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ITIS6120/8120

Project 2

Electronic Medical Record System

Introduction

Project Overview

As technology develops at an astounding rate, data has become an intrinsic byproduct on major fields, therefore being able to manage and use them properly is essential for their prosperity. In the medical field databases are mainly known as Electronic Medical Records System or EMR and play a key role in maintaining high levels of organizations in this industry. These store patient's information, such as demographics, appointments, billing, and medical history. Storing this information is essential for the medical staff, such as nurses and doctors to be informed of their patients and how their health have changed through time.

Project Scope

For this project I decided to work with a small or private orthodontist clinic, which mainly has a primary orthodontist, a secretary, and a couple of orthodontist assistants. Storing, updating, and maintaining their medical records is the primary objective. Allowing them to maintain simple and clean records of their patient's visits, bills, treatments, and procedures performed. Also allowing them to manage their staff and document their information and participation with which patient. Using relational tables will allow for data to be stored, retrieved, and updated with ease. All while also adding the ability to add additional patients and staff records if necessary. The project will also allow them to keep track of their supplies and equipment making sure they know when was the last restock and who to contact. The EMR System will contain an application program interface (API), which will allow users to manipulate the information in the system. Allowing them to insert, update and delete data, as well as providing a security layer protecting access to the information based each of the user roles. The systems will also

include an audit system which will log and store any modification made to any of the tables in the database.

Assumptions

- All users will have access to the EMR System.
- The EMR System will store all the information about a patient's visit.
- API stored procedures will be used by the staff to interact with the EMR system
- The orthodontist office will contain enough staff to house all the roles available in the *orthodontistDB* database.

Constrains

- The EMR system is designed for a small scale small orthodontic office.
- The EMR system currently has a set number of user roles

Database Requirements

1. Store patient's demographics
2. Store patient's appointment information, including which staff served them and in which room and what procedure was performed.
3. Store staff credentials and specialties
4. Store clinic supplies and equipment information
5. Store patients billing information
6. Store drugs and medication information
7. Store insurance and supply companies' information
8. Modify existing records
9. Add new records
10. Have the ability for medical staff to interact with the system using stored procedures
11. Provide user roles and user authentication to the EMR system
12. Log all changes made to the information in the system.

