face while spending twice the time completing paperwork and documentation that has nothing to do with patient's healthcare however it is imposed upon them because of regulatory mandates. With implementation of EHR providers will be able to spend almost 90% of their time with the patient face to face which will result in tremendous patient satisfaction and improved outcomes.

EHR is designed to eliminate redundancy from nurse’s work which is burdened with need for unnecessary documentation, and repetitious robotic duties. Nurses will truly be able to focus on what they are trained to do which is "to take care of the patient" and assist physician to achieve best outcome for each and every patient. Data is easily transferred from one chart to the other and there is no need for faxing and copying. Happy nurses and happy staff!! Any information such as recent ER visits, hospital visits, different provider visits, all the tests done, will be instantly available wherever the patient is. This would prevent duplication of the testing, redundancy of duplicate records at multiple places and virtually will create a paperless environment in a true sense.

Each time App Is opened during the visit by a provider, a simple word page will open. On the left side of the page there is a vertical column which will have different folders. Starting on the top with demographics, past history, family history, social history, vaccinations, Physical examination, Labs are, X-rays and so on. Folders with names of the different physicians-patient is seeing. Under each physician folder tab visits will be listed in chronological order with dates.

Patient will have control over each of these tabs to lock or unlock. The data from the patient's device to physician's device can be transferred via a NFC (Near Field Communication) or authentication using a QR code will be done and then the secure data transfer will occur.

## 1.2 AIM AND OBJECTIVE OF THE PROJECT

The main purpose behind of this project will be to create a medium where all the medical records of the patient will be store centrally in a data base and even in the user's smart phone, which will reduce the paper work. EHR is designed to restore the sanctity of patient physician relationship and reduce the influences of third parties such as insurance and government regulations from day to day patient care. Currently such interferences are causing havoc resulting in severely frustrated healthcare providers and nurses leading to poorer outcomes and patient satisfaction.

EHR is designed so the physician time with the patient will increase substantially. Under current system providers are barely able to spend few minutes with the patient face to face while spending twice the time completing paperwork and documentation that has nothing to do with patient's healthcare however it is imposed upon them because of regulatory mandates. With implementation of EHR providers will be able to spend almost 90% of their time with the patient face to face which will result in tremendous patient satisfaction and improved outcomes. EHR is designed to eliminate redundancy from nurse's work which is burdened with need for unnecessary documentation, and repetitious robotic duties. Nurses will truly be able to focus on what they are trained to do which is "to take care of the patient" and assist physician to achieve best outcome for each and every patient.

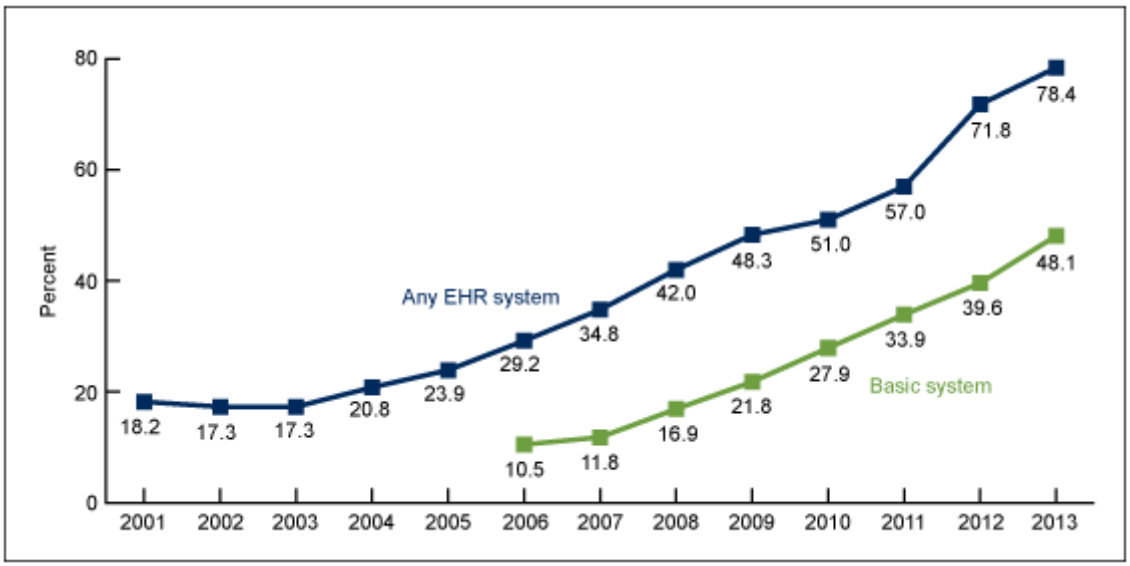
## 1.3 PROBLLEM SPECIFICATION

This project ensure that the patients important data will be securely stored at the central data base and in patient's smartphone. Authentication techniques will be adopted to ensure that the data to be transferred is valid.

Patient will have a control on what data to share and what not to. User must be able to fetch all the data from the database when required without any data lose. Implementing this project will reduce the paper work and will store the data digitally. Doctors will be able to give their precious time to patients, which will improve the patient doctor relation.

## 1.4 BRIEF LITERATURE REVIEW

There Several evidence-based reviews that conclude some types of health information technology (IT), particularly electronic health records (EHRs) with advanced functionalities, have reduced medication errors and improved care processes, adherence to evidence-based guidelines, patient engagement, and patient satisfaction. Despite these many potential benefits, health care providers were initially slow to adopt EHRs. Around 2008, approx. 1.6 percent of non-federal acute care hospitals reported having a comprehensive EHR system and 7.7 percent had a basic EHR systems. Similarly, approximately 18 percent of office-based physicians used an EHR that met the criteria of a basic system in 2008. The basic purpose of this literature review is to provide examples of how organizations are implementing and optimizing the use of health EHRs from peer-reviewed publications and the gray literature by examining the context and organization specific factors, barriers and facilitators, and "lessons learned" associated with the successful implementation and optimal use of EHR systems.




**Percentage of office based EHR physician with EHR System: US 2001-2013**

## 1.5 MATERIAL / TOOLS REQUIRED

- The project will be developed using Android Studio which is a API for downloading android apps.
- SQL Server to connect android app with database.
- Inbuilt database to store user personal data.
- QR Code
- Bluetooth/Wi-Fi for data transfer.

# CHATER 2: REQUIREMENT ANALYSIS

## 2.1 Feasibility study

### Legal Feasibility

The proposed parking system will not only accumulate but also process and store sensitive data such as credit card information. The information is significant in processing the financial transactions when the customers are paying the parking fees. Such information is also considered personally identifiable as it can be used in uniquely identifying the clients utilizing the parking. In the present age, there are a lot of malicious individuals looking to secure access to such information for their personal gain. Privacy rules or data protection acts, such as HIPAA and PCIDSS, require all companies handling complex information to do with a lot of attention so as to protect the identity and funds of their customers. As a result, adequate measures have to be taken to ensure that the new system is secure so as to protect the clients' identity as well as from other losses in the event of and attack.

### Operational Feasibility

The new system will not only solve the issues related to the existing system but also feat on the chances present. Some of the problems related the existing system include; first time customers find it hard in locating parking areas when they arrive at the airport, issues with identifying the most suitable parking, entering full parking lots then having to find new lots, and use of paper tickets which are also easily misplaced by the customers. The new system is predictable to solve these problems and capitalize on the market prospects. The airport's parking hence increasing the revenue produced due to the fact that eliminating these issues will encourage more customers to utilize the services provides this. The new system will also fit with the existing business situation hence optimizing the performance of the parking hence enabling it attain its objectives. This is due to the fact that the new system will be able to integrate and co-exist with the current system.

### Economic Feasibility

The proposed or new system will add a lot of economic value to Developers. Basing on the given information, there are no exact figures on the amount of income generated by the parking. However, there is data indicating the faults of the current system, which discourage some customers from utilizing the parking. The new system will alleviate the faults of the current system hence retaining the old and attracting new customers. The new system will turn the old customers into repeat or loyal customers who will always be utilizing the parking despite increased rivalry, changes in prices or economic conditions. As a result, the parking will always be generating high proceeds and retain profitability. The new system will also enable the parking to attract new customers who will help in maximizing the revenue.

### Technical Feasibility

The current system collects processes and stores many customer data utilized in the day-to-day actions of the parking. However, the current system is related to various faults. This is due to the fact that some of the customers have issues with discover parking areas, identify most suitable parking and also lose their paper tickets. Therefore, the new system requires a good infrastructure both hardware and software to enable it overcome these challenges successfully. The software has to be able to process the big data due to the large number of customers while

the hardware has to be able to store the large data. The airport also needs technically skilled staff so as to operate the IT infrastructure utilized by the parking. Good it infrastructure and technically skilled employees will ensure that services are not interrupted.

## 2.2 USER CHARACTERISTICS

The end users of this system would be the Physicians, Patients, Technicians, Database Administrator, Developer, Employee.

1. **Physicians:** - Will be able to fetch particular patient's data and treat them. Unique patient ID will be used by the physician to retrieve the data. Physicians will have a privilege to update the patient's data.
2. **Patients:** - Will be able to manage their medical history store in a central data base and internal database as well. Patient will be able to give feedback.
3. **Technicians:** - Will provide technical support in case system faces any technical issues.
4. **Administrator**: - Will have all the privilege to access the data and can use all the functionality of the system.
5. **Developer:** - Will provide technical software updates to the application if required.
6. **Employee:** - Will not have all the functionalities. Employee will not have the privilege to update the patient's data.

## 2.3 HARDWARE AND SOFTWARE REQUIREMENT

### Hardware Requirements

- External Database
- CPU type: Intel Pentium 4
- Clock Speed: 3.0GHZ
- Ram Size: 512 MB
- Hard Disk Capacity: 40 GB
- Mobile: Android Mobile

