

Data Management and Database Design
DAMG 6210
Team 6

Project by

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Hospital Management System

1. Business Problem

Healthcare industry is experiencing a massive transition. The erstwhile legacy manual filing system has plethora of problems associated with it. Some of these problems include insecurities of files, inefficient retrieval, inefficient billing system, data portability etc. to name a few.

According to PwC's report there are 5 main aspects that are driving this growth.

1. Growing influence of consumerism – Patients have a greater access to data, and it is easier for them to find options that suit them well. It has become easier for healthcare providers to reach out to consumers.
2. Transition to value-based care – Transition to alternative payment models has yielded a more immediate, wide scale results and helped in producing new sources of revenue for healthcare facilities.
3. Widespread use of technology – With the shift to electronic health records, new technologies are changing the way clinics provide health care and how patients connect with them.
4. Decentralization of care – Remote patient monitoring and virtual clinics have brought care programs directly to patients. This decentralization has brought health care providers directly to consumers without the need to bring consumers to a centralized location.
5. Increased focus on wellness – There is an increased focus on personal health in the current times. Patients, insurers, and healthcare providers have all benefited from this.

2. Proposed Solution:

For this project we are designing a healthcare management system to provide accessibility, data management and information transfer among various entities. We are integrating multiple entities including doctors, hospital staff, pharmacy, testing labs, hospital rooms, ambulances, patients etc. into a single unified system.

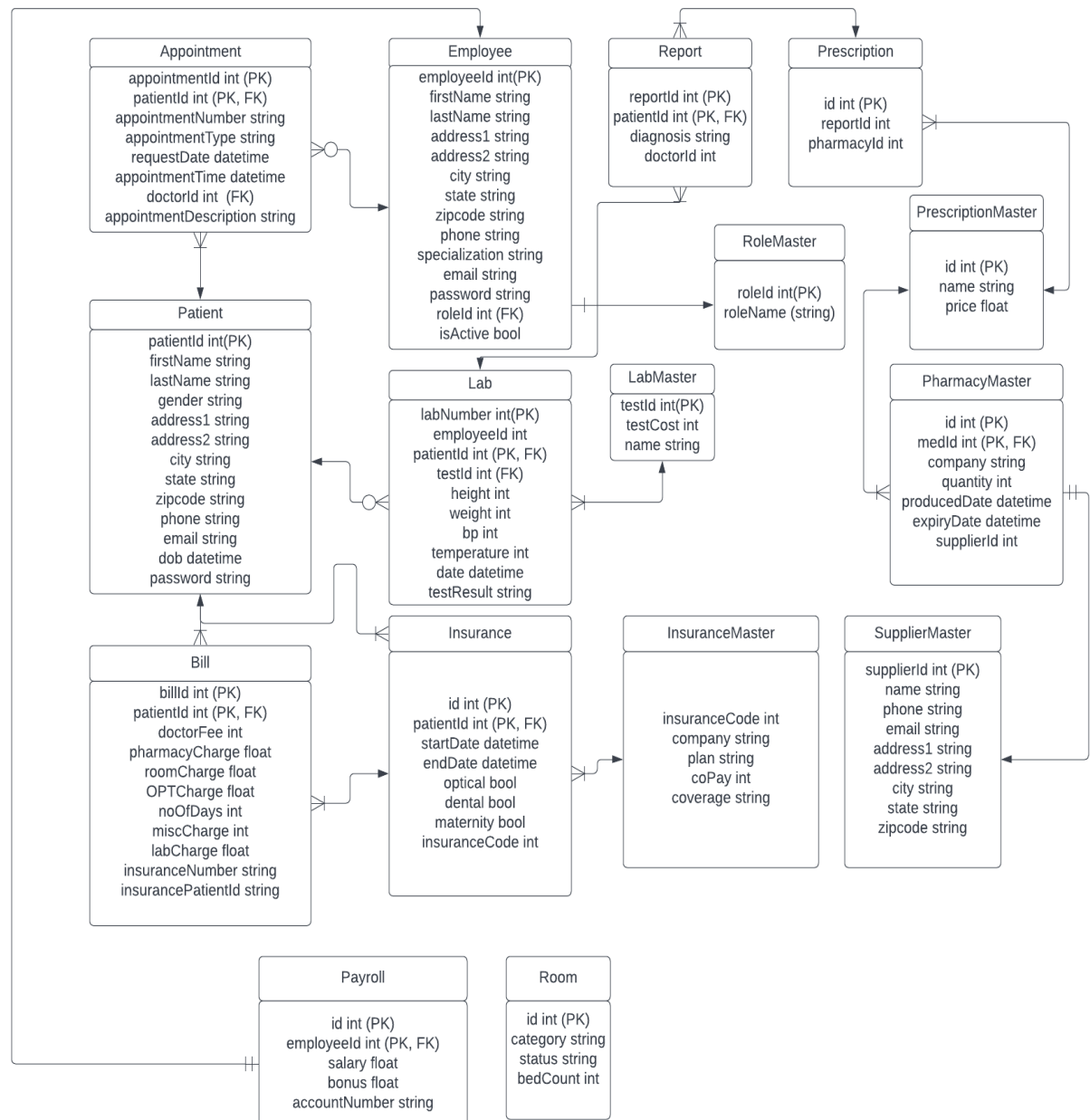
The system will have multiple views for the different categories of users.

