

MAYO CLINIC



Project:
Hospital Management System
for
The Mayo Clinic

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for **Simplilearn-CBAP**

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1. Introduction

The Mayo Clinic is an American nonprofit academic medical center currently based in three major locations, Rochester, Minnesota; Jacksonville, Florida; and Scottsdale, Arizona focused on integrated patient care, education, and research. Mayo Clinic holds the number 1 rank among hospitals in the United States.

It was opened on the 30th of September 1889. Over the years it grew in size and facilities. It increased the size of its premises and also the number of doctors it employs. The vast number of patients it treated made management of such a huge hospital an arduous task. The paperwork and storing of all patients' records was becoming unmanageable. It was then the management of the hospital decided to invest money in a hospital management software. The Hospital Management System is designed to manage all hospital operations.

The 1980s initiated transformative changes that set the course for the modern Mayo Clinic. As an early adopter of the Internet, Mayo Clinic has been recognized for its online communications to patients.

2. Stakeholders

While coming up with Mayo Clinic's Hospital Management System (HMS), several stakeholders may be involved. The table below highlights some of the stakeholders that can be key in the realization of the Hospital Management System.

STAKEHOLDER	ROLE
Patients	<ul style="list-style-type: none">• Experience of the patients while using the HMS is vital
Doctors/Nurses	<ul style="list-style-type: none">• May have inputs in some aspect of the HMS
Administrative staff	<ul style="list-style-type: none">• May be involved as a focus group whose input is considered in the HMS readiness assessment.• May have some inputs in some aspect of the HMS
Operation support	<ul style="list-style-type: none">• May provide information on their ability to support the operations of the HMS.
Senior Management, Sponsors	<ul style="list-style-type: none">• Steer the hospital towards a sustainable future by adopting sound, ethical and legal governance, and management policies.• May authorize and ensure funding for the software solution delivery.

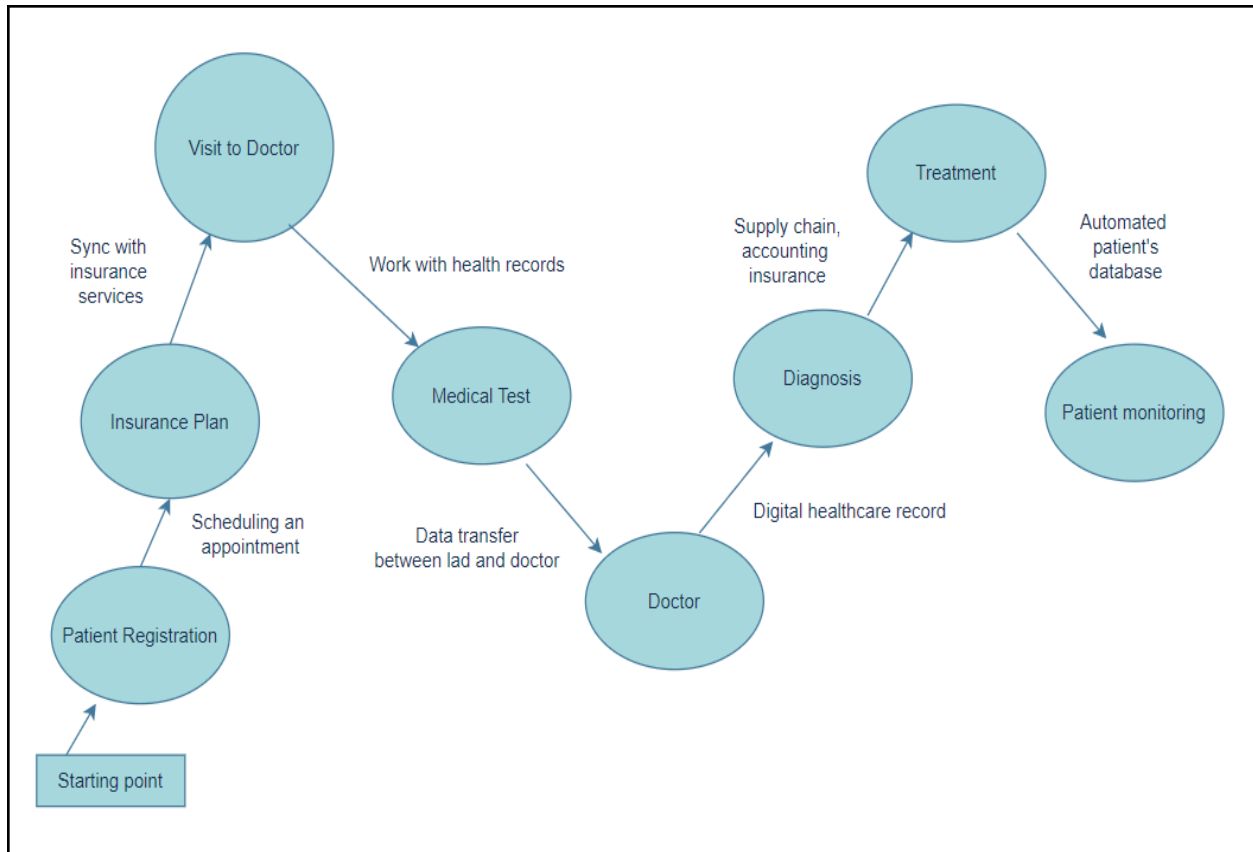
Pharmaceutical companies	<ul style="list-style-type: none"> Pharmaceutical companies provide necessary medications that doctors prescribe to patients.as such the HMS may require integration to pharmaceutical company's platforms
Government, Regulator	<ul style="list-style-type: none"> They will ensure adherence to regulations and laws including privacy, confidential laws etc.
Project management team, Project Manager	<ul style="list-style-type: none"> Will be responsible for carrying out the project in order to realize the solution. The PM will be responsible for managing HMS and planning the detailed activities to complete the implementation.
Suppliers	<ul style="list-style-type: none"> Will help implement the HMS through provision of resources
Testers	<ul style="list-style-type: none"> They have the responsibility of ensuring that the HMS will function within acceptable parameters.
Insurance companies	<ul style="list-style-type: none"> May have inputs in some aspect of the HMS especially where integration to their platform is concerned