### Software Requirements

- Operating System: Android
- The Android SDK

- Apache Ant
- Android Operating System in Smart Phone

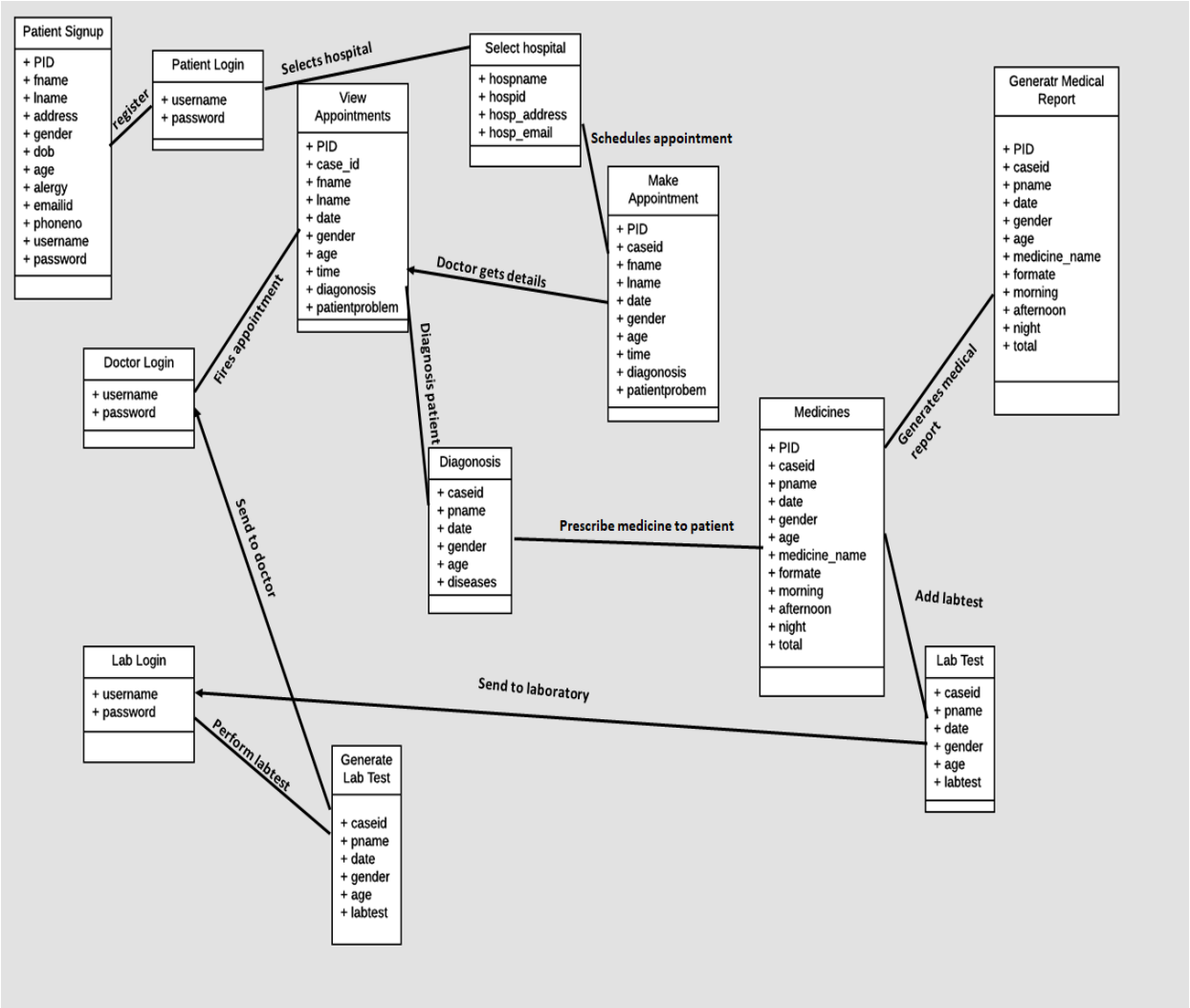
## 2.4 TOOLS AND TECHNOLOGY

- PHPStroam
- Mysql Database
- APIs

# CHAPTER 3: SYSTEM DESIGN

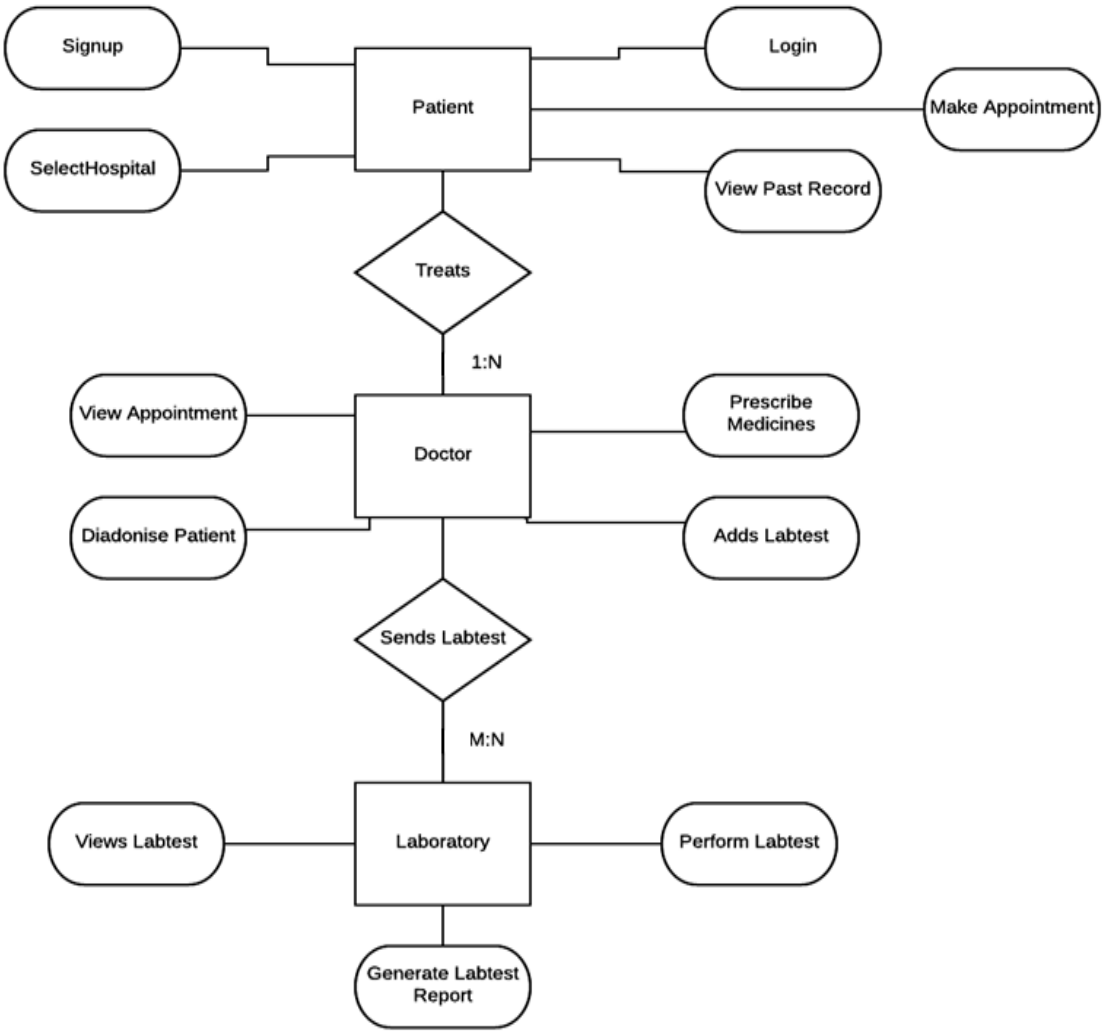
## 3.1 CLASS DIAGRAM

**Class Diagram of EHR**




(Class Diagram)

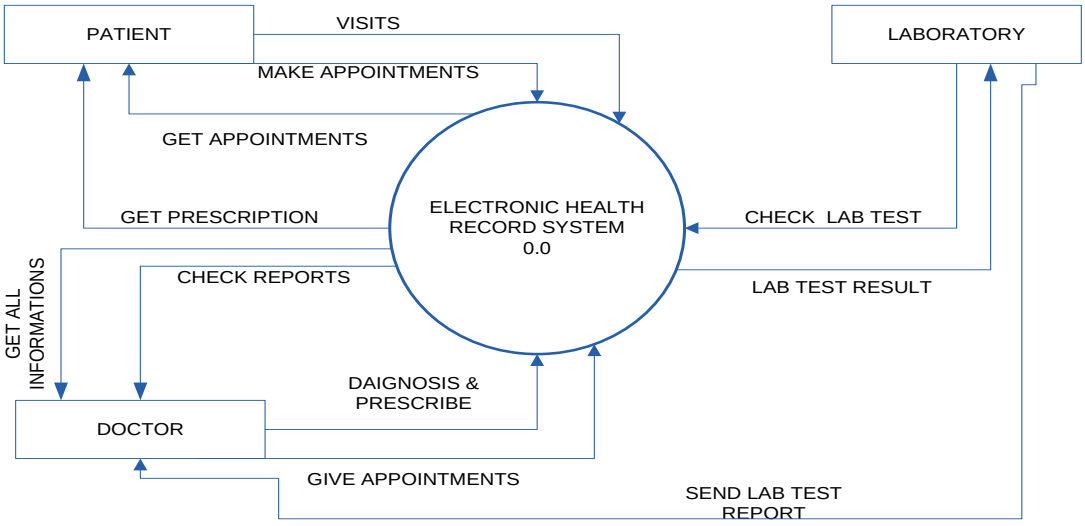
## 3.2 E-R DIAGRAM




(E-R Diagram)

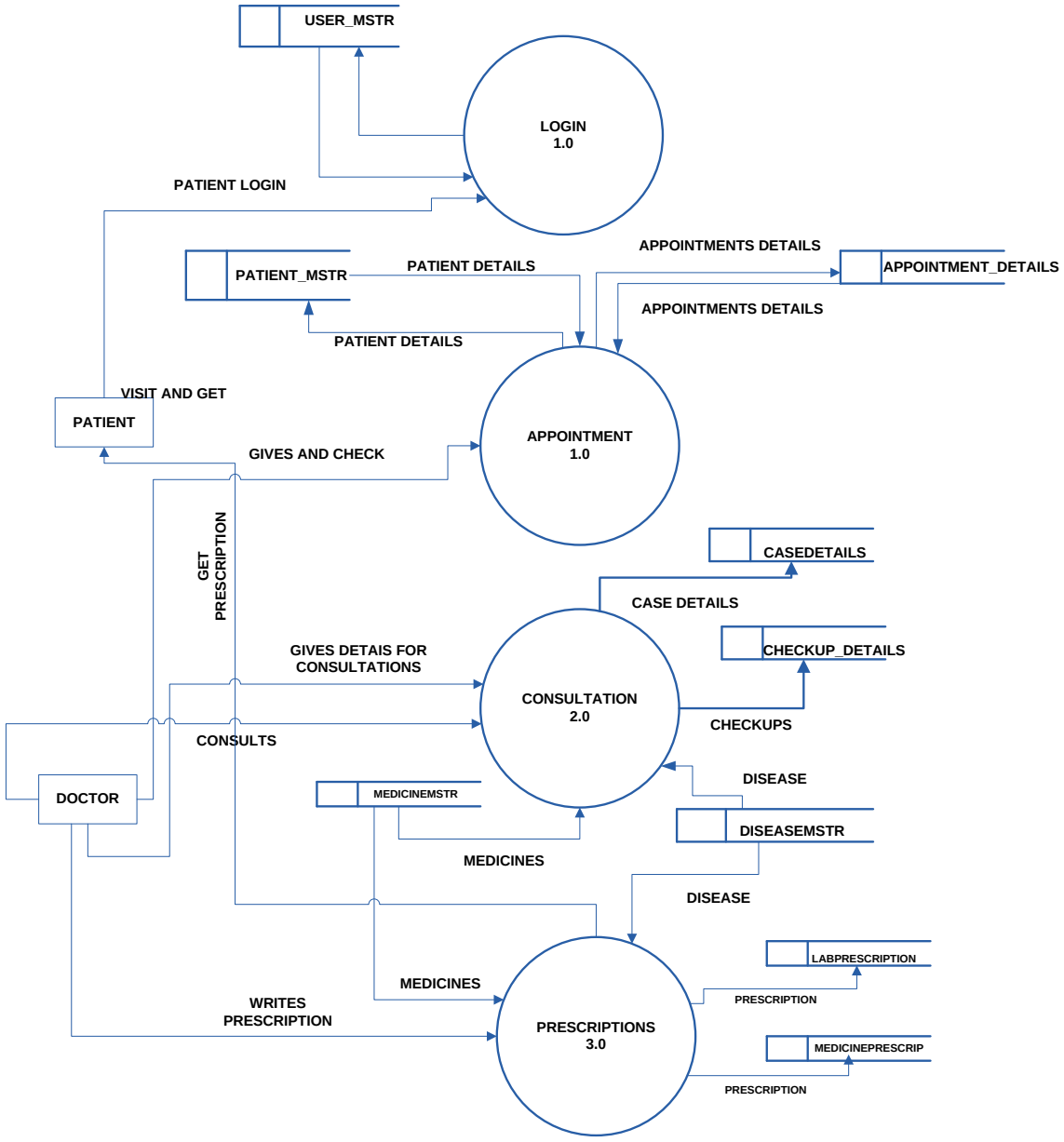
## 3.3 DATA FLOW DIAGRAM(DFD)

**EHR System DFD Diagram**



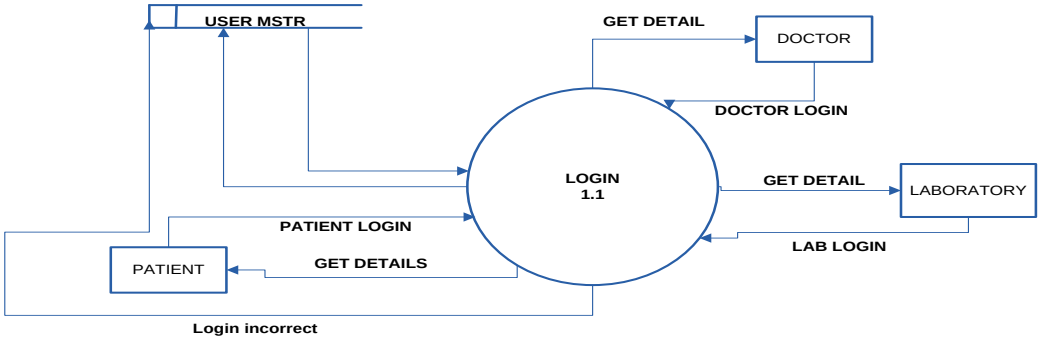

LEVEL-0 DFD

(DFD Level-0)