- Doctors
- Lab Assistants
- Pharmacists
- Receptionists
- Patients

The system will also incorporate a role-based system that will provide a layer of abstraction as to who has access to what data as health records are considered confidential.

At the heart of the system will be a master employee and patient tables that will have records of all active and inactive staff and patients respectively. Putting the nitty gritty aside we will have multiple tables channeling data to demonstrate normalization.

ER Diagram



Business Rules

Defined Roles and Applicable Rules:

Patient

- Each patient must be associated with unique Patient ID.
- Each Patient can have one or many Patient Records.
- Each Patient Record can be for a different Record Component, such as Admission, Diagnosis, Medication etc.,
- A Patient can have one or many Address.
- A Patient can stay in one or many Rooms during their stay in the Hospital.
- A Patient can have one or many Bills.
- Each Patient Bill can have one or many Bill Items.
- A Patient can have one or many Methods of Payment.

Doctor

- Each doctor will be bearing a unique Doctor ID.
- Each Doctor can be attending/treating one/many patients at a time, provided timings not overlapped.
- Each doctor may be specialized in more than one department such as cardio, neuro, general surgery etc., but not involved with more than one in the given hospital.
- A doctor may not give unavailability in case of extreme emergency, even if their work-hour requirements for the week are met. (Field of Specialization + Pay based on hours attended).

Nurse/Attendant

- Each nurse may be attending one or many patients at a given time.
- Each assistant/nurse/attendant will be assigned a department/work floor based on their field of study.

Lab Practitioner

- Each lab will be assigned to 4 practitioner and looked after by not more than two (based on shifts) lab practitioners and will be assigned based on their field of study and expertise.
- Each lab will be provided with necessary equipment and will be under continuous observation by the lab practitioners when a patient is assigned.

Staff- Assistant / Staff- Receptionist / Staff- Cleaners

- The reception must be assigned with at least three and at most five staff members including receptionists and assistants based on their work-shifts.

Views

1. Patients View:

Patients will have access to 3 separate views

- Personal detail view – this view will provide patients with an option to view/edit their personal details
- Appointment View – in this view the patients can view their upcoming and past appointments
- Prescription View – This view will be a combination of Lab and Report tables. The person can view the test results and corresponding prescriptions using this view.
- Bill View – This view will include all the billing information for a patient based on their visits. This will fetch details from the insurance table as well.

2. Employee View:

All employees by default get 1 view and further based on their roles in the system.