HOSPITAL MANAGEMENT SYSTEM (HMS) PROPOSED WORKFLOW:

Workflow management refers to a set of activities for automating a series of tasks and designed to improve efficiency and streamline value delivery. Some of the tasks can include outpatient management, appointment management, approvals, consultations, admissions, billing, claims etc. For the proposed Mayo Hospital Management System, the workflow can be grouped as:

- Patient registration
- Visit to doctor
- Medical test
- Diagnosis
- Treatment
- Patient monitoring

HMS Workflow



The hospital management system will organize the stable functioning of daily tasks and interactions. The hospital database management system will keep a track of all the operations, store the patients' data, performs its analysis, and generates the reports. Mayo Clinic through the HMS is given the opportunity to collect its information in one place including the patient and doctors' records as well as the data concerning billing affairs, pharmacy, bed allocation etc. In addition, the HMS will only be processed, classified and accessible for authorized users.

The hospital database management system will provide users with data security due to all regulations. Implementation of different functions will also empower smooth and clear functionality. Since the database will store the names and timings of the nurses and ward boys on duty with their respective ward numbers, the HMS software tracks the number of available doctors and their working hours. This allows to have the accurate schedule of each hospital staff, manage the hospital's abilities to meet all the needs of the patients. Similarly, it will help organize the appointments for both the staff and patients' convenience.

Mayo clinic's HMS will also store medical histories, test results, prescribed treatments, etc. All the details will be securely stored for the access of the doctor and can be provided to the patients on request. The patients can receive the test results or medical reports by email and when the written form is required, printing will take only a few minutes for the clinic staff.

The HMS will be capable of linking the different departments. For example, If a doctor needs to prescribe any tests for any patient, he will enter the same in HMS. This will be received by the laboratory or radiation department directly. The patient's tests are done, and the reports are uploaded by the department in the HMS. The doctor can log in the system and enter the patient ID and view them directly. This eliminates the need of paper reports and retrieval is also easy.

