# Database Design Documentation

Design and Implementation of a

Dental Clinic

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# REVISION HISTORY

|  |  |  |  |
| --- | --- | --- | --- |
| Version Number | Version date | Updated by | Description |
| 1.0 | 12/11/2021 | Aishwarya Sawant | Added major entities and few business rules |
| 2.0 | 20/11/2021 | Prashanti Salunkhe | Included all the entities, additional business rules and ER diagram |
| 3.0 | 03/12/2021 | Pratik Randad | Modified Entities, rules, ER diagram |
| 4.0 | 15/12/2021 | Krithika Madabhooshi | Made final changes to the document, modified entities, rules, ER diagram |

# INTRODUCTION

Nowadays, dental clinics have become important as they are providing crucial services to the public. Therefore, it is necessary to automate their work process to enhance the quality of their service.

By creating a database, it is easy to keep track of all the information regarding the patients and their doctors and simply their work up to an extent.

The objective of creating this database is to:

* Manage and save the patient records accurately
* Avoid the data redundancy of patient dental information
* Check the available date and time to make appointment between dentist and patient
* Check the availability of the room for the appointment to take place
* Save and display patient’s medical history information
* Save and display patient’s dental history and any treatment done before coming to the clinic.
* Save and display a patient’s current dental records from this clinic
* Manage payments done by the patient after each appointment
* Display prescription given by the doctor after each appointment

# ENTITIES OVERVIEW

|  |  |
| --- | --- |
| **Entities** | **Attributes** |
| Patient\_details | patient\_id, first\_name, last\_name, primary\_phone, secondary\_phone, email, login\_password, street\_address, zip\_code, city, state, dob, gender, emergency\_contact\_name, emergency\_contact\_number, registration\_date |
| Employee | employee\_id, first\_name, last\_name, primary\_phone, email, login\_password, street\_address, zip\_code, city, state, dob, gender, joining\_date, SSN, branch\_id, title\_id |
| Title | title\_id, title\_name |
| Insurance | patient\_id, subscriber\_name, provider\_id, relationshipto\_insured, policy\_group\_number, certificate\_number, valid\_till |
| Insurance\_provider | provider\_id, name, address, phone |
| Medical\_history | patient\_id, isEverHospitalized, heart\_condition, disease, medications, description, allergies |
| Dental\_history | patient\_id, last\_visited\_date, last\_visited\_dentist, complications, reaction\_to\_anesthesia, braces, gums\_bleed, cavities, gums\_recession, difficulties\_swallowing, tooth\_ache, teeth\_removed, allergies |
| Procedure | procedure\_id, procedure\_name, duration, fees |
| Branch | branch\_id, branch\_name, phone |
| Room | branch\_id, procedure\_id, room\_no |
| Doctor\_branches | employee\_id, branch\_id |
| Doctor\_speciality | employee\_id, procedure\_id |
| Doctor\_schedule | employee\_id, branch\_id, date, isAvailable |
| Appointment | appointment\_id, employee\_id, procedure\_id, branch\_id, date, time\_slot, patient\_id, room\_no, status |
| Payment | payment\_id, appointment\_id, mode\_of\_payment |
| Prescription | patient\_id, appointment\_id, prescription |
| Dental\_records | patient\_id, branch\_id, procedure\_id |

# ENTITY DETAILS

## 1. Patient\_details

This table contains all the general information about the patient. This table will be used to fill up the basic information form when the patient wants to book the appointment for the first time. Patient\_id is the primary key of the entity and will be unique to each patient. This will link to tables like insurance, medical\_history, appointment, prescription, dental\_history.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Column Name** | **Type** | **Sample Data** | **Allows Nulls** | **Description** |
| patient\_id (PK) Old Key with solid fill | Integer | 1 | No | Primary key |
| first\_name | NVarchar (50) | John | No | First Name of the patient |
| last\_name | NVarchar (50) | Doe | No | Last Name of the patient |
| primary\_phone | NVarchar (10) | 8573346360 | No | Primary phone number |
| secondary\_phone | NVarchar (10) | 8573346357 | Yes | Secondary phone number |
| email | NVarchar (30) | [john.dor@gmail.com](mailto:john.dor@gmail.com) | No | Email ID of patient |
| login\_password | NVarchar (10) | Qwerty@123 | No | Password |
|  |  |  |  |  |
| street\_address | NVarchar (50) | Northampton Street | No | Address |
| zipcode | NVarchar (6) | 02118 | No | Zipcode |
| city | NVarchar (10) | Boston | No | City |
| state | NVarchar (20) | Massachusetts | No | State |
| dob | Date | 02/11/1996 | No | Date of birth |
| gender | Enum | Male | No | Male, Female, prefer not to say options for gender |
| emergency\_contact\_name | NVarchar (50) | John Sheen | No | Emergency contact name for the patient |
| emergency\_contact\_number | NVarchar (10) | 8573346350 | No | Emergency contact for the patient |
| registration\_date | Date | 11/29/2021 | No | Date of patient registration |