- Personal Detail View: this view will provide employee with an option to view/edit their personal details and will be combined with payroll to view their corresponding payments.

3. Doctor View:

- Employees of type doctor will get an additional view for their upcoming appointments
- They can also view the prescription view by querying on the patient and appointment id fields.

4. Pharmacist View:

- A pharmacist is another employee in the hospital and will get another view in the form of combination of medicine, inventory, and supplier tables.

5. Lab Assistant View:

- Lab assistant will be able to update the results of the tests in the lab table and enter details of the patients that will later be picked up by the reports view.

6. Receptionist View:

- Receptionist will be able to schedule appointments for the patients by referring to the appointments table.
- Receptionist will also have access to the billing module to provide the patients with their bills. This will be an aggregation of bill and insurance tables but unlike the patients who can only access their records the receptionist will have access to all bills.
- Receptionist will also have access to room table to update the availability based on patients opting for beds.

7. HR View:

- This type of view will be a master combination of employee and payroll tables.

8. Manager View:

- This view will derive sections of receptionist's view and HR views.
- Users with view can access the details of the employees and view billing tables.

9. Power User:

- This will be the system admin with all access to every module of the system.

Security (User level access, permissions)

Patient Details	Read	Write	Modify
Doctor	Access	No Access	No Access
Patient	Access	Access	Access
Nurse	Access	No Access	No Access
Receptionist	Access	Access	Access
Lab assistant	Access	No Access	No Access
Pharmacist	No Access	No Access	No Access
Manager	No Access	No Access	No Access
HR	No Access	No Access	No Access

Report	Read	Write	Modify
Doctor	Access	No Access	No Access
Patient	Access	No Access	No Access
Nurse	Access	No Access	No Access
Receptionist	Access	No Access	No Access
Lab assistant	Access	Access	Access
Pharmacist	No Access	No Access	No Access
Manager	No Access	No Access	No Access
HR	No Access	No Access	No Access

Prescription	Read	Write	Modify
Doctor	Access	Access	Access
Patient	Access	No Access	No Access
Nurse	Access	No Access	No Access
Receptionist	Access	No Access	Access
Lab assistant	Access	No Access	No Access
Pharmacist	Access	No Access	No Access
Manager	No Access	No Access	No Access
HR	No Access	No Access	No Access

Appointment	Read	Write	Modify
Doctor	Access	Access	Access
Patient	Access	No Access	No Access
Nurse	No Access	No Access	No Access
Receptionist	Access	Access	Access
Lab assistant	No Access	No Access	No Access
Pharmacist	No Access	No Access	No Access
Manager	No Access	No Access	No Access
HR	No Access	No Access	No Access

Billing	Read	Write	Modify
Doctor	No Access	No Access	No Access
Patient	Access	No Access	No Access
Nurse	No Access	No Access	No Access
Receptionist	Access	Access	Access
Lab assistant	No Access	No Access	No Access
Pharmacist	No Access	No Access	No Access
Manager	Access	No Access	No Access
HR	No Access	No Access	No Access

Employee	Read	Write	Modify
Doctor	Access	No Access	No Access
Patient	No Access	No Access	No Access
Nurse	Access	No Access	No Access
Receptionist	Access	No Access	No Access
Lab assistant	Access	No Access	No Access
Pharmacist	Access	No Access	No Access
Manager	Access	Access	Access
HR	Access	Access	Access

Lab Master	Read	Write	Modify
Doctor	No Access	No Access	No Access
Patient	No Access	No Access	No Access
Nurse	No Access	No Access	No Access
Receptionist	Access	No Access	No Access
Lab assistant	Access	Access	Access
Pharmacist	No Access	No Access	No Access
Manager	No Access	No Access	No Access

HR	No Access	No Access	No Access
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Pharmacy Master	Read	Write	Modify
Doctor	No Access	No Access	No Access
Patient	No Access	No Access	No Access
Nurse	No Access	No Access	No Access
Receptionist	No Access	No Access	No Access
Lab assistant	No Access	No Access	No Access
Pharmacist	Access	Access	Access
Manager	Access	Access	Access
HR	No Access	No Access	No Access