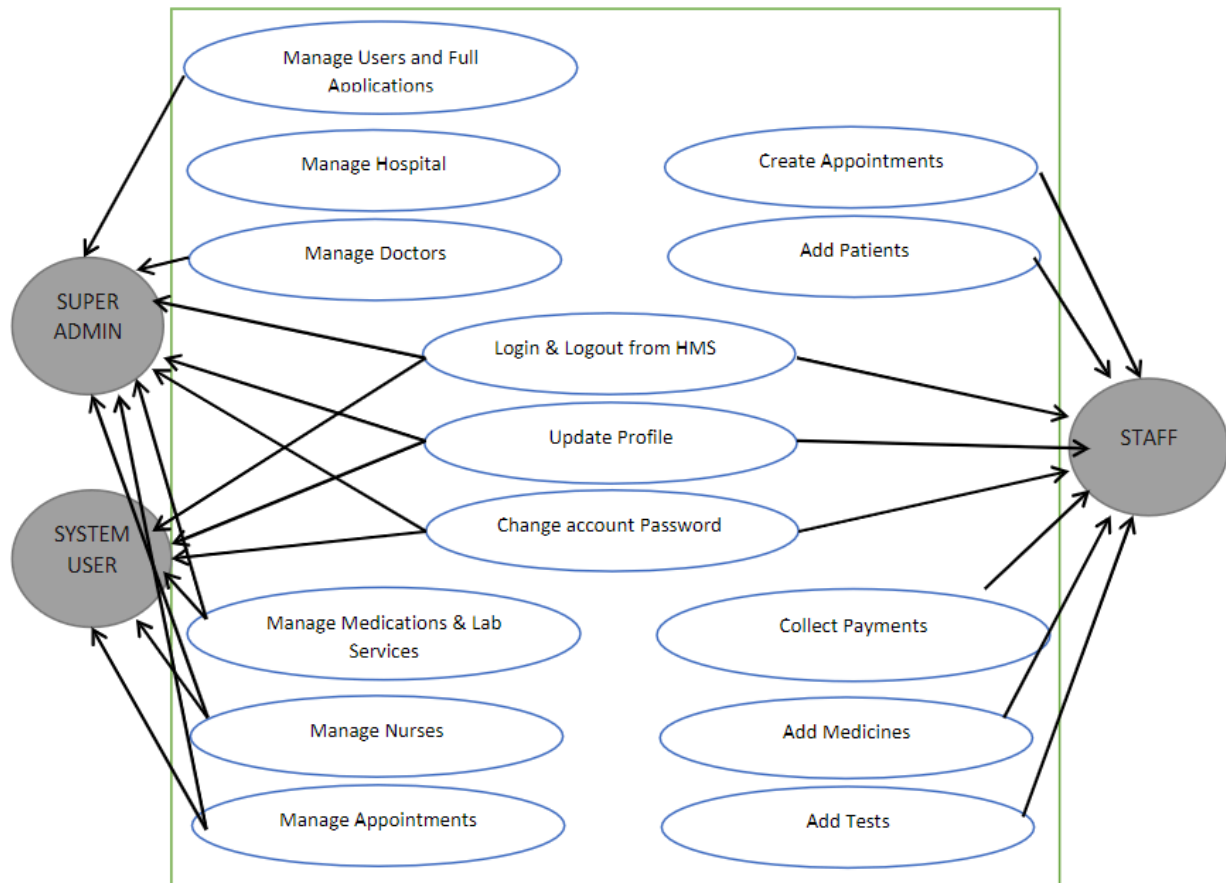
IN SCOPE

- OPD Billing Module where in patient registration, details will be fed along with billing for lab and pathological test, Doctor Consultation and other procedures.
- Any modifications to be done pertaining to patient details can be done in OPD module along with details of invoices and revenue, discount and other Reports will be updated here
- OPD scroll for Hospital Staff will also be available in OPD Module.
- IPD module will be subdivided into Emergency Module as well where in Bed allotment IP billing and patient admission process will be done.
- Another sub division in IP module will be for Insurance where in TPA Patient details will be reflected and processing for them would be done
- A separate module for nursing doctors and lab will be there where in each Nurse will be able to see Line of treatment for patient, enter vitals log and see medications for patients.
- Nurses can intimate doctors in case of emergency and access lab reports as well
- Doctors will be able to enter patient treatment details and diagnosis and see test reports, create discharge summaries, prescriptions.
- Doctors can modify and update their schedules of appointments which will directly be notified to patients
- Lab staff can enter reports and receive notifications whenever an investigation is suggested in case of IP
- Pharmacy module will maintain logs for stocks and provide medications to IPAs as well as OP Patients as when required and generate daily reports for same