## 2. Employee

This table includes all the staff who works for the dental Clinic. It is linked to the branch and title table. Each employee is associated with a base branch and each has a job title assigned to him from the title table. Employee\_id is the primary key of the entity and it unique to each employee.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Column Name | Type | Sample data | Allows Null | Description |
| employee\_id (PK) Old Key with solid fill | Integer | 1 | No | Primary key |
| first\_name | NVarchar(50) | John | No | First Name of the employee |
| last\_name | NVarchar(50) | Doe | No | Last Name of the employee |
| primary\_phone | NVarchar(10) | 8573346340 | No | Primary phone number |
| secondary\_phone | NVarchar(10) | 8573346333 | Yes | Secondary phone number |
| email | NVarchar(30) | james\_doe@gmail.com | No | Email ID of employee |
| login\_password | NVarchar(10) | Qwerty@123 | No | Password |
| street\_address | NVarchar(50) | Northampton Street | No | Address |
| zipcode | NVarchar(6) | 02118 | No | Zipcode |
| city | NVarchar(10) | Boston | No | City |
| state | NVarchar(20) | Massachusetts | No | State |
| dob | Date | 02/11/1996 | No | Date of birth |
| gender | Enum | Male | No | Male, Female, prefer not to say options for gender |
| joining\_date | Date | 11/11/2021 | No | Joining date of employee |
| ssn | NVarchar(9) | 123456789 | No | SSN of employee |
| branch\_id (FK) | Integer | 1 | No | Base branch of an employee, Foreign key of from branch table |
| title\_id (FK) | Integer | 1 | No | Job title of an employee |

## 3. job\_title

This table includes all the job titles of all the employees. Title\_id is the primary key of this entity and is unique to each title. This table is linked with the employee table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Column Name | Type | Sample Data | Allows Null | Description |
| title\_id (PK) Old Key with solid fill | Integer | 1 | No | Primary key |
| name | Varchar(20) | Doctor | No | Job title of an employee |

## 4. Insurance

This contains the insurance details of all the patients. For each entry either the patient is the subscriber or is a blood relative to the subscriber. This table is linked with the insurance\_provider table which gives us the details of the insurance provider.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Column Name | Type | Sample Data | Allows Null | Description |
| patient\_id (FK) | Integer | 1 | No | Foreign key from patient table |
| subscriber\_name | Varchar(50) | John Doe | No | This is the name of the subscriber. |
| provider\_id (FK) | Integer | 1 | No | Insurance provider ID, Foreign key from insurance\_provider |
| relationship\_to\_insured | Enum | Father | No | Blood relation relatives allowed |
| policy\_group\_number | NVarchar(30) | ABC12345 | No | Policy number of insurances |
| certificate\_number | NVarchar(30) | 123ABC | No | Certificate number of insurances |
| valid\_till | Date | 11/11/2030 | No | Insurance valid date |

## 5. Insurance\_Provider

This contains details of the insurance provider accepted by the clinic. It contains all the details of the provider. This table is linked to the insurance table. Provider\_id is unique for each provider and is the primary key of this entity.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Column Name | Type | Sample Data | Allows Null | Description |
| provider\_id (PK) Old Key with solid fill | Integer | 1 | No | Primary key |
| name | Varchar(50) | HealthLife | No | Name of the insurance provider |
| address | NVarchar(30) | Boston, MA | No | Address of the insurance provider |
| phone | NVarchar(10) | 8547737747 | No | Phone number of the insurance provider |