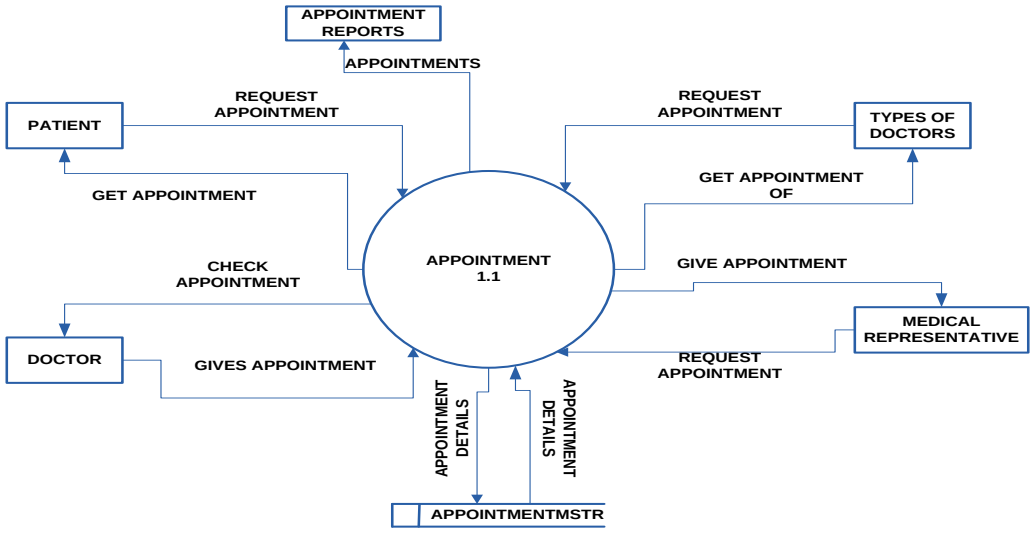



# FIRST LEVEL DFD

(DFD Level-1)

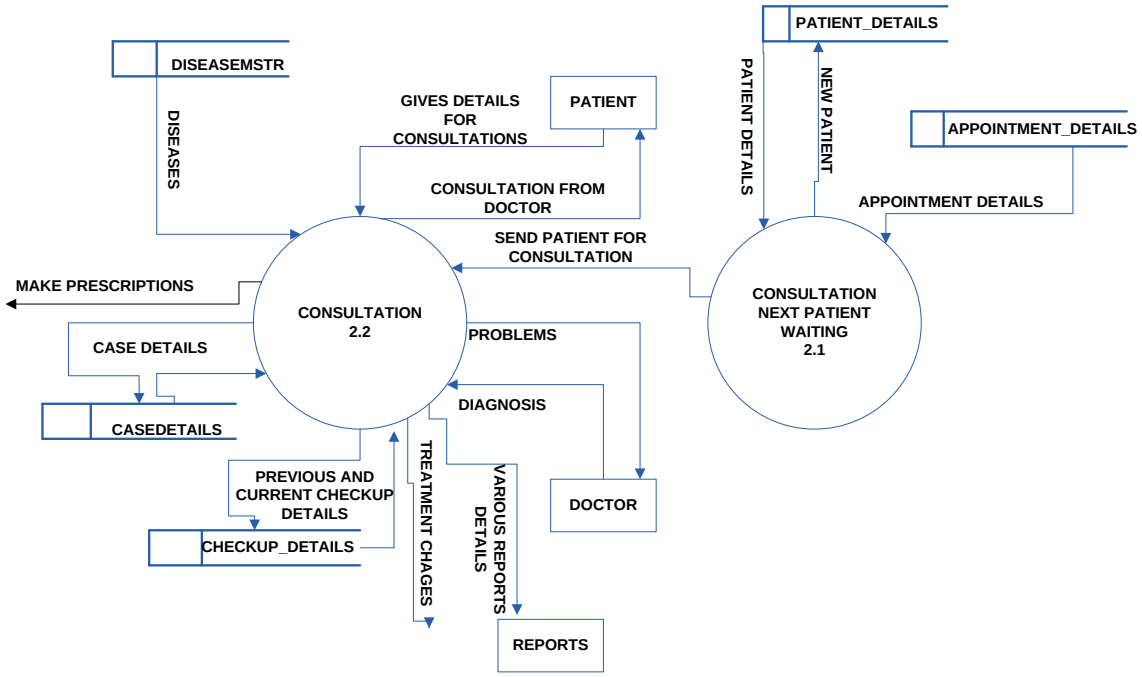



LEVEL-2 DFD FOR LOGIN

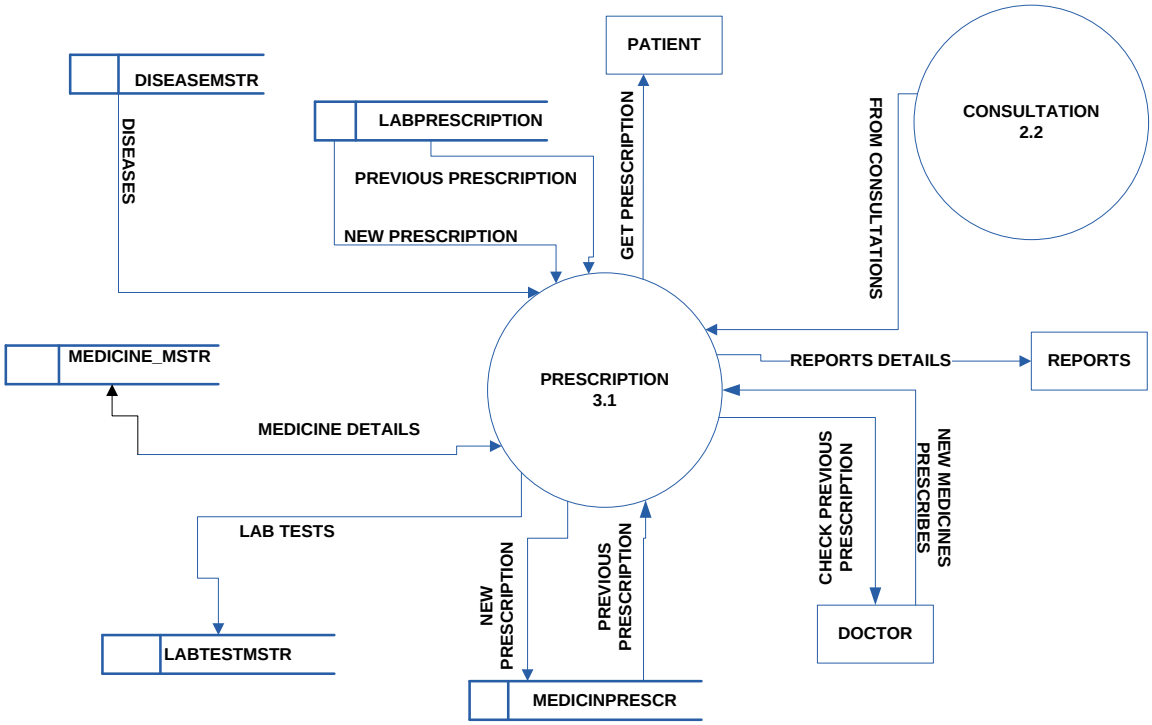



LEVEL-2 DFD FOR APPOINTMENT

(DFD Level-2)




LEVEL 2 DFD FOR CONSULTATION

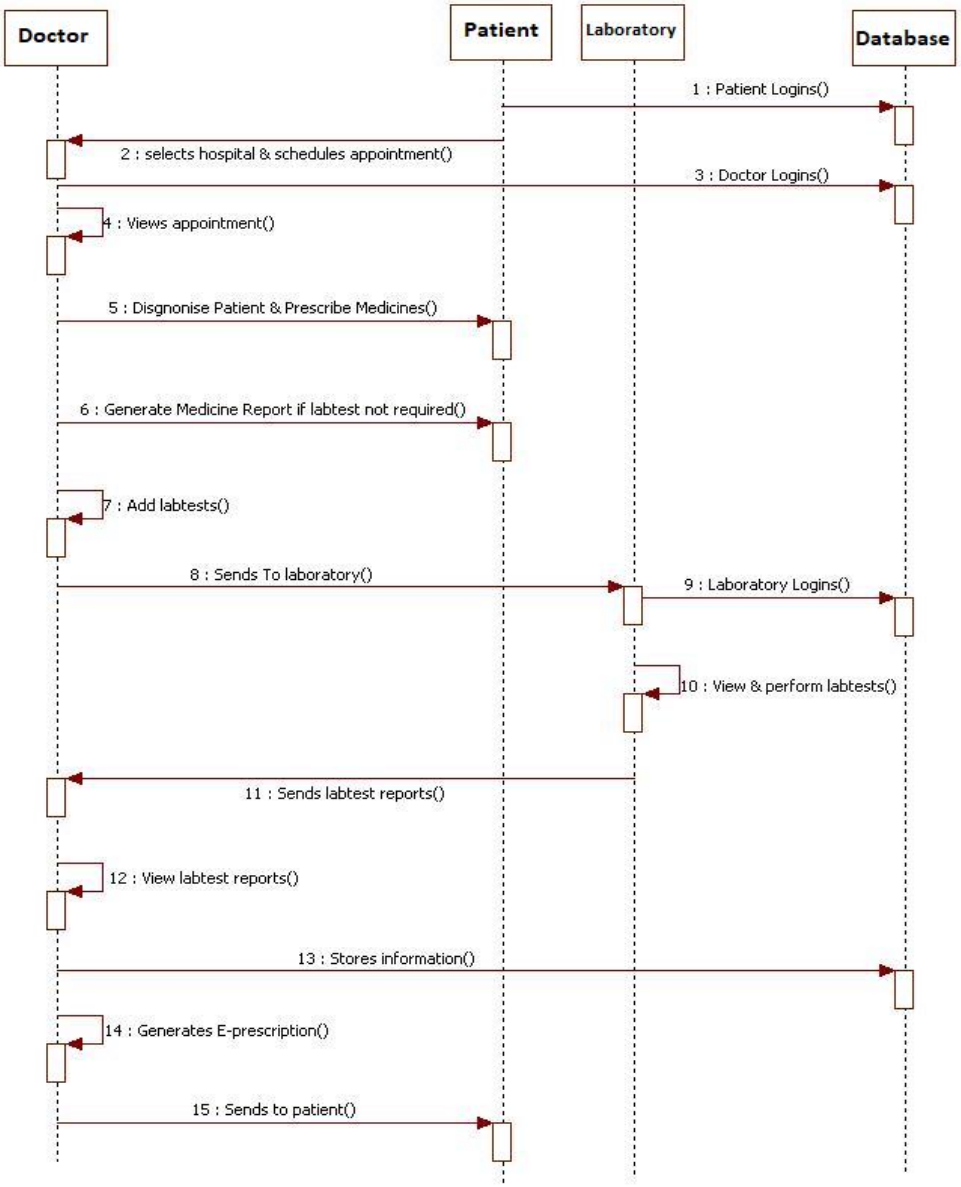



# LEVEL 2 DFD FOR PRESCRIPTION

(DFD level-2)

## 3.4 SEQUENCE DIAGRAM

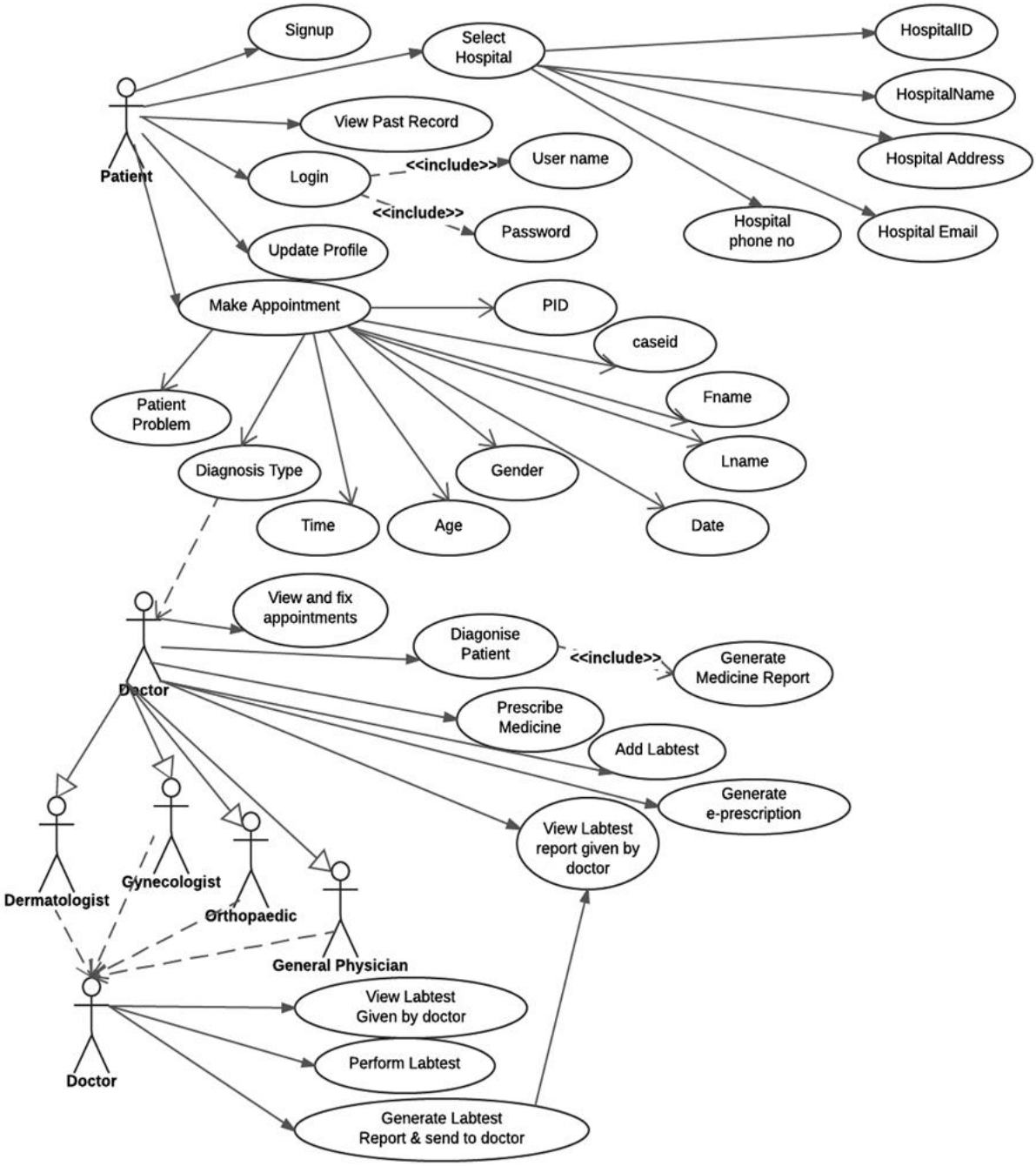
**SEQUENCE DIAGRAM FOR EHR SYSTEM**




(Sequence Diagram)