Role Master	Read	Write	Modify
Doctor	No Access	No Access	No Access
Patient	No Access	No Access	No Access
Nurse	No Access	No Access	No Access
Receptionist	No Access	No Access	No Access
Lab assistant	No Access	No Access	No Access
Pharmacist	No Access	No Access	No Access
Manager	Access	No Access	No Access
HR	Access	Access	Access

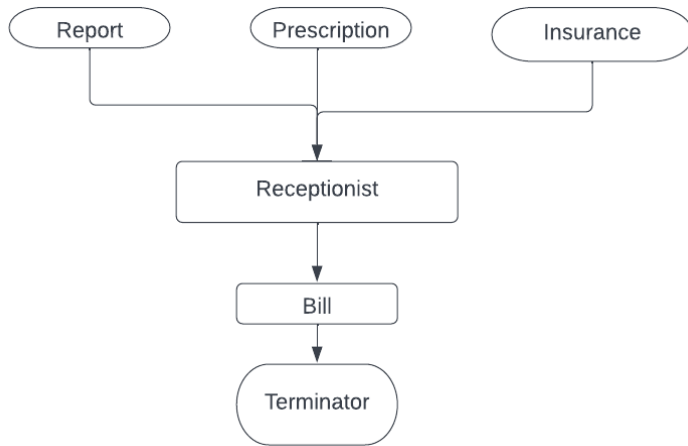
Supplier Master	Read	Write	Modify
Doctor	No Access	No Access	No Access
Patient	No Access	No Access	No Access
Nurse	No Access	No Access	No Access
Receptionist	No Access	No Access	No Access
Lab assistant	No Access	No Access	No Access
Pharmacist	Access	Access	Access
Manager	Access	Access	Access
HR	No Access	No Access	No Access

Insurance Master	Read	Write	Modify
Doctor	No Access	No Access	No Access
Patient	Access	Access	Access
Nurse	No Access	No Access	No Access
Receptionist	Access	Access	Access
Lab assistant	No Access	No Access	No Access
Pharmacist	No Access	No Access	No Access
Manager	Access	No Access	No Access
HR	Access	Access	Access

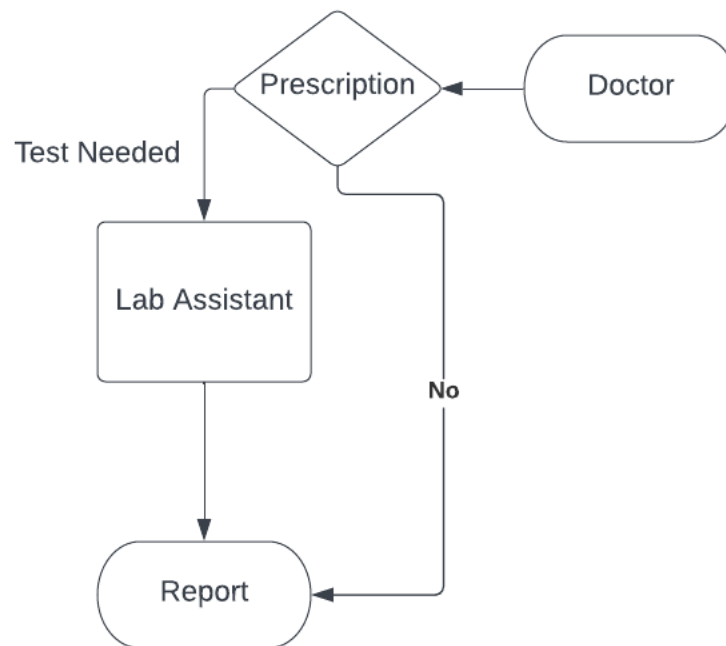
Room	Read	Write	Modify
Doctor	Access	No Access	No Access
Patient	No Access	No Access	No Access
Nurse	Access	No Access	No Access
Receptionist	Access	Access	Access
Lab assistant	No Access	No Access	No Access
Pharmacist	No Access	No Access	No Access
Manager	Access	Access	Access
HR	No Access	No Access	No Access

