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.
   1. Doctors
   2. Lab Assistants
   3. Pharmacists
   4. Receptionists
   5. 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
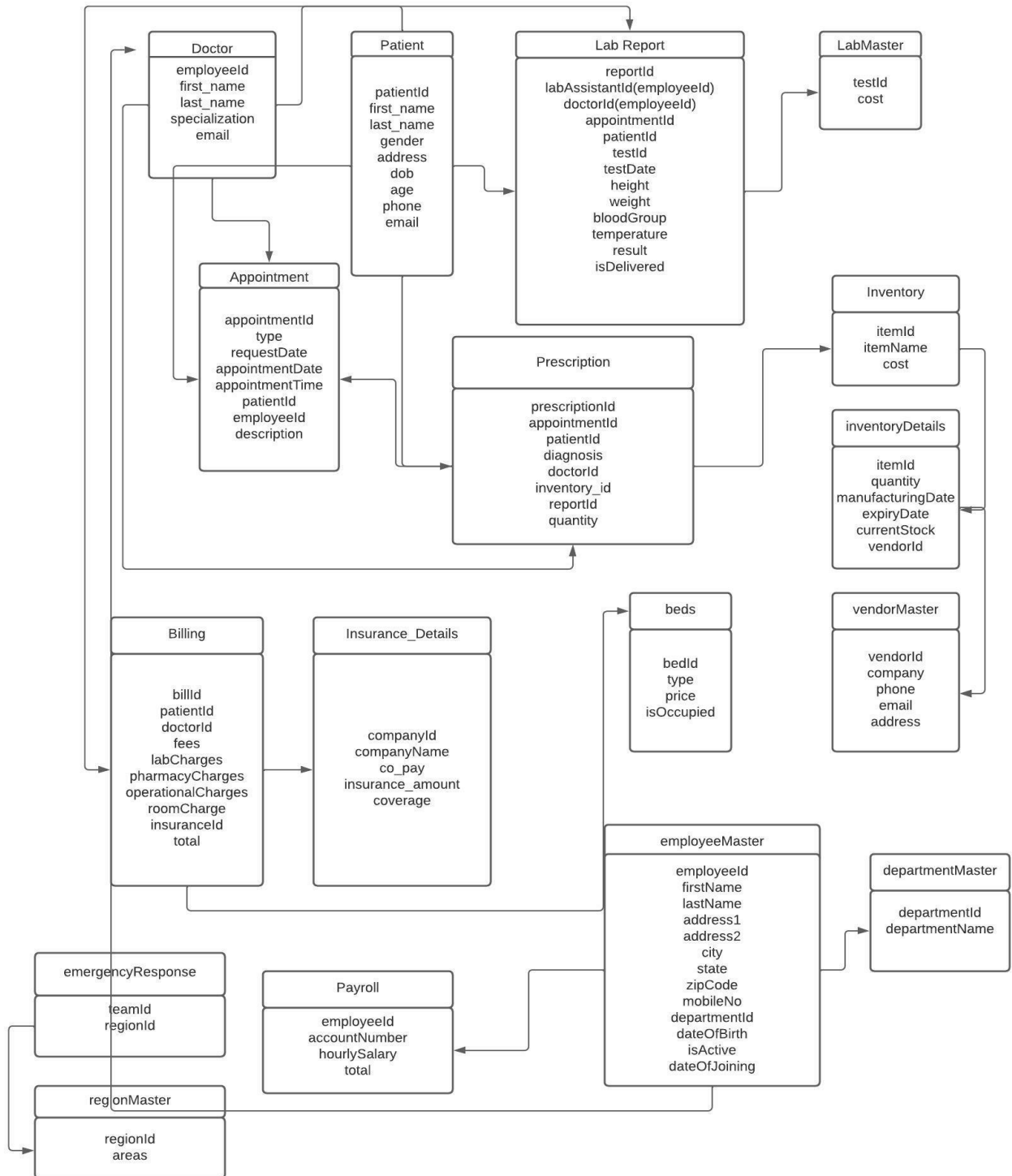
aside we will have multiple tables channeling data to demonstrate normalization. Here is a brief overview of what will be co0vered in each view.

1. Doctor's View:
    a. Doctor can view their upcoming appointments
    b. View the prescriptions
    c. View lab reports
2. Patients View:
    a. Patients can schedule appointments (endpoints will be provided via SP)
    b. View prescriptions (historic and current)
    c. View lab reports (historic and current)
    d. View bills
    e. Book Room
3. Receptionist View:
    a. Book appointment for patient
    b. View Bills
    c. Book Room
4. Lab Assistant View:
    a. Can schedule a test
    b. Update results in the reports
5. Pharmacist View:
    a. View inventory details
    b. View vendor details
    c. Update bill for a patient
6. Employee View:
    a. View Payroll

In addition to this we will incorporate functionalities for emergency response and tie the units to designated areas. We will try to provide endpoints for as many services as possible and demonstrate their use by creating users with those roles so that a degree of abstraction is maintained.

3. ER Diagram

The proposed ER diagram for the system will be as follows but it might go through certain alterations in the later stages.

Doctor
- employeeId
- first_name
- last_name
- specialization
- email

Patient
- patientId
- first_name
- last_name
- gender
- address
- dob
- age
- phone
- email

Lab Report
- reportId
- labAssistantId(employeeId)
- doctorId(employeeId)
- appointmentId
- patientId
- testId
- testDate
- height
- weight
- bloodGroup
- temperature
- result
- isDelivered

LabMaster
- testId
- cost

Appointment
- appointmentId
- type
- requestDate
- appointmentDate
- appointmentTime
- patientId
- employeeId
- description

Prescription
- prescriptionId
- appointmentId
- patientId
- diagnosis
- doctorId
- inventory_id
- reportId
- quantity

Inventory
- itemId
- itemName
- cost

inventoryDetails
- itemId
- quantity
- manufacturingDate
- expiryDate
- currentStock
- vendorId

vendorMaster
- vendorId
- company
- phone
- email
- address

Billing
- billId
- patientId
- doctorId
- fees
- labCharges
- pharmacyCharges
- operationalCharges
- roomCharge
- insuranceId
- total

Insurance_Details
- companyId
- companyName
- co_pay
- insurance_amount
- coverage

beds
- bedId
- type
- price
- isOccupied

employeeMaster
- employeeId
- firstName
- lastName
- address1
- address2
- city
- state
- zipCode
- mobileNo
- departmentId
- dateOfBirth
- isActive
- dateOfJoining

departmentMaster
- departmentId
- departmentName

emergencyResponse
- teamId
- regionId

Payroll
- employeeId
- accountNumber
- hourlySalary
- total

regionMaster
- regionId
- areas

4. Flow diagram
   This is the basic flow diagram which will undergo more fine tuning in the course of development.
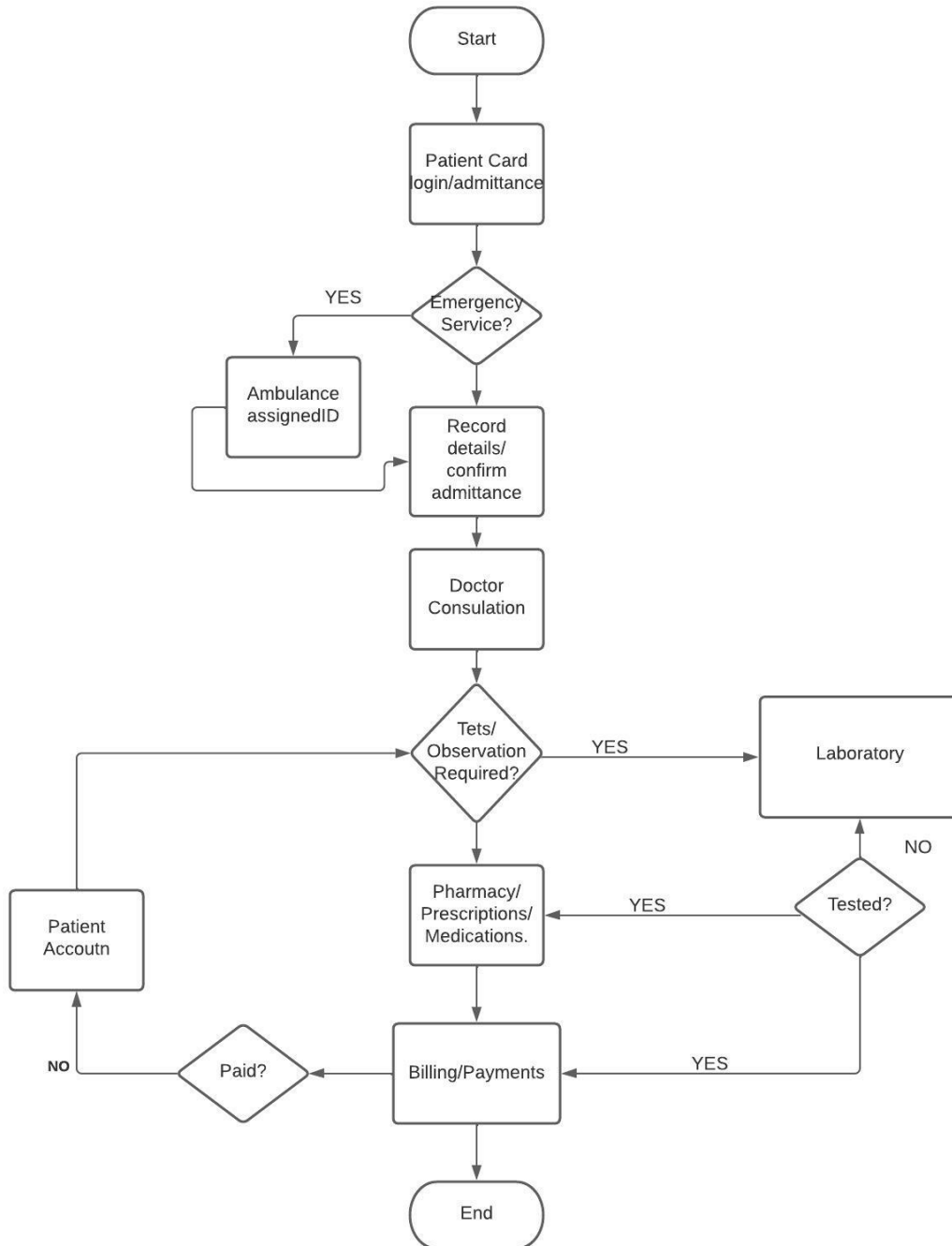
5. Entities and datatypes
   a. employeeMaster
      i. employeeId – INT
      ii. firstName – VARCHAR
      iii. lastName – VARCHAR
      iv. address1 – VARCHAR
      v. address2 – VARCHAR
      vi. city – VARCHAR
      vii. city – VARCHAR
      viii. state – VARCHAR
      ix. country – VARCHAR
      x. zipCode – VARCHAR
      xi. mobileNumber – VARCHAR
      xii. dateOfBirth – DATE
      xiii. email - VARCHAR
      xiv. isActive – BOOL
      xv. dateOfJoining – DATE
   b. Payroll
      i. employeeId – INT
      ii. accountNumber – DECIMAL
      iii. hourlySalary – DOUBLE
      iv. total – DOUBLE
   c. departmentMaster
      i. departmentId – INT
      ii. departmentName – VACHAR
   d. beds
      i. bedId – INT
      ii. bedType – VARCHAR
      iii. price – DOUBLE
      iv. isOccupied – BOOL
   e. emergencyResponse
      i. teamId – INT
      ii. regionId – INT
   f. regionMaster
      i. regionId – INT
      ii. areas – VARCHAR
   g. Doctor
      i. employeeId – INT
      ii. first_name – VARCHAR
      iii. last_name – VARCHAR
      iv. specialization – VARCHAR