## 3.5 USE CASE DIAGRAM

**USE-CASE DIAGRAM FOR EHR SYSTEM**




(Use Case Diagram)

# CHAPTER 4: DATA DICTIONARY

**Table: User_Login_Table**

| Filename | Datatype | Description | Constraint |
|---|---|---|---|
| UID | Int(50) | Primary | Unique Key_AInc |
| User Name | Varchar(50) | | PK |
| Password | varchar | | - |
| CreateDateTime | | | |
| UpdateDateTime | | | |
| Status | Varchar(50) | | |
| Active | Varchar(50) | | |
| Type | Varchar(50) | | |
| | | | |

**Table:Use_Info_Table**

| Filename | Datatype | Description | Constraint |
|---|---|---|---|
| User_Info_Id | Int(50) | Primary | Unique Key_AIn |
| User_Name | Varchar(50) | | Foreign key |
| Full Name | Varchar(50) | | |
| Gender | Varchar(50) | | |
| DOB | Int(50) | | |
| City | Varchar(50) | | |
| Pincode | Int(50) | | |
| M_Number | Int(50) | | |
| Email_ID | Varchar(50) | | |
| Address | Varchar(50) | | |
| CreateDateTime | | | |
| UpdateDateTime | | | |

**Table: Prescription_Table**

| Filename | Datatype | Description | Constraint |
|---|---|---|---|
| UserID | Int(50) | Primary | Not Null |
| Prescribed Medicines | Varchar(50) | | |
| D_ID | Int(50) | | |
| Doctor Type | Varchar(50) | | |
| H_ID | Int(50) | | |
| CreateDateTime | | | |
| UpdateDateTime | | | |

**Table: Hospital_Table**

| Filename | Datatype | Description | Constraint |
|---|---|---|---|
| H_Name | Varchar(50) | | |
| H_ID | Int(50) | Primary | Not Null |
| H_Address | Varchar(50) | | |
| Contact No. | Number(15) | | |
| D_ID | Int(50) | | |
| CreateDateTime | | | |
| UpdateDateTime | | | |

**Table: Doctor_Table**

| Filename | Datatype | Description | Constraint |
|---|---|---|---|
| D_ID | int(50) | Primary Key | Not Null |
| D_FName | Varchar(50) | | |
| D_LName | Varchar(50) | | |
| D_Email | Varchar(50) | | |
| D_Contact No. | Number(15) | | |
| Age | Number(100) | | |
| Speciality | Varchar(50) | | |
| H_ID | int(50) | | Foreign Key |
| CreateDateTime | | | |
| UpdateDateTime | | | |

**Table: Patient_Table**

| Filename | Datatype | Description | Constraint |
|---|---|---|---|
| P_ID | int(50) | Primary Key | Not Null |
| P_FName | Varchar(50) | | |
| P_LName | Varchar(50) | | |
| P_Email | Varchar(50) | | |
| P_Contact No. | Number(15) | | |
| Age | Varchar(50) | | |
| CreateDateTime | | | |
| UpdateDateTime | | | |

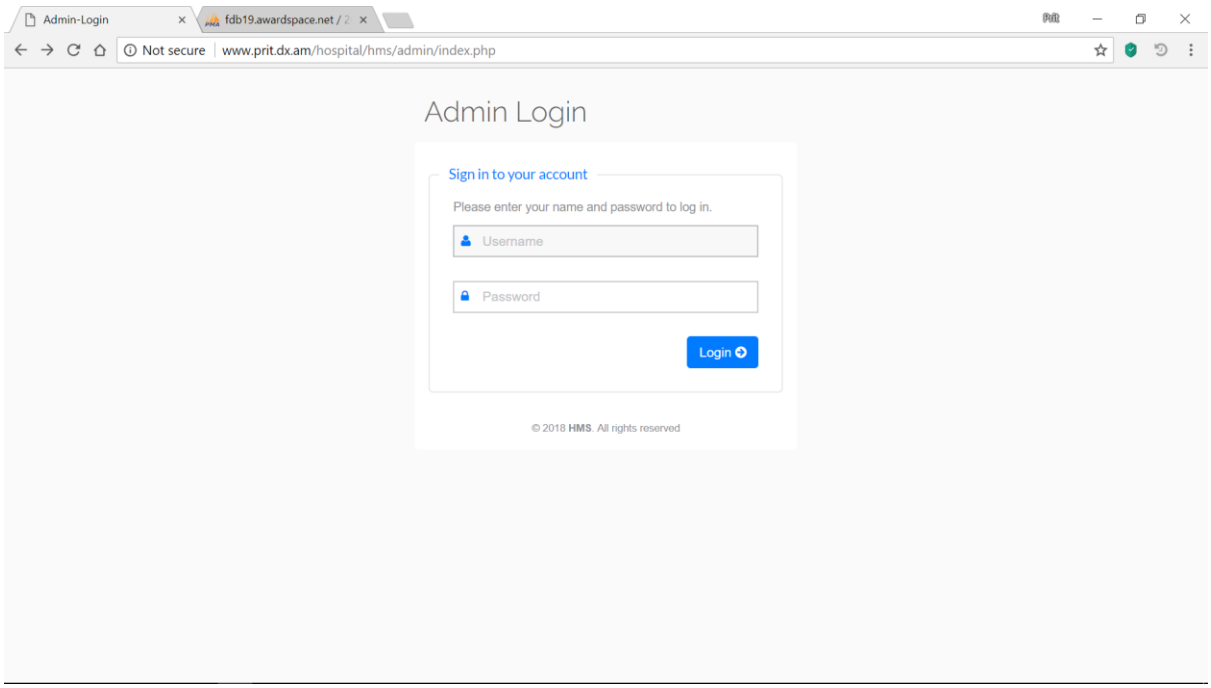
**Tabel: Patient_History**

| Filename | Datatype | Description | Constraint |
|---|---|---|---|
| P_ID | Int(50) | Primary Key | Not Null |
| Document_Type | Varchar(50) | | |
| CreateDataTime | | | |
| UpdateDateTime | | | |

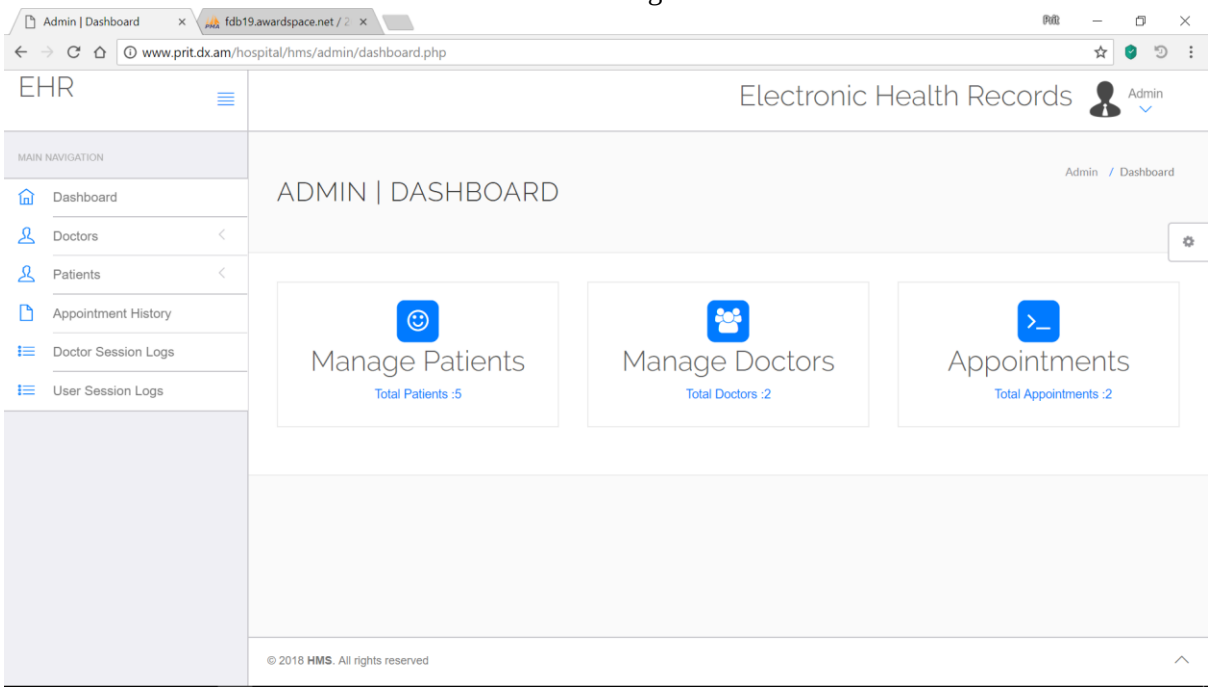
**Tabel: Lab Test**

| Filename | Datatype | Description | Constraint |
|---|---|---|---|
| P_ID | Int(50) | Primary Key | Not Null |
| D_ID | Int(50) | | |
| Document_Type | Varchar(50) | | |
| CreateDataTime | | | |
| UpdateDateTime | | | |