OUT OF SCOPE

- HMS at this stage won't be able to allow chats or video consult with Doctors
- It won't notify for upcoming events or tasks
- Educate Staff
- Generate risk reports

SCOPE Using Case Diagram (UML)



FEATURES OF THE HOSPITAL MANAGEMENT SYSTEM FOR THE MAYO CLINIC:

- **Appointment Management**

For Mayo clinics, appointment will be integrated onto its site. Patients visiting the website can book online appointments with ease.

- **Billing Management**

The system will integrate billing with treatments, Lab, Radiology, consultations etc.. Notifications will also be introduced in the event that a given discount has been introduced. Automatic due capture, Option to bill before and after consultation.

- **Prescription Management**

Manage commonly and recently used medicines. Option to show medicines available in the pharmacy. SMS prescriptions to Patients.

- **Discharge Summary**

Template based Discharge Summary. ICD10 integration. Option to prevent discharge summary till IP bill is closed.

- **Operation Management**

Automatic notification can be sent to customers on test results. Lab notifications like email, SMS of the test reports sent from the Automated Lab notification module.

- **Pharmacy Management**

Comprehensive Pharmacy Management handles stock, Prescription Integration, Ward Request, Stock Management, Stock Moment and intelligent reports.

- **Lab Management**

Comprehensive Lab Management handles complete order management, Custom Reports, Smart Notifications, Credit Settlement, detailed MIS Reports, Analytics and App for Phlebotomist.

- **Master Information Systems**

Let's you access entire MIS data from your device.



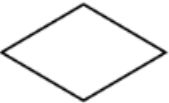
- **Manage Multiple Locations**

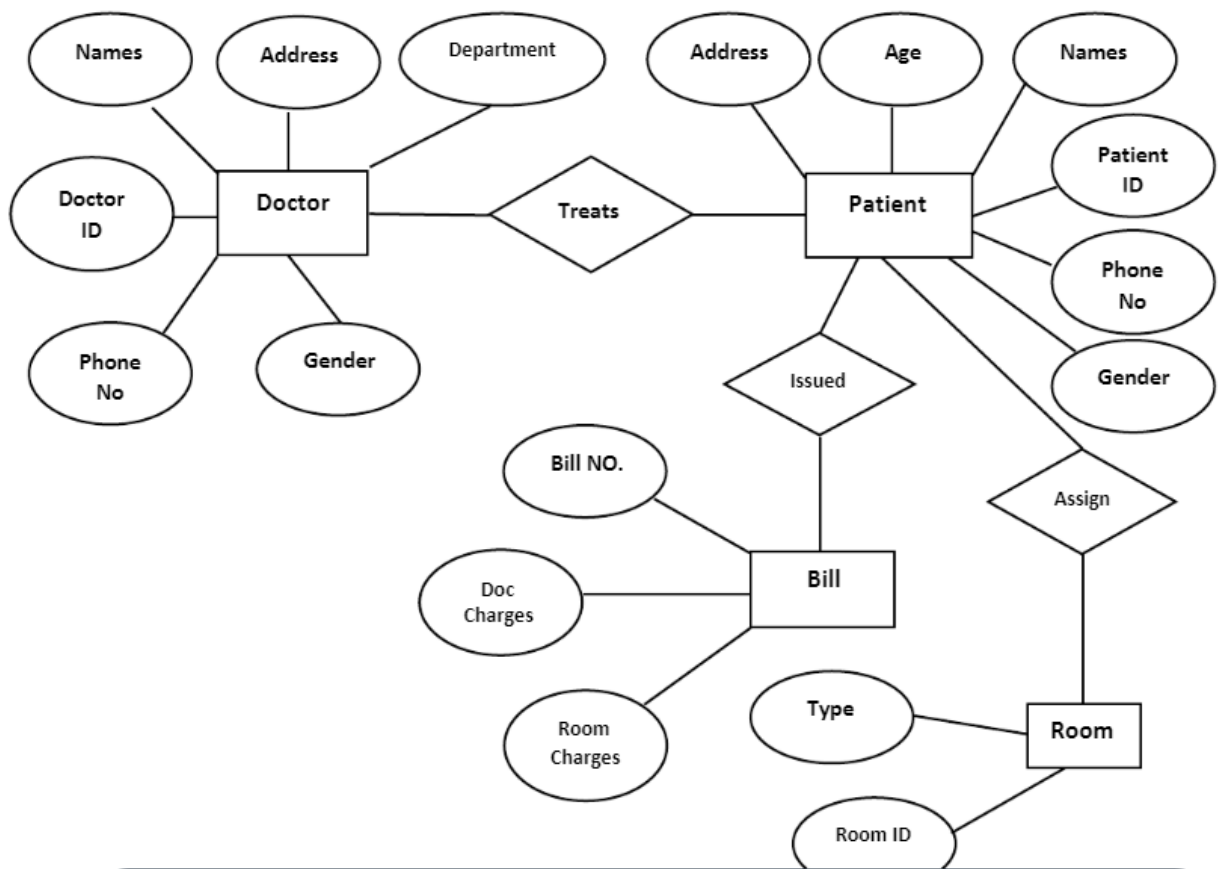
Any number of branches can be added and managed using a single account.

