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DENTIST OFFICE BUSINESS MODEL

Northeastern University

2nd Edition.

CONTENTS

REVISION HISTORY