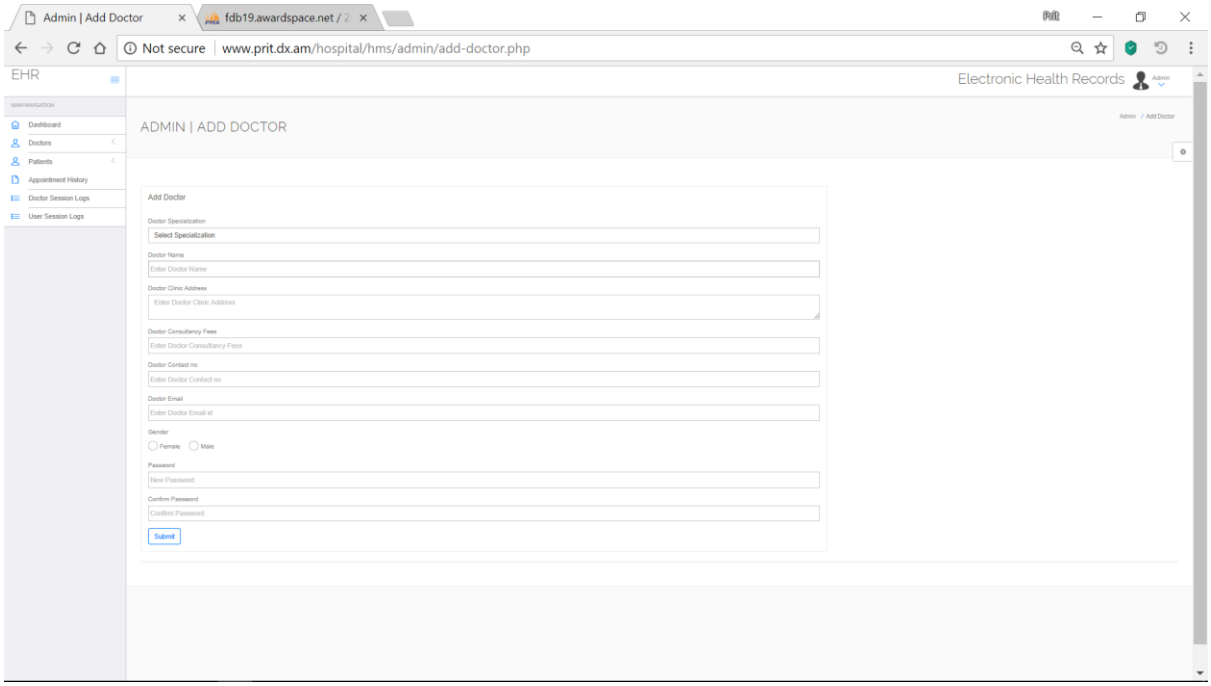
# CHAPTER 5: SNAPSHOTS



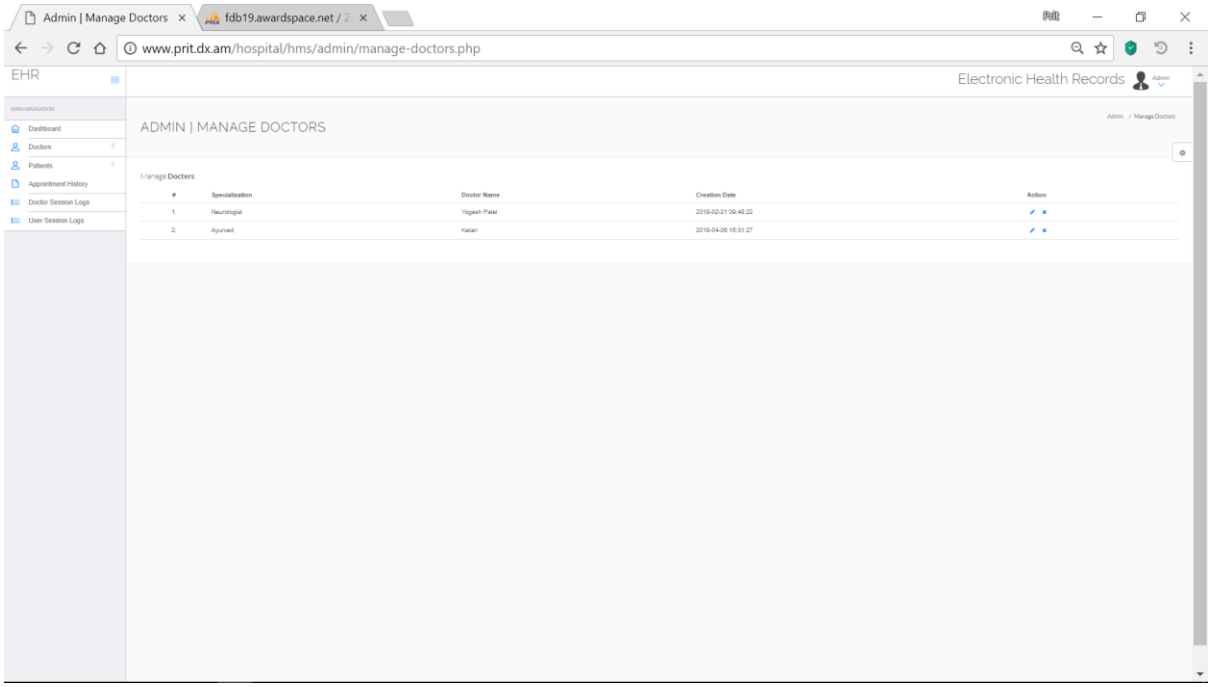

Admin Login



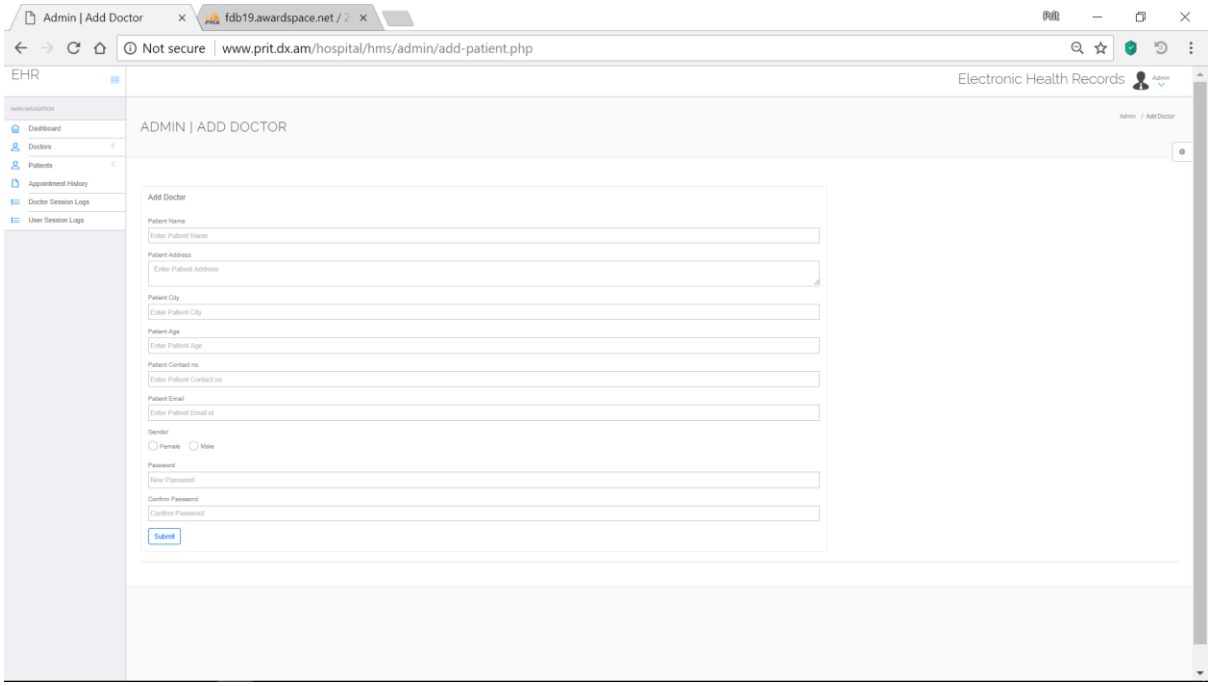

Admin Dashboard



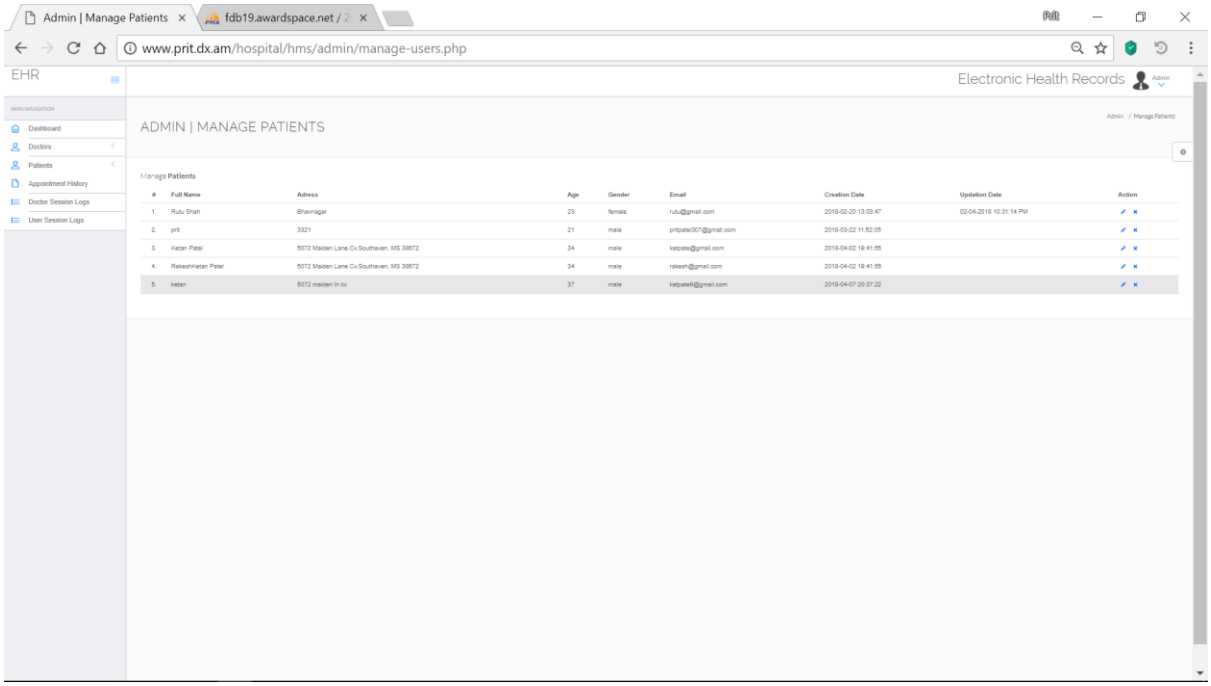

Add Doctor



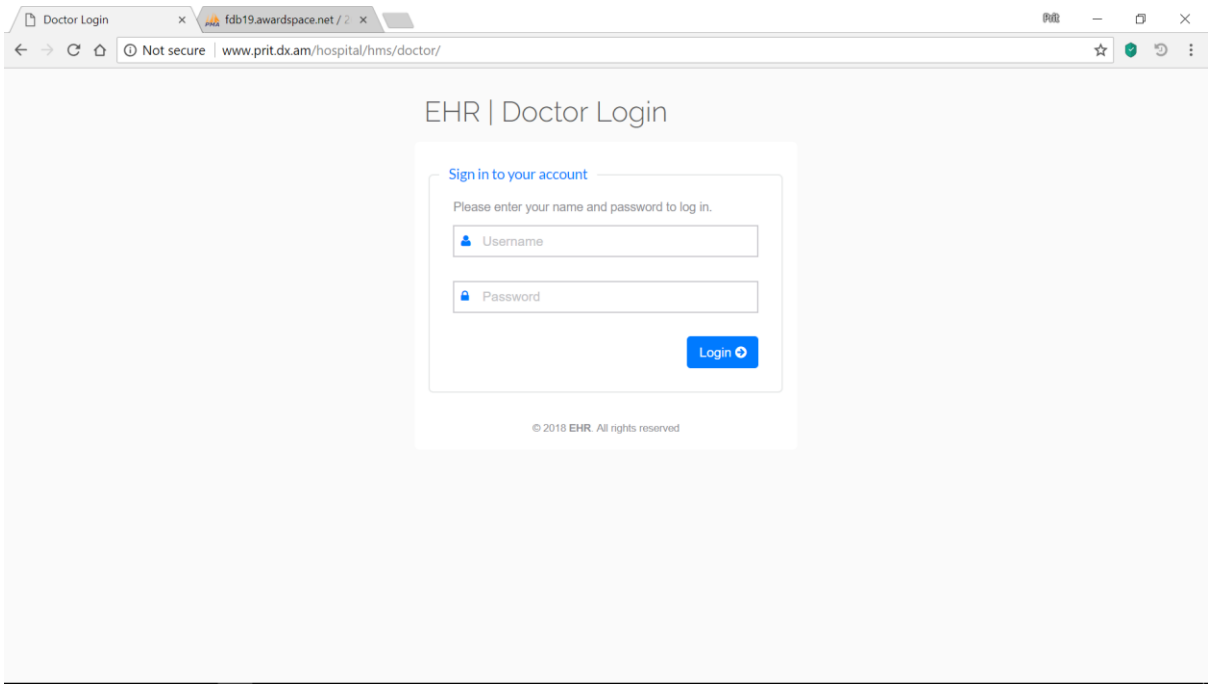

Manage Doctor