ER Diagram for HMS





Entity Relationship diagram is a graphical representation of entities and their relationship to each other. It describes how data is related to each other. As such, an entity, is a piece of data, an object or a concept about which data is stored. Whereas a relationship is how the data is shared between entities. In ER, there are three main components i.e., Entity, Attribute and Relationship. Consider the table below.

Symbol	Component	Description
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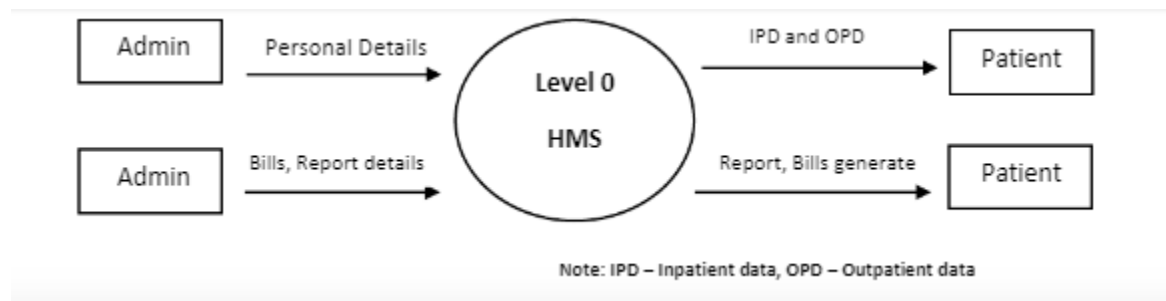
	Entity	An entity can be an object, place, person etc.
	Attribute	An attribute describes a property or characteristics of an entity
	Relationship	A relationship describes relation between entities