UML Diagram

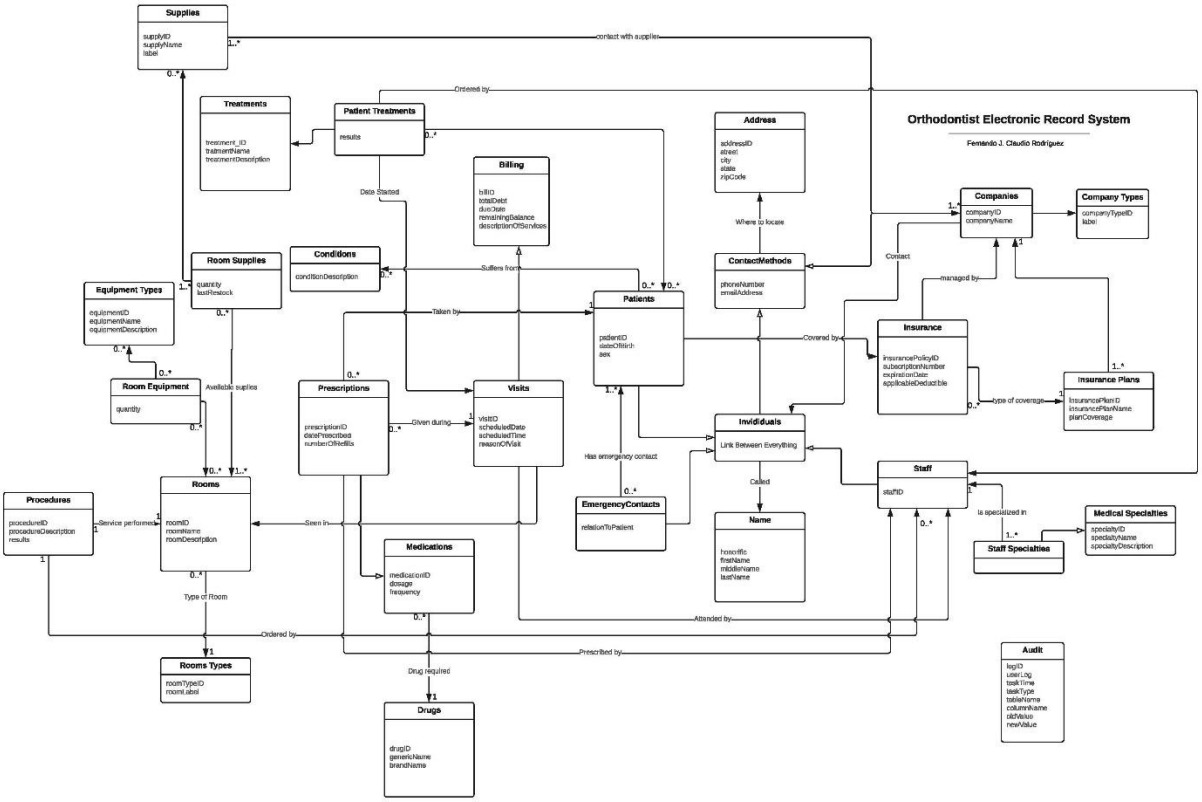
Orthodontist Electronic Record System
Fernando J. Claudio Rodriguez
Supplies
supplyID
supplyName
label
Treatments
treatment_ID
tratmentName
treatmentDescription
Patient Treatments
results
Billing
billID
totalDebt
dueDate
remainingBalance
descriptionOfServices
Address
addressID
street
city
state
zipCode
Companies
companyID
companyName
Company Types
companyTypeID
label
Room Supplies
quantity
lastRestock
Conditions
conditionDescription
ContactMethods
phoneNumber
emailAddress
Equipment Types
equipmentID
equipmentName
equipmentDescription
Patients
patientID
dateOfBirth
sex
Insurance
insurancePolicyID
subscriptionNumber
expirationDate
applicableDeductible
Insurance Plans
InsurancePlanID
insurancePlanName
planCoverage
Room Equipment
quantity
Prescriptions
prescriptionID
datePrescribed
numberOfRefills
Visits
visitID
scheduledDate
scheduledTime
reasonOfVisit
Invididuals
Link Between Everything
Staff
staffID
Procedures
procedureID
procedureDescription
results
Rooms
roomID
roomName
roomDescription
EmergencyContacts
relationToPatient
Name
honorific
firstName
middleName
lastName
Medical Specialties
specialtyID
specialtyName
specialtyDescription
Staff Specialties
Medications
medicationID
dosage
frequency
Rooms Types
roomTypeID
roomLabel
Drugs
drugID
genericName
brandName
Audit
logID
userLog
taskTime
taskType
tableName
columnName
oldValue
newValue
contact with supplier
Ordered by
Date Started
Where to locate
Contact
managed by
Suffers from
Taken by
Covered by
Given during
Has emergency contact
Called
Is specialized in
Service performed
Seen in
Type of Room
Attended by
Ordered by
Prescribed by
Drug required
Available supplies
type of coverage

Table Structure

Overview

Comprise of 27 tables the database can store all the required information in an effective manner. Using different relationships between the tables allowing for the data to be distributed across multiple tables, minimizing issues of all the information being stored in one place. Using primary or foreign keys as the indexes helps maintain a simple, yet clean record. This structure allows for the normalization of the information allowing for a simpler modification and adaptation of the data.

Tables Descriptions

1. **Address**

   The *address* table stores the postal addresses of all the individuals and companies that are used in the *orthodontistDB* database. It contains indexes on *addressID*, which is the primary key, *city, state* and *zipCode*.

2. **Audit**

   The *audit* table stores the information of all the procedures and modifications made to any to the tables including inserts, updates, and deletes made in the *orthodontistDB* database. All changes contain their new and old values. It contains an index in the *logID*, primary key.

3. **Billing**

   The *billing* table stores the information related to the payment and bills for the services performed to the patient. It contains an index in the *billID*, which is the primary key.

4. **Companies**

   The *companies* table stores the information of the companies which the orthodontist office has connections with, including their names and contact information. Is contains indexes on the *companyID,* which is the primary key, and *mailingAddress,* being a foreign key referencing the *address* table.