## 6. Medical\_history

Details about medical history of patients. This contains all the medical history the patient has apart from the dental history before visiting the clinic. This table is linked to the patient\_details table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Column Name | Type | Sample Data | Allows Null | Description |
| patient\_id (FK) | Integer | 1 | No | Foreign key from patient\_details which is a unique key used to determine a specific patient. |
| isEverHospitalized | Tinyint(1) | Yes | No | Is patient hospitalized? |
| heart\_condition | Varchar(50) | Had a heart attack 2 years ago | Yes | This column specifies if the patient had a heart condition |
| disease | Varchar(50) | None | Yes | This column specifies if the patient had any diseases |
| medications | Varchar(50) | None | Yes | This column specifies if the patient is on any medication |
| description | Varchar(100) | None | No | This column specifies any additional comments |
| allergies | Varchar(100) | None | Yes | This column specifies if the patient has any allergies |

## 7. Procedures

This table contains all the details about different procedures performed at the clinic like scaling, root canal, etc. It also contains the duration of each procedure along with the fees. The primary key of this entity is procedure\_id and it is unique for each procedure. This table is linked to the room, appointment table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Column Name | Type | Sample Data | Allows Null | Description |
| procedure\_id (PK) Old Key with solid fill | Integer | 1 | No | Primary Key |
| procedure\_name | Varchar(20) | Root Canal | No | Name of the procedure |
| duration | Integer | 120 minutes | No | Time required for the procedure |
| fees | Bigint(20) | 100$ | No | Cost of the procedure |

## 8. Branch

This contains all the details of all the branches operated by the clinic. Branch\_id is the primary key of the entity and is unique to each branch. This table is linked to the room, employee, doctor\_branches, appointment table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Column Name | Type | Sample Data | Allows Null | Description |
| branch\_id (PK) Old Key with solid fill | Integer | 1 | No | Primary Key |
| branch\_name | Varchar(20) | Roxbury | No | Name of the branch |
| phone | Varchar(10) | 8573346550 | No | Contact no. of the branch |

## 9. Room

This table contains all the details about the room in all the branches of the clinic. This table is linked to the branch, appointment table. Branch\_id from the branch table and procedure\_id from the procedure table will make a composite primary to this table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Column Name | Type | Sample Data | Allows Null | Description |
| branch\_id (FK) | Integer | 1 | No | Foreign key from branch table and also forms the composite PK |
| procedure\_id (FK) | Integer | 1 | No | Foreign key from procedure table and also forms the composite PK |
| room\_no | Varchar(10) | 110 | No | Room number at a branch |

## 10. Doctor\_branches

This table contains the details of the branches a doctor can work/visit in. This table is linked to the doctor\_schedule table. The employee\_id from the employee table and the branch\_id from the branch table form a composite primary key.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Column Name | Type | Sample Data | Allows Null | Description |
| employee\_id (FK) | Integer | 1 | No | Foreign Key- This is the employee\_id from employee table and also forms the composite PK |
| branch\_id (FK) | Integer | 1 | No | Foreign Key- This is the branch\_id from branch table and also forms the composite PK |

## 11. Doctor\_speciality

This table contains information which doctor can provide which kind of procedure. Based on this during the appointment doctor list will be populated.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Column Name | Type | Sample Data | Allows Null | Description |
| employee\_id (FK) | Integer | 1 | No | This is a foreign key from employee table which will be used to determine a specific job related to employee |
| procedure\_id (FK) | Integer | 6 | No | This is a foreign key, the procedure\_id of the procedure table |

## 12. Doctor\_schedule

This table contains information about schedule of a doctor on a weekly basis. At the staring of the week doctor can put up the availability at each branch.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Column name | Type | Sample Data | Allows Null | Description |
| employee\_id (FK) | Integer | 1 | No | Employee id of the doctor which is foreign key from employee table |
| branch\_id (FK) | Integer | 1 | No | This is the foreign key from branch table |
| date | Date | 12/12/2021 | No | Date of the appointment booked |
| IsAvailable | tinyint(1) | Y | No | Availability of the doctor |