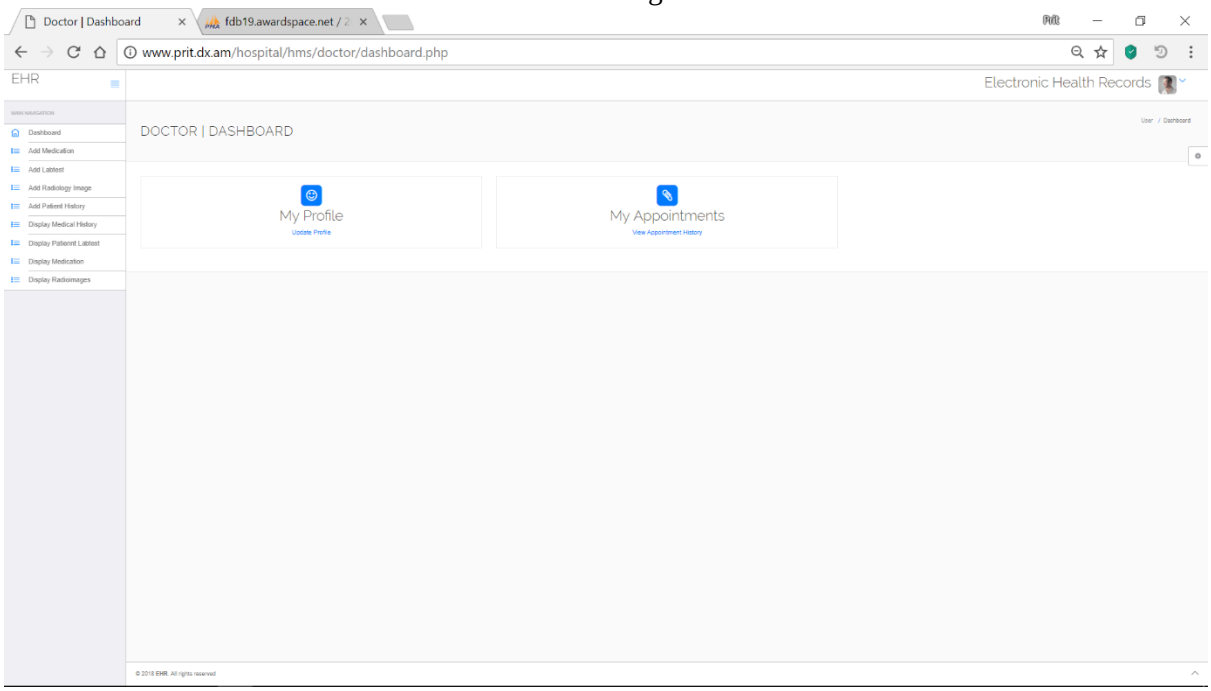

Add Patient



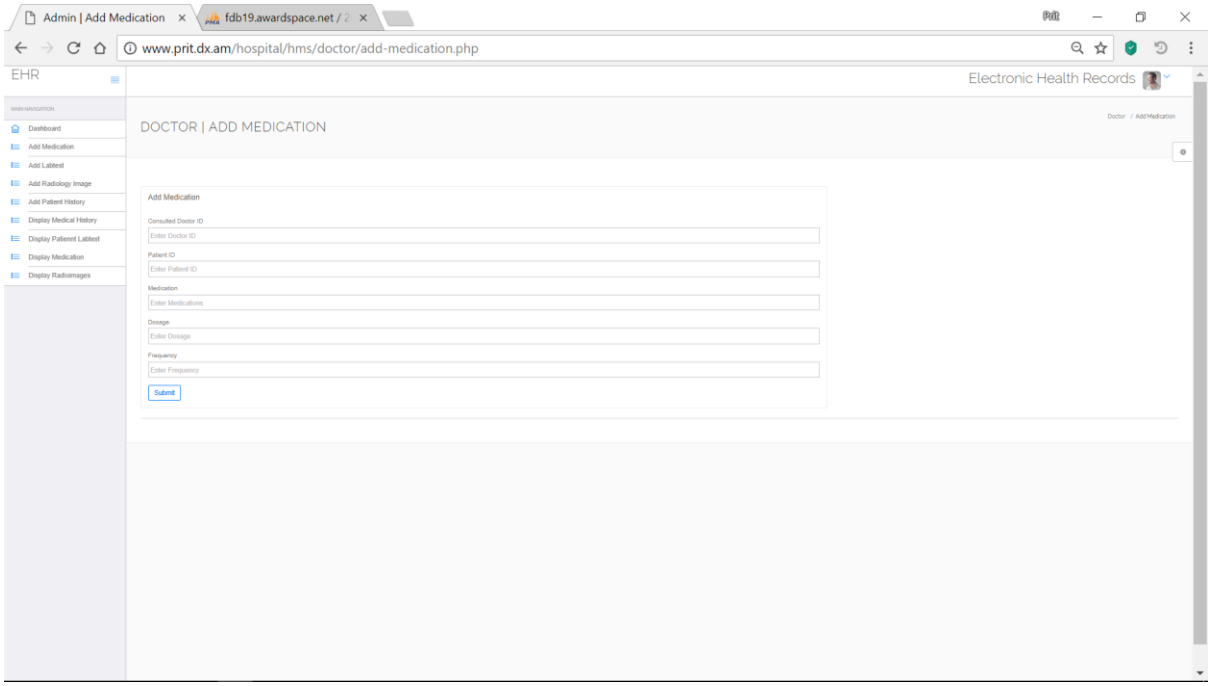

Manage Patient



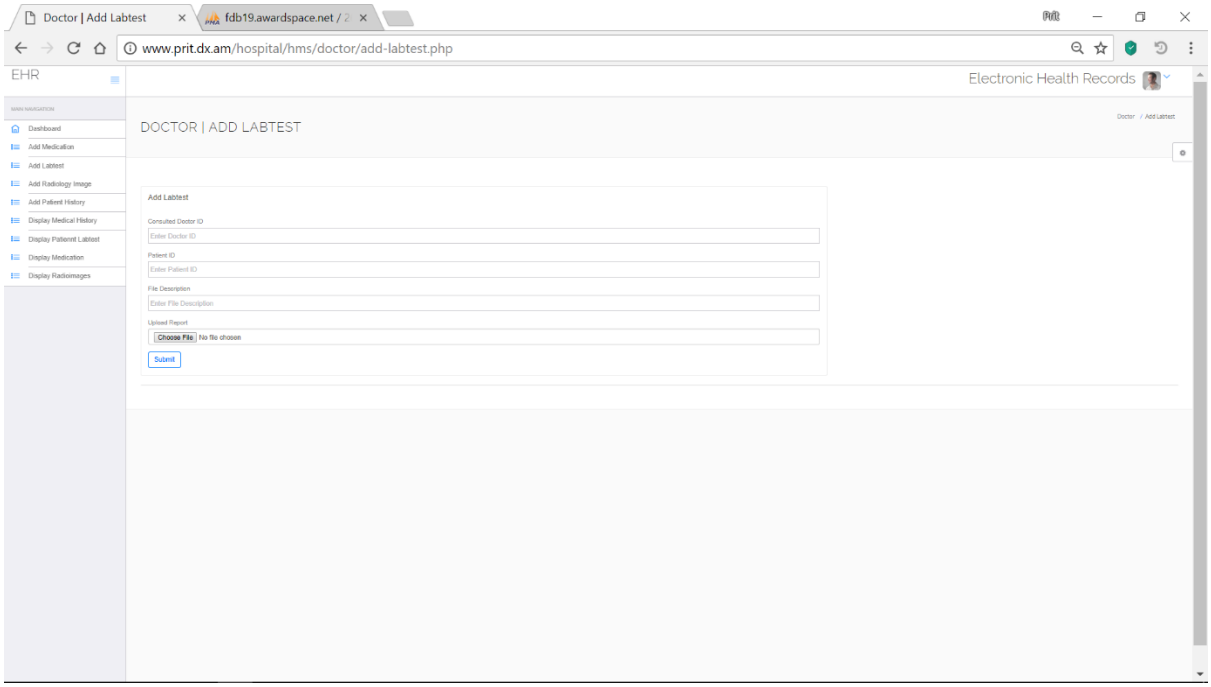

Doctor Login




Doctor Dashboard




Add Medication

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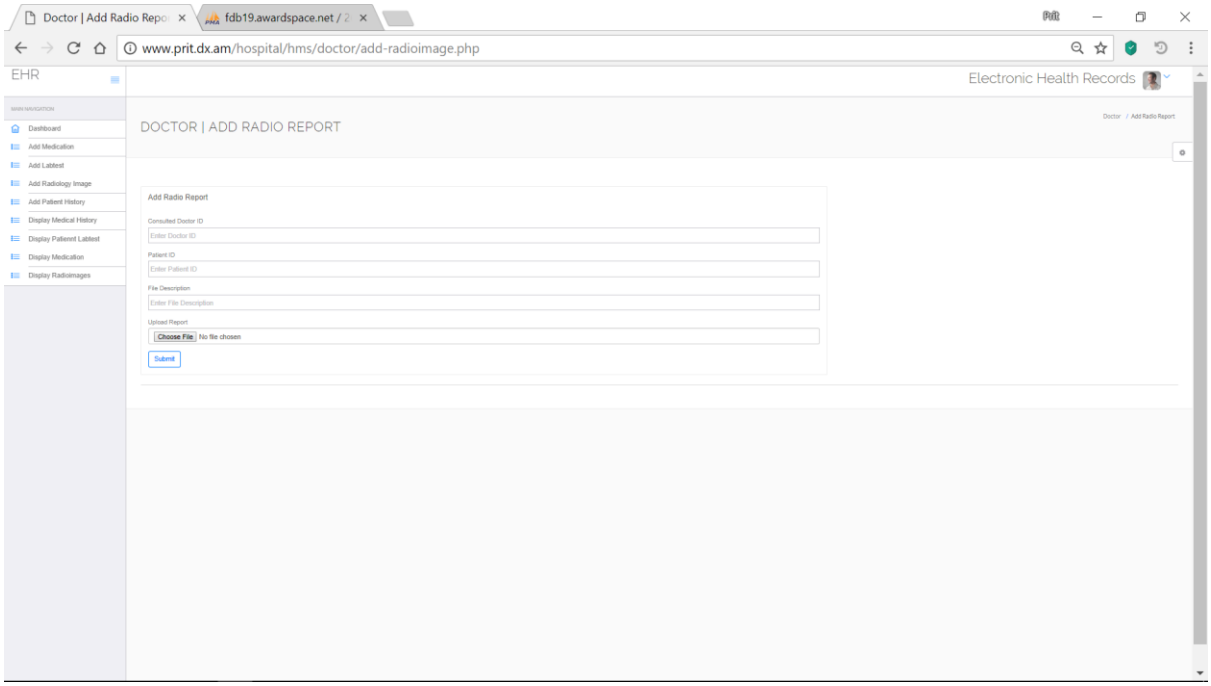