5. **Company Types**

   The *companyTypes* table stores a label for the different kinds of companies that could be used for the development and functioning of an orthodontist office. It contains and index in its primary key, *companyTypeID.*

6. **Drugs**

   The *drugs* table is a lookup table which stores the information about drugs that may be taken or prescribed to patients. It contains an index on *drugID*, its primary key.

7. **Emergency Contacts**

   The *emergencyContacts* table stores the people in the *individuals* table identified as emergency contact for a certain patient. This table contains indexes on the composite key, composed of *contactID* and *patientID*.

8. **Equipment Types**

   The *equipmentTypes* table is a lookup table which stores the information about the different equipment used in the orthodontist office. It contains and index in *equipmentID,* its primary key.

9. **Individuals**

   The *individuals* table stores the names and contact information of all the people registered in the *orthodontistDB* database. Those being, patients, staff, company contacts or emergency contacts. It contains an index on *individual ID*, which is the primary key, and *mailingAddress*, which is a foreign key to the *address* table.

10. **Insurance**

    The *insurance* table stores the information details about the insurance plan of each of the different patients. It contains multiple indexes for *insurancePolicyID*, primary key, *patientID,* foreign key referencing *patients* table, *companyID,* foreign key refencing the *companies* table and lastly *insurancePlan*, referencing the *insurancePlans* table.

11. Insurance Plans

The *insurancePlans* table is a lookup table which stores the information about the different kinds of insurance plans available, which the orthodontist office accepts and what are their coverages. It contains an index in its primary key, *insurancePlanID*.

12. Medical Specialties

The *medicalSpecialties* table contains the information about the different kinds of specialties obtained by the diverse staff of the orthodontist office. It also contains an index on the *specialtyID*, which is the primary key.

13. Medications

The *medications* table stores the information about the instruction and dosage required for taking each of the different medication. It contains indexes on both *medicationID,* its primary key, and *drug*, which is a foreign key referencing the *drugs* table.

14. Patient Conditions

The *patientConditions* table stores the medical conditions which the patients are currently experiencing. It contains an index on the *patientID,* being the primary key.

15. Patients

The *patients* table stores the information about patients, including their *dateOfBirth* and *sex.* Patients are identified by the corresponding id row in the *individuals* table.

16. Patient Treatments

The *patientTreatments* table stores the information about the progress and starting dates of the treatments of each patient. It contains indexes on *patientID,* foreign key referencing the *patients* table, *treatmentID*, foreign key referencing the *treatments* table, *dateStarted*, foreign key referencing the *visits* table, and *orderedBy*, foreign key referencing the *staff* table.

17. Prescriptions

The *prescription* table stores the information about the different medications prescribed to the patients by the orthodontist in the office. It contains indexes on *prescriptionID*, its primary key, *prescribedBy,* foreign key referencing the *staff* table, *patientID*, foreign key

referencing the *patients* table and datePrescribed, foreign key referencing the *visits* table.

18. Procedures

The *procedures* table stores the information about the different medical procedures performed during each of the patients visits. It contains indexes on *procedure_ID,* its primary key, *visit*, foreign key referencing the *visits* table, *patient*, foreign key referencing the *patients* table, *examinedBy,,* foreign key referencing the *staff* table, *examinedIn*, foreign key referencing the *rooms* table and *treatment*, foreign key referencing the *treatments table.*

19. Room Equipment

The *roomEquipment* table stores information about the amount and kind of equipment available in each one of the rooms of the office. It contains indexes on both *roomID roomID* and *equipmentID*, both foreign keys referencing the *rooms* and *equipmentTypes* table.

20. Rooms

The *rooms* table stores information about the rooms in the orthodontist office, including name, type, and description. It contains indexes in *roomID,* primary key, and *roomType*, foreign key referencing *roomTypes* table.

21. Room Types

The *roomTypes* table is a lookup table which stores the classification or types for each of the different rooms available to the orthodontist office. It contains an index in *roomTypeID,* being its primary key.

22. Room Supplies

The *roomSupplies* table stores the information about the different supplies available in the rooms of the orthodontist office. It contains indexes in *roomID,* foreign key referencing *rooms* table, and *supplyID,* foreign key referencing *supplies* table.