## 13. Appointment

This table contains information about all the appointments scheduled at the clinic. This table will also be used to retrieve patient dental records. Whenever an appointment is made an entry will be made in this table. Appointment\_id is the primary key of this entity and is unique for each appointment.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Column Name | Type | Sample Data | Allows Null | Description |
| appointment\_id (PK) Old Key with solid fill | Integer | 1 | No | Primary key- This is a unique key which will be used to determine a specific fuel type |
| employee\_id (FK) | Integer | 1 | No | This is the foreign key used from employee table |
| procedure\_id (FK) | Integer | 4 | No | This is the foreign key used from procedure table |
| branch\_id (FK) | Integer | 3 | No | This is the foreign key used from the branch table |
| date | date | 12/12/2021 | No | Date of the booked appointment |
| time\_slot | datetime | 04:00:000 | No | Time of the booked appointment |
| patient\_id | Integer | 12 | No | This is the foreign key used from patient\_details |
| room\_no | Integer | 102 | No | Room no of the allotted room |
| status | Boolean | Y | No | Whether the room is available or not. |

## 14. Prescription

This table contains the prescription given by the doctor to the patient after each appointment.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Column Name | Type | Sample Data | Allows Null | Description |
| patient\_id (FK) | Integer | 1 | No | Foreign key from patient\_details which is a unique key used to determine a specific patient. |
| appointment\_id (FK) | Integer | 2 | No | This is the foreign key from the appointment table |
| Prescription | Varchar(100) | Dolo-65 to be taken 1-0-1 | No | Prescription in the proper format |

## 15. Dental\_history

This table contains information about the dental history of the patient before visiting the clinic. This table will be used by the doctor before treating the patient to get more information about the dental condition.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Column Name | Type | Sample Data | Allows Null | Description |
| patient\_id (FK) | Integer | 1 | No | Foreign key from patient\_details which is a unique key used to determine a specific patient. |
| last\_visited\_date (FK) | Date | 2 | No | It is the foreign key from the appointment table |
| last\_visited\_dentist | Varchar(20) | Jack Meyers | No | Dentist from the previous dental clinic |
| Complications | Varchar(100) | None | Yes | Other questions |
| Braces | Tinyint(1) | Y | Yes | Other questions |
| gums\_bleed | Tinyint(1) | Y | Yes | Other questions |
| Cavities | Tinyint(1) | Y | Yes | Other questions |
| gums\_recession | Tinyint(1) | Y | Yes | Other questions |
| allergies | Varchar(100) | None | Yes | Other questions |

## 16. Payment

This table contains the information regarding the payments done by the patients after each appointment. The primary key of this entity will be payment\_id and this is unique for each payment. This table is linked to the appointment table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Column Name | Type | Sample Data | Allows Null | Description |
| payment\_id (PK) Old Key with solid fill | Integer | 1 | No | Primary Key |
| appointment\_id (FK) | Integer | 2 | No | This is the foreign key from the appointment table |
| mode\_of\_payment | Enum | Card | No | Payment method used by the patient. E.g.: Cash/Card/Insurance |
| amount | Integer | 200 | No | Amount that must be paid by the patient |

## 17. Dental\_records

This table contains information regarding the procedures undergone by a patient in the current dental clinic. This table gets information from patient table, branch table and procedure table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Column Name | Type | Sample Data | Allows Null | Description |
| patient\_id (FK) | Integer | 1 | No | Foreign key from patient\_details which is a unique key used to determine a specific patient. |
| branch\_id (FK) | Integer | 2 | No | foreign key from the appointment table |
| procedure\_id (FK) | Enum | Card | No | foreign key from the procedure table |

# BUSINESS RULES

1. Email Address is a system generated field
2. Each employee must be at least 18 years of age
3. Gender of employee and patient can be ‘Male’, ’Female’, ’Choose not to specify’.
4. Primary phone number cannot be null, secondary can be null
5. Each patient must provide an emergency contact name and phone number
6. A patient can have multiple insurance provider
7. Multiple insurance information of the patient must be captured.
8. Only certain insurance providers mentioned in insurance\_provider table are accepted by the clinic
9. Each patient must have a primary dentist
10. A doctor can work at maximum 3 branches
11. Subscriber must be the patient or any blood relative to the patient
12. Insurance expiration date cannot be less than current date
13. Each employee is associated with a base branch
14. No two patients can book the same appointment
15. Doctor’s schedule will be updated according to the doctor’s availability and will reset to base schedule at the beginning of each week
16. Each appointment has is associated with only one procedure. If multiple procedures are required, the patient has to book multiple appointments.
17. The appointment gets cancelled when either the patient or the doctor cancels the appointment
18. Availability of the dentist is marked by isAvailable attribute in the doctor\_schedule table

# ENTITY RELATIONSHIP DIAGRAM

Diagram, schematic

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