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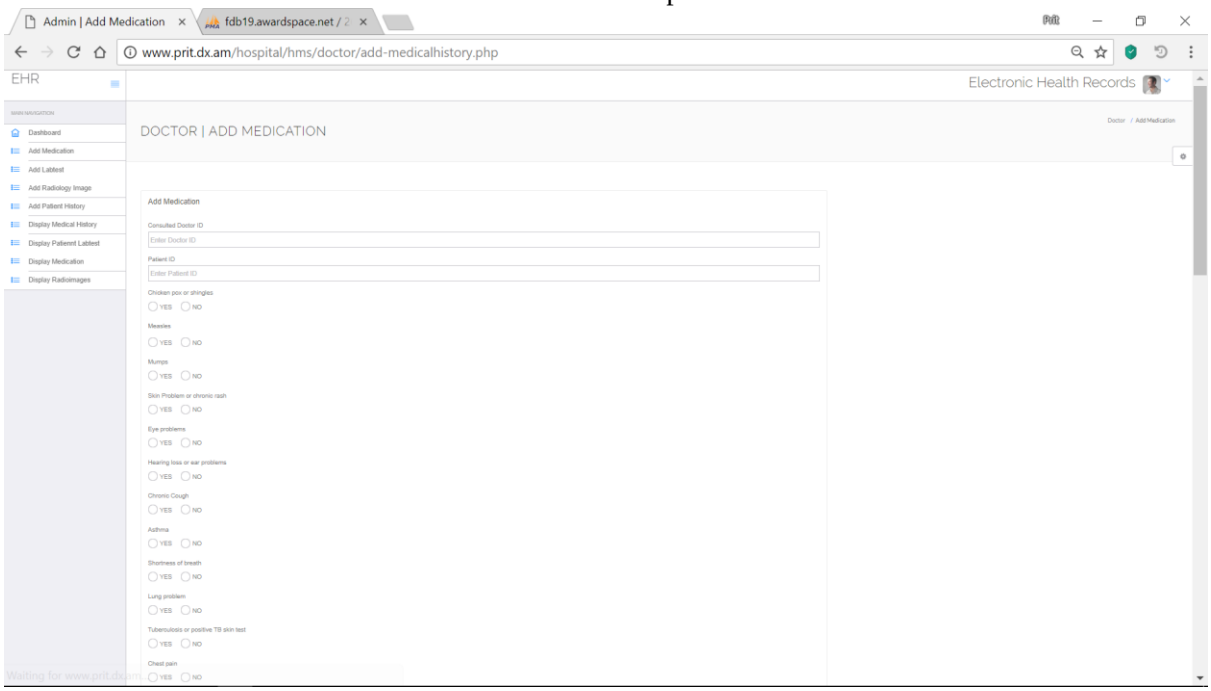
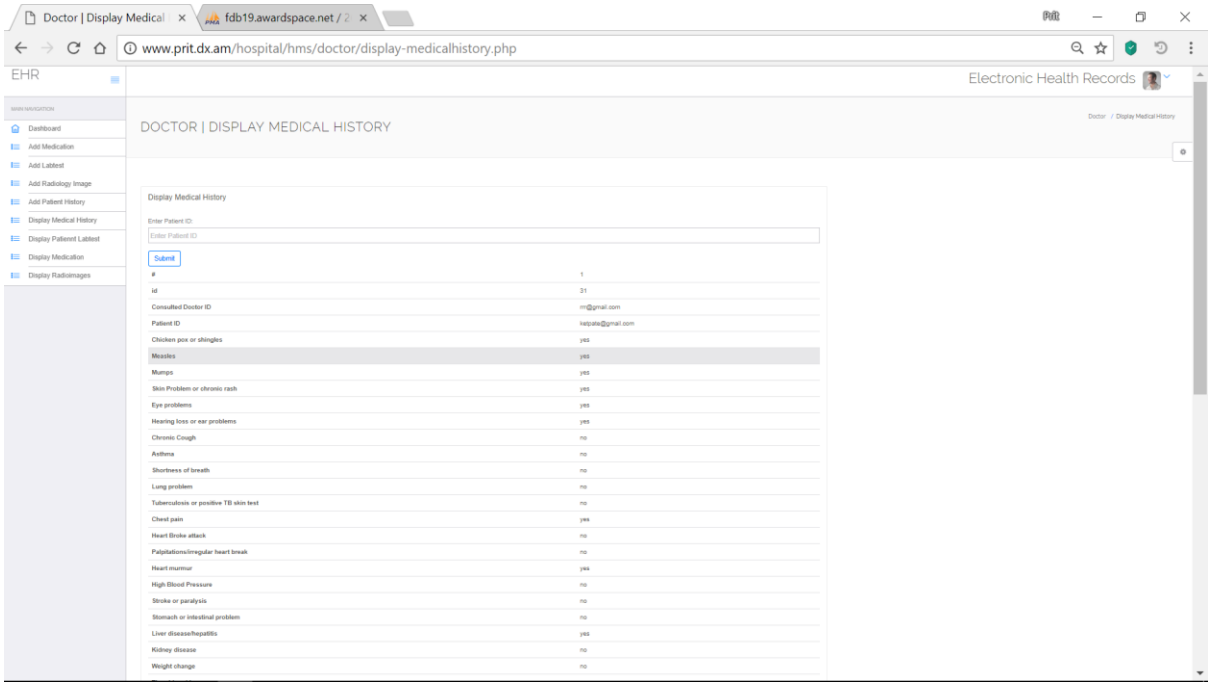
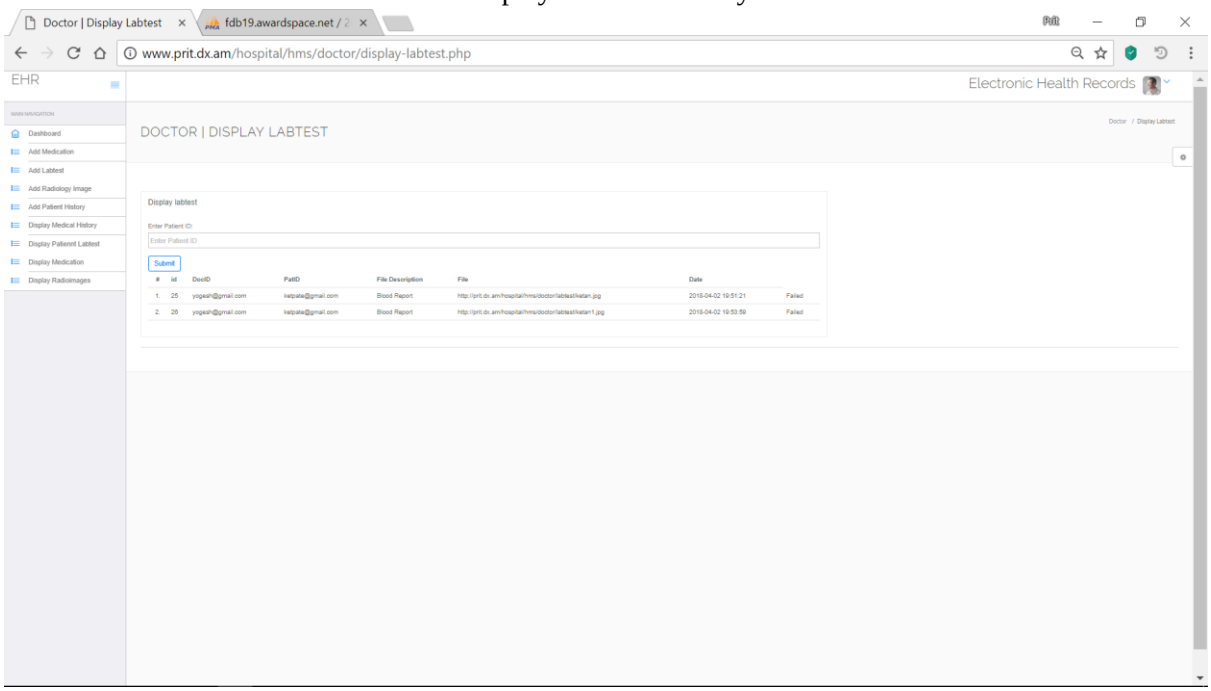



Add Medication

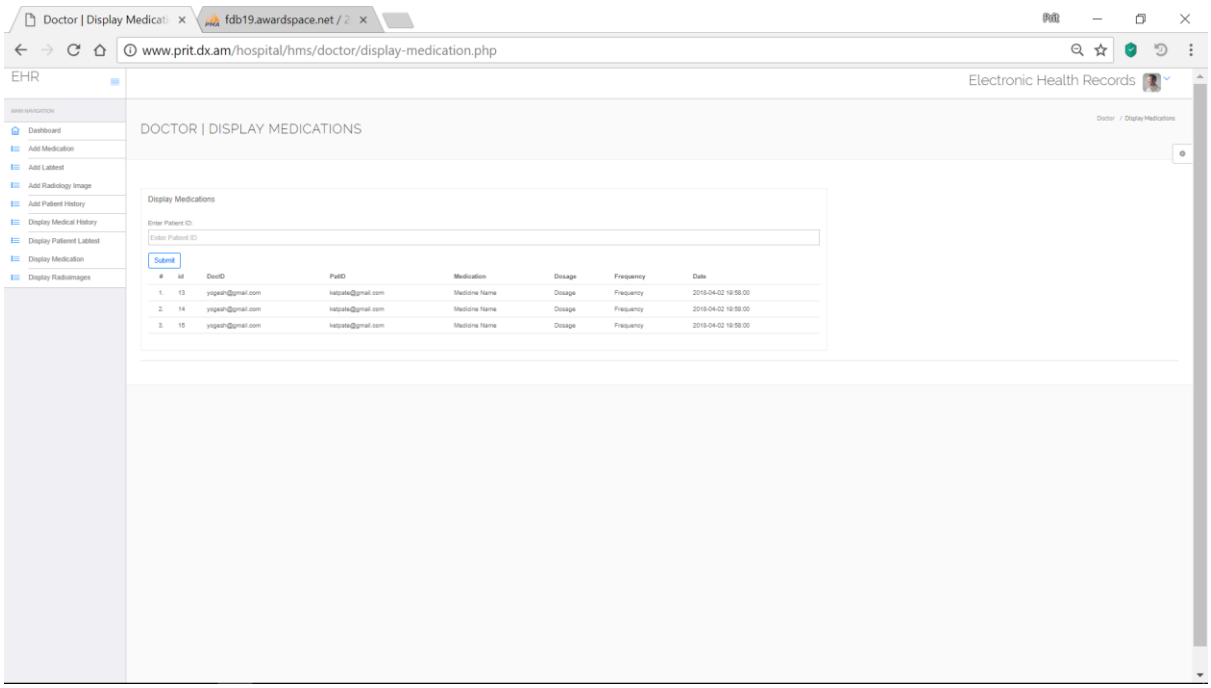
Add Medication




Display Medical History




Display Labtest

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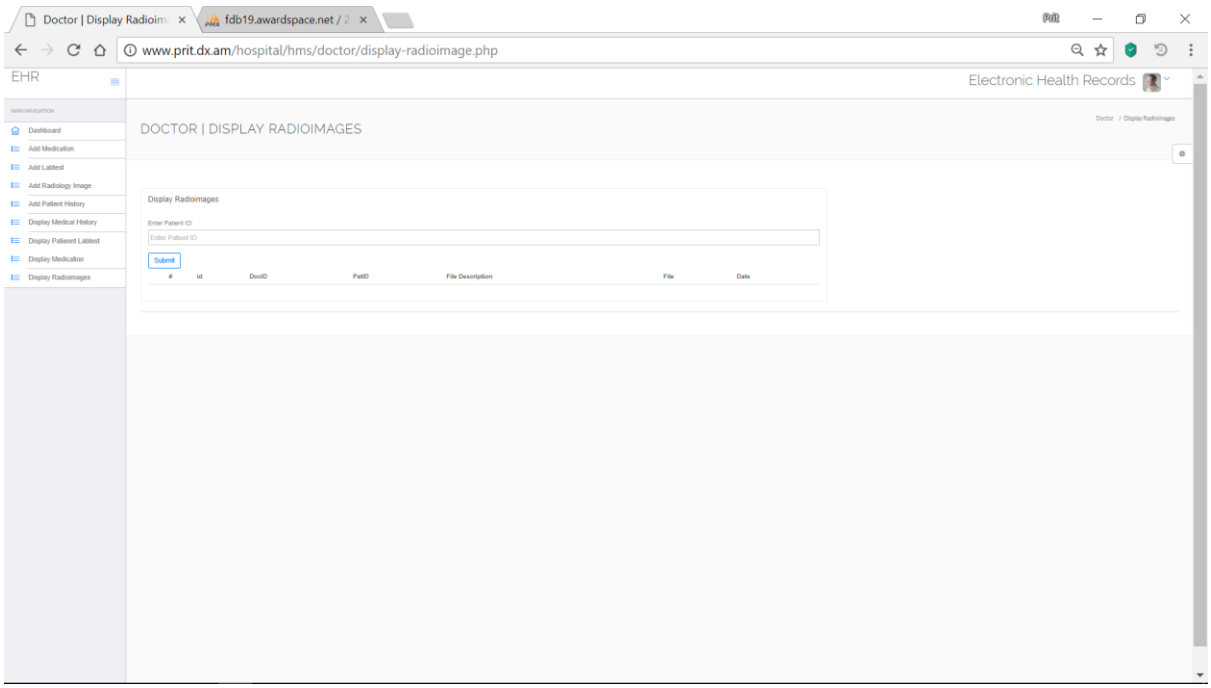
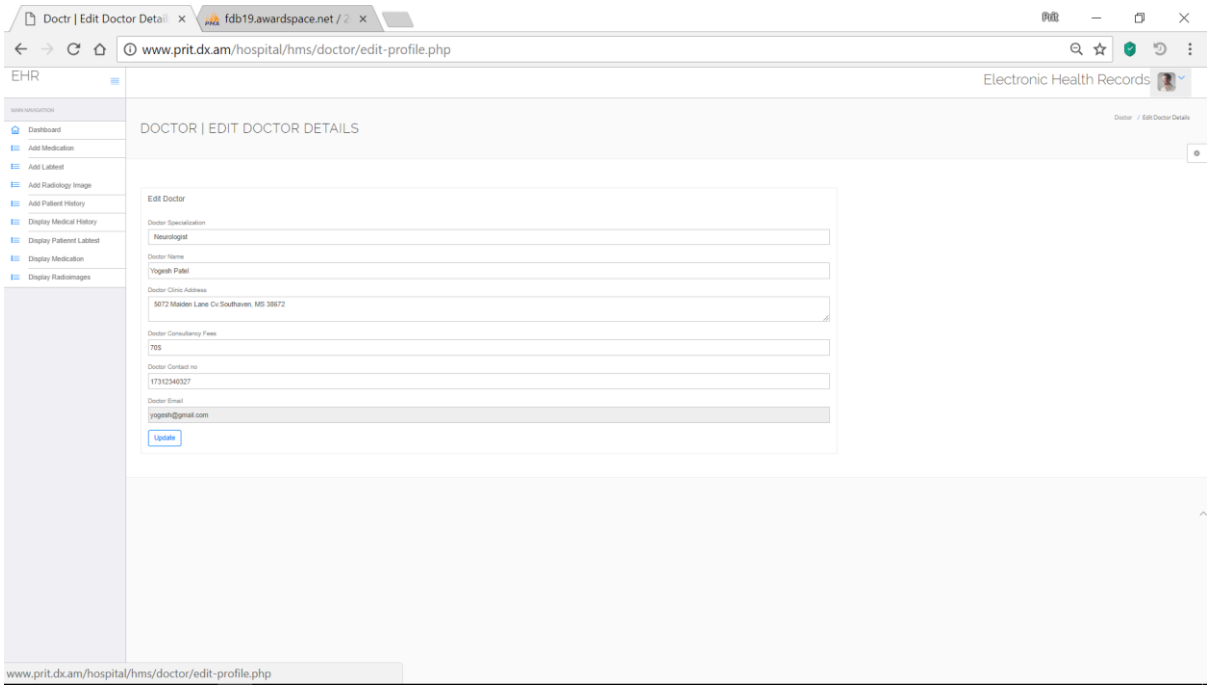
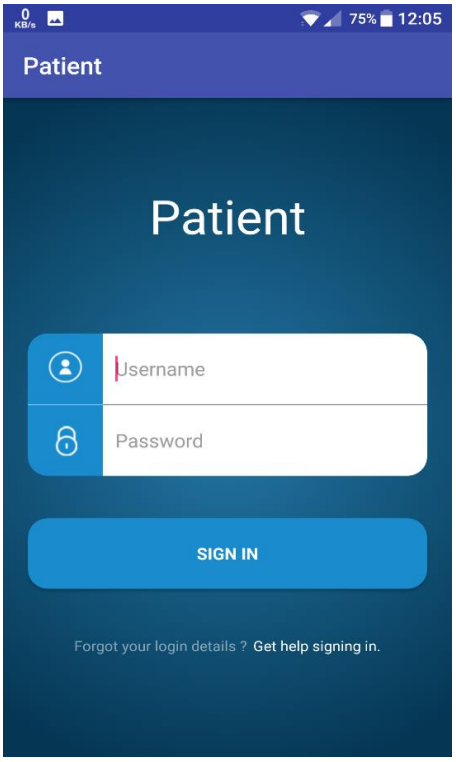