Payroll	Read	Write	Modify
Doctor	Access	No Access	No Access
Patient	No Access	No Access	No Access
Nurse	Access	No Access	No Access
Receptionist	Access	No Access	No Access
Lab assistant	Access	No Access	No Access
Pharmacist	Access	No Access	No Access
Manager	Access	No Access	No Access
HR	Access	Access	Access

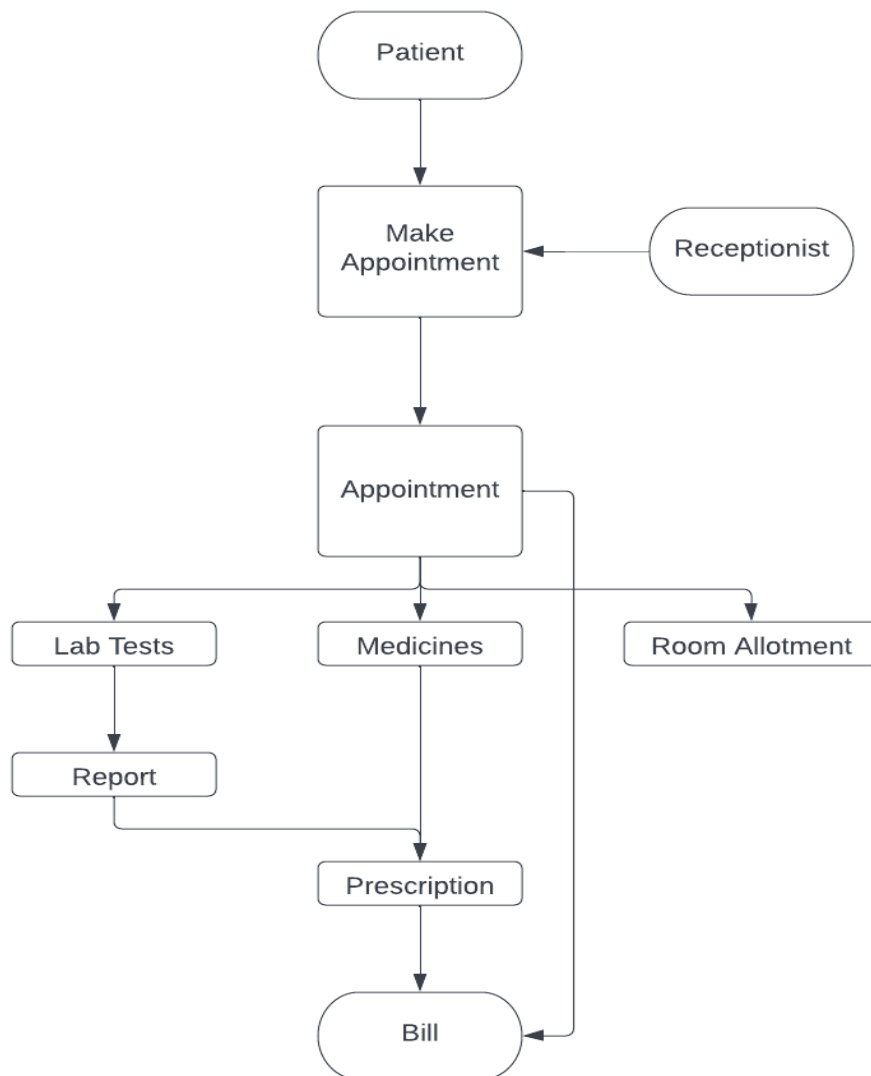
Flow Diagram - Bill



Flow Diagram - Lab



Flow Diagram – Doctor



Flow Diagram - Inventory