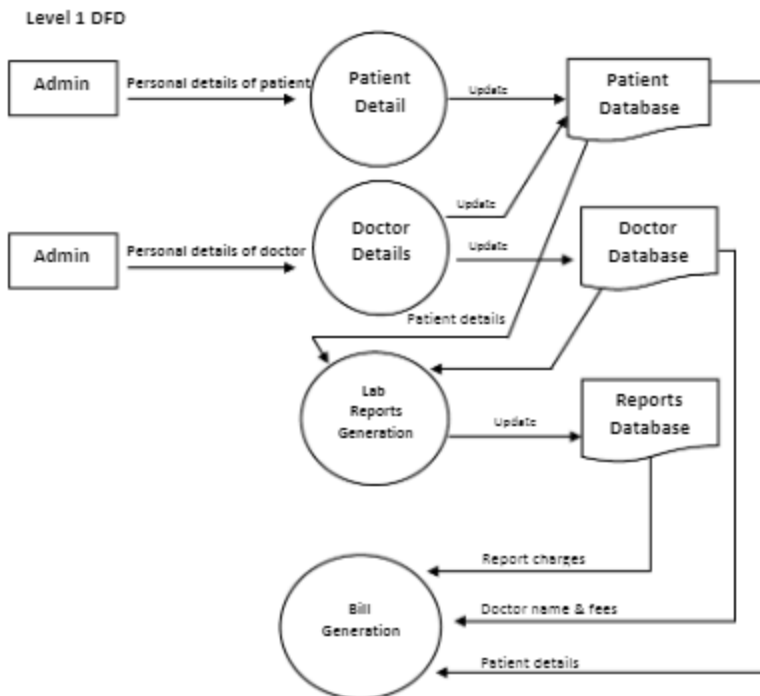


Data Flow Diagram for HMS

Symbol	Name	Function
	Data Flow	Used to connect processes to each other. The arrowhead indicates direction of data flow.
	Process	Performs some transformation to input data to output data
	Source or Sink (External entity)	A source of system inputs or sink of system outputs
	Data Source	A repository of data. Arrowheads indicate net inputs or net outputs to the store.

Level 0 also known as a context diagram is a top-level diagram that contains one process mode that generalizes the function of the entire system in relation to the external entities. It shows how the system is divided into sub systems each of which delas with one or more of the data flows to or from an external source and which together provide all the functionality of the system. In addition, it identifies internal data stores that must be present for the system to work and shows the flow of data between the various parts of the system.





FUNCTIONAL REQUIREMENTS

There are a lot of software requirements specifications included in the functional requirements of the Hospital Management System, which contains various process, namely Registration, Check out, Report Generation, and Database.

Registration Process of SRS (Software Requirements Specification)

- Adding Patients: The Hospital Management enables the staff in the front desk to include new patients to the system.
- Assigning an ID to the patients: The HMS enables the staff in the front desk to provide a unique ID for each patient and then add them to the record sheet of the patient. The patients can utilize the ID throughout their hospital stay.

Check Out of SRS:

- Deleting Patient ID: The staff in the administration section of the ward can delete the patient ID from the system when the patient's checkout from the hospital.
- Adding to beds available list: The Staff in the administration section of the ward can put the bed empty in the list of beds-available.

Report Generation of SRS:

- Information of the Patient: The Hospital Management System generates a report on every patient regarding various information like patients name, Phone number, bed number, the doctor's name whom its assigns, ward name, and more.
- Availability of the Bed: TheHospital Management system also helps in generating reports on the availability of the bed regarding the information like bed number unoccupied or occupied, ward name, and more.

Database of SRS:

- Mandatory Patient Information: Every patient has some necessary data like phone number, their first and last name, personal health number, postal code, country, address, city, 'patient's ID number, etc.
- Updating information of the Patient: The hospital management system enables users to update the information ofthe patient as described in the mandatory information included.

NON-FUNCTIONAL REQUIREMENTS

There are a lot of software requirements specifications included in the non-functional requirements of the Hospital Management System, which contains various process, namely Security, Performance, Maintainability, and Reliability.

Security:

- Patient Identification: The system needs the patient to recognize herself or himself using the phone.
- Logon ID: Any users who make use of the system need to hold a Logon ID and password.
- Modifications: Any modifications like insert, delete, update, etc. for the database can be synchronized quickly and executed only by the ward administrator.

Front Desk Staff Rights:

- The staff in the front desk can view any data in the Hospital Management system, add new patients record to the HMS but they don't have any rights alter any data in it.

Administrator rights:

- The administrator can view as well as alter any information in the Hospital Management System.

Performance:

- Response Time: The system provides acknowledgment in just one second once the 'patient's information is checked.
- Capacity: The system needs to support at least 500 people at once.
- User-Interface: The user interface acknowledges within five seconds.
- Conformity: The system needs to ensure that the guidelines of the Microsoft accessibilities are followed.