23. Staff

The *staff* table stores the information about the different staff members working at the orthodontist office. All the staff contains a corresponding row in the *individuals* table. This table contains an index on its primary key, which is *staffID.*

24. Staff Specialties

The *staffSpecialties* table contains all the medical specialties which each of the different staff members possess. Both *staffNumber* & *medicalSpecialty* contain a corresponding row in the *staff* and *medicalSpecialties* tables. The table contains index on both previous mentioned.

25. Supplies

The *supplies* table is a lookup table which stores the information about the different supplies used in the orthodontist office and which company supplies them. It contains indexes in the *supplyID,* primary key*,* and *companySupplier*, foreign key referencing the *companies* table.

26. Treatments

The *treatments* table is a lookup table is which stores the information about the different treatments for the multiple conditions that patients may present. It contains and index in *treatmentID*, which is its primary key.

27. Visits

The *visits* table stores the information about the all the appointments made. Each row in the table has a corresponding row in the *billing* table. It contains multiple indexes on *visitID,* its primary key, *patient,* foreign key referencing the *patients* table, *examineBy,* foreign key refenring the *staff* table, *examinedIn,* foreign key referencing the *rooms,* table and *billOfServices*, foreign key referencing the *billing* table.

Tables & Attributes

- **Address**
  - Address ID
  - Street
  - City
  - State
  - Zip Code’
- **Audit**
  - Log ID
  - User Log
  - Task Time
  - Task Type
  - Table Name
  - Column Name
  - Previous Value
  - New Value
- **Individuals**
  - Individual ID
  - Honorific
  - First Name
  - Middle Name
  - Last Name
  - Mailing Address
  - Phone Number
  - Email Address
- **Patients**
  - Patient ID
  - Date Of Birth
  - Sex
- **Patient Conditions**
  - Patient ID
  - Condition Description
- **Emergency Contacts**
  - Contact ID
  - Patient ID
  - Relation to Patient
- **Medical Specialties**
  - Specialty ID
  - Specialty Name
  - Specialty Description
- **Staff**
  - Staff ID
  - Job Position
  - User Log In
  - User Role
- **Staff Specialties**
  - Staff Number
  - Medical Specialty
- **Company Types**
  - Company Type ID
  - Label
- **Companies**
  - Company ID
  - Company Name
  - Company Type ID
  - Contact Person
  - Phone Number
  - Email Address
  - Mailing Address
- **Insurance Plans**
  - Insurance Plan ID
  - Insurance Plan Name
  - Plan Coverage
- **Insurance**
  - Insurance Policy ID
  - Patient ID
  - Company ID
  - Insurance Plan
  - Subscription Number
  - Expiration Date
  - Applicable Deductible
- **Drugs**
  - Drug ID
  - Generic Name
  - Brand Name
- **Medications**
  - Medication ID
  - Drug
  - Dosage
  - Frequency
- **Room Types**
  - Room Type ID
  - Room Label

- **Rooms**
  - Room ID
  - Room Name
  - Room Type
  - Room Description
- **Equipment Types**
  - Equipment ID
  - Equipment Name
  - Equipment Description
- **Room Equipment**
  - Room ID
  - Equipment ID
  - Quantity

- **Supplies**
  - Supply ID
  - Supply Name
  - Label
  - Company Supplier
- **Room Supplies**
  - Room ID
  - Supply ID
  - Quantity
  - Last Restock
- **Treatments**
  - Treatment ID
  - Treatment Name
  - Treatment Description
- **Billing**
  - Bill ID
  - Total Debt
  - Due Date
  - Remaining Balance
  - Description Of Services
- **Visits**
  - Visit ID
  - Patient
  - Schedules Date Time
  - Reason of Visit
  - Examined By
  - Examined In
  - Bill of Services
  - Results
  - Check In
- **Prescriptions**
  - Prescription ID
  - Prescribed By
  - Patient ID
  - Date Prescribed
  - Number of Refills
- **Patient Treatments**
  - Patient ID
  - Treatment ID
  - Date Started
  - Ordered By
  - Results
- **Procedures**
  - Procedure ID
  - Visit
  - Patient
  - Examined By
  - Examined In
  - Treatment

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