h. Appointment
   i. appointmentId – INT
   ii. type – VARCHAR
   iii. requestDate – DATE
   iv. appointmentDate – DATE
   v. appointmentTime – DATE
   vi. patientId – INT
   vii. employeeId – INT
   viii. description – VARCHAR
i. Prescription
   i. prescriptionId – INT
   ii. appointmentId – INT
   iii. patientId – INT
   iv. diagnosis – VARCHAR
   v. doctorID – INT
   vi. inventoryId – INT
   vii. reportId – INT
   viii. quantity – INT
j. Patient
   i. patientId -INT
   ii. firstName – VARCHAR
   iii. lastName – VARCHAR
   iv. gender – VARCHAR
   v. address – VARCHAR
   vi. dob – DATE
   vii. age – TINYINT
   viii. phone – VARCHAR
   ix. email – VARCHAR
k. LabReport
   i. reportId – INT
   ii. labAssistantId – INT
   iii. doctorId – INT
   iv. appointmentId – INT
   v. patientId – INT
   vi. testId – INT
   vii. testDate- DATE
   viii. height – TINYINT
   ix. weight – TINYINT
   x. bloodgroup – VARCHAR
   xi. temperature – TINYINT
   xii. result – VARCHAR

xiii. isDelivered – BOOL

l. LabMaster
    i. testId – INT
    ii. cost – DOUBLE

m. Inventory
    i. itemId – INT
    ii. itemName – VARCHAR
    iii. cost – DOUBLE

n. InventoryDetails
    i. itemId – INT
    ii. quantity – INT
    iii. manufacturingDate – DATE
    iv. expiryDate – DATE
    v. currentStock – INT
    vi. vendorId – INT

o. vendorMaster
    i. vendorId – INT
    ii. company – VARCHAR
    iii. phone – VARCHAR
    iv. email – VARCHAR
    v. address – VARCHAR

p. Billing
    i. billId – INT
    ii. patientId – INT
    iii. doctorID – INT
    iv. fees – DOUBLE
    v. labcharges – DOUBLE
    vi. pharmacyCharges – DOUBLE
    vii. operationalCharges – DOUBLE
    viii. roomCharge – DOUBLE
    ix. insuranceId – INT
    x. total – DOUBLE

q. Insurance_Details
    i. companyId – INT
    ii. companyName – VARCHAR
    iii. co_pay – DOUBLE
    iv. insurance_amount – DOUBLE
    v. coverage - VARCHAR