Display Radio Images



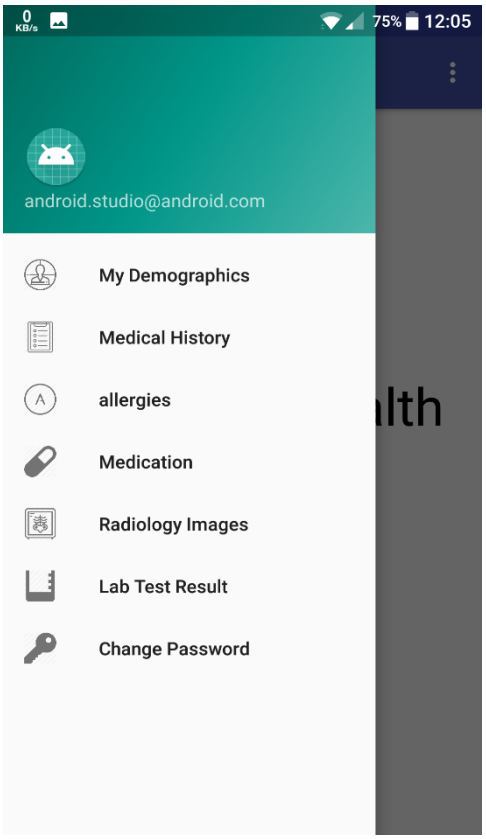

Doctor Detail


Main Page

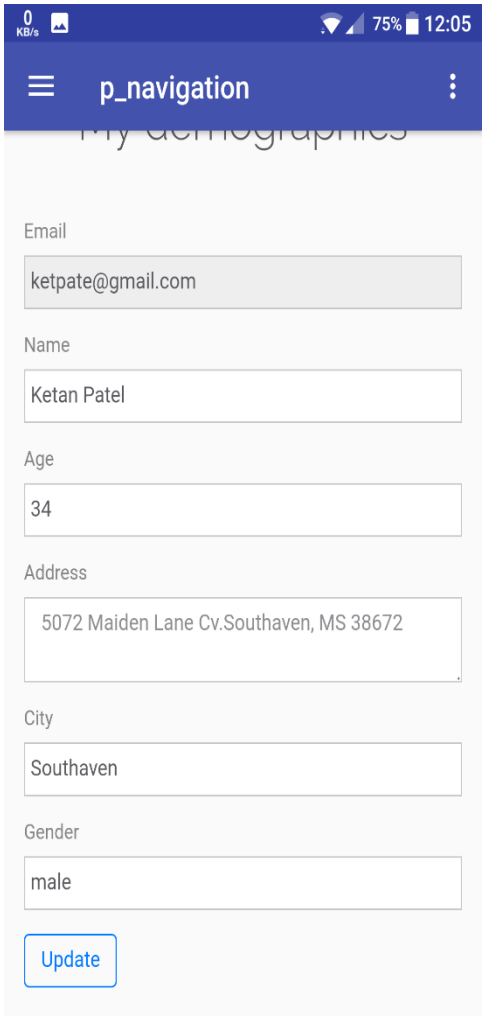



Patient Login

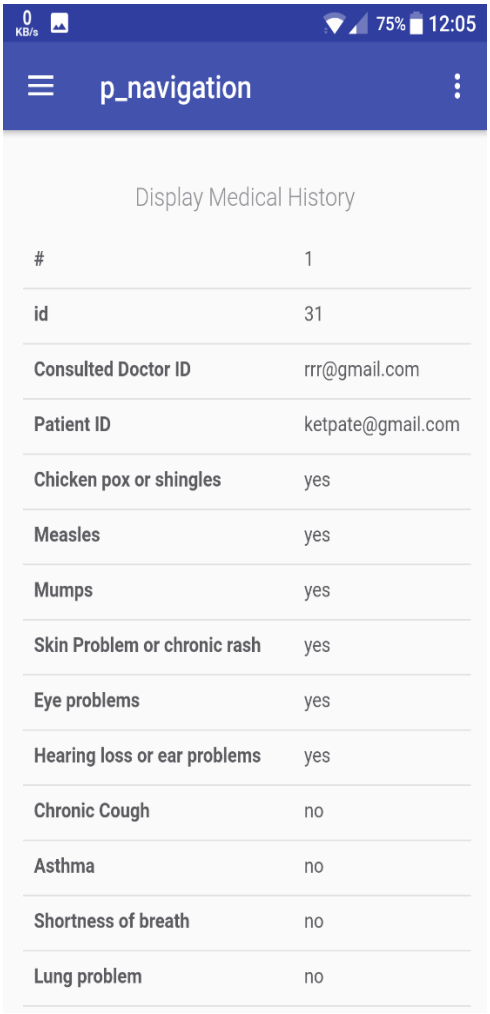

Patient Dashboard



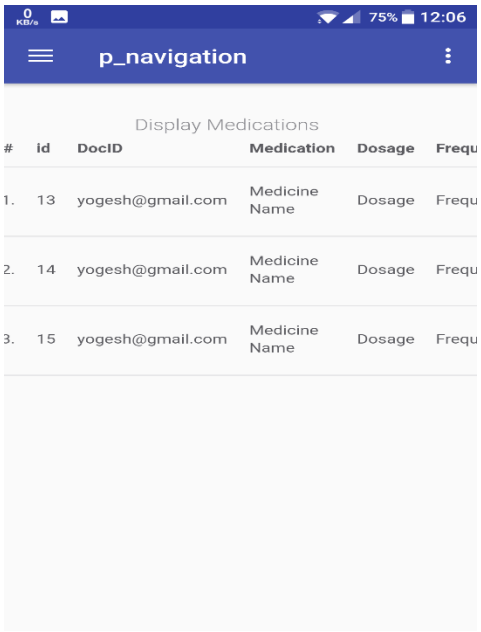

Patient Navigation



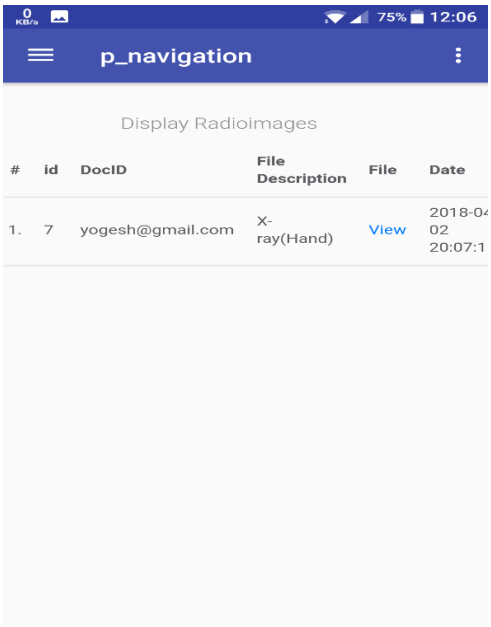

My Demographics



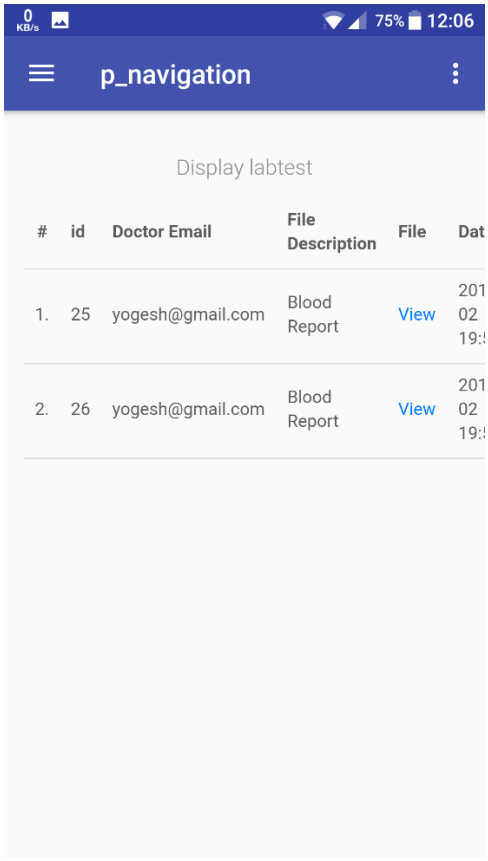

Display Medical History



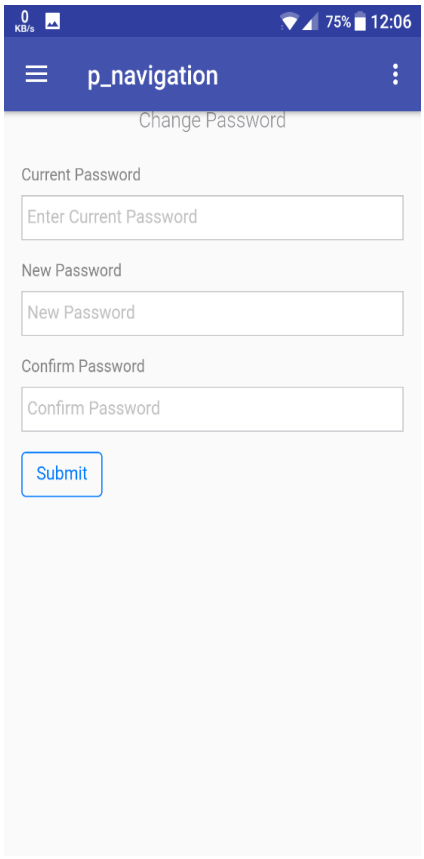

Display Medication




Display Radio Images




Display Latest




Change Password

# CHAPTER 6: SUMMARY OF RESULTS

## 6.1 FUTURE SCOPE

In this semester I designed and programmed most of the modules of my project and in future I will be planning to connect application with an external database so that the data can be stored centrally.

In future many more features can be added as specified below:

- Bill Payment
- QR Code
- NFC (Near Field Communication)
- Connecting External database and internal database

## 6.2 ADVANTAGES

After implementing this system, the following advantages can be seen:

- Improves patient time with doctor
- Patient Satisfaction
- Will reduce paper work
- As there will be less paper work nurse will be able to take care of patient effectively.
- Patients sanity

## 6.3 LIMITATION

- The system cannot be used in absence of internet.
- Application must be installed on user's smartphone.
- Only registered users will be allowed.
- Internet connection is required.

## 6.4 CONCLUSION

After successful implementation of this project the users which in our case which are patients and the physicians will be easily able to share their data with each other. The patients will be able to keep track of all his/her health records centrally which will reduce paper work. Electronic Health Records will be used by patients and physicians.

During a regular ER visit all the necessary documents will be available, so that the physicians can take proper care of the patient. Documents such as insurance, x-rays, Prescription, Medicines, consulting doctor, and all medical related records will be stored centrally.

Doctors will be able to spend 90% of their time with patient face to face which will result in tremendous patient satisfaction and will improve outcomes. And will also reduce the nurse work which is burdened with need for unnecessary documentation, and repetitious robotic duties. Data will be easily transferred from one chart to the other and there is no need for faxing and copying.

# CHAPTER 7: REFERENCE

# References

## Reference Materials

- I referred all this articles, research papers and patents:

A) **Brian Fung** - How US Health care system waste $750 billion annually

**B) Joseph S. Alpert** - The electronic medical records in 2016: Advantages and Disadvantages

**C) Keith L Martin** - It's time for everyone to stop talking interoperability and actually achieve it

D) **Ken Terry** - Why are doctors still waiting for interoperability?

E) **Allan H. Goroll** - Emerging from HER Purgatory --- Moving from Process to Outcomes

# CHAPTER 8: APPENDIX