Maintainability:

- Back-Up: The system offers the efficiency for data back up.
- Errors: The system will track every mistake as well as keep a log of it.

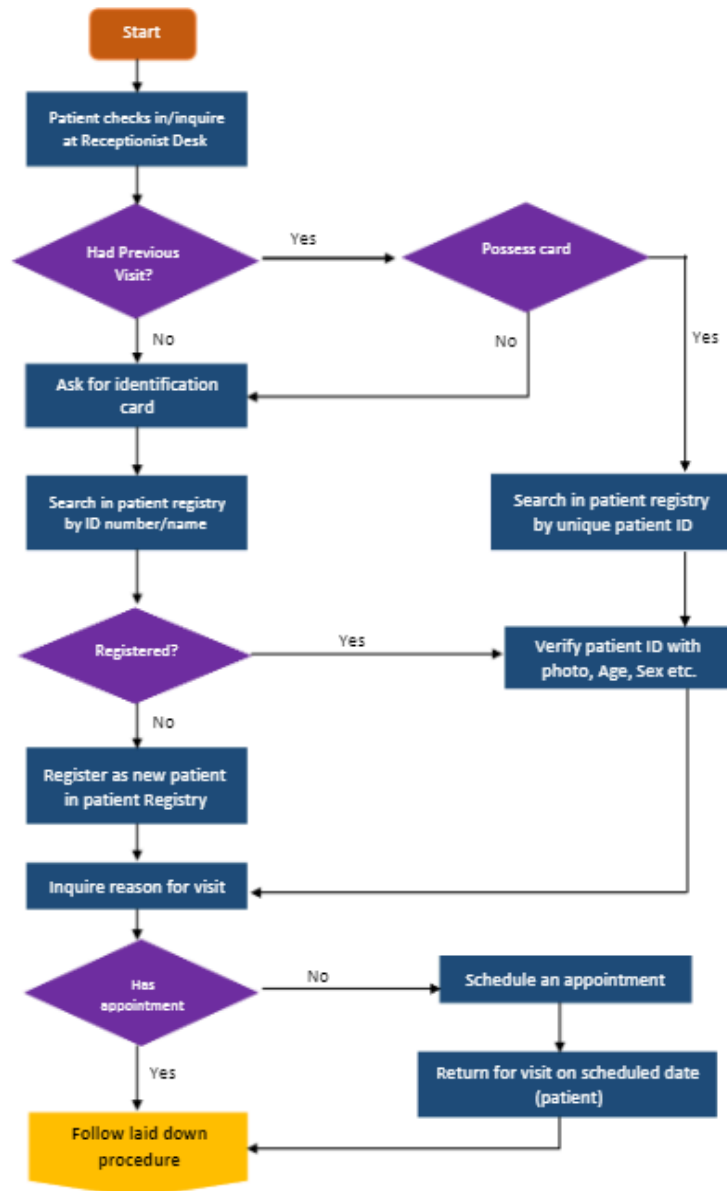
Reliability:

- Availability: The system is available all the time.

System Requirement:**Usability:**


- Database: MySQL Database to be used since it is open source and free.
- Operating System: Shall be Windows 2016
- Web-Based: The system shall be a web-based application
- Response Time: The system shall give responses in 1 second
- Capacity: The System must support 500 people using it at a time
- Errors: The system shall keep a log of all the errors
- Availability: The system shall be available all the time
- Usability: The screens should be self-explanatory and very user friendly. Management would not want employees not ordering from the system as they cannot understand the screens and data fields on screen. The users should not find the system cumbersome.

Flow chart for the patients' admission process

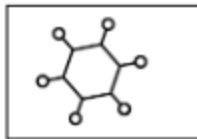


Wireframes


For Homepage




Receptionist




Lab Incharge




Pharmacy Incharge



Doctor/ Nurse



Admin



Management

Patient Registration screen

PATIENT REGISTRATION

Patient Name		Registration Date	
Patient ID		Room Number	
Age		Yrs	
Gender			
Address			
Contact Number			

Save

Add

Delete

Search

Close

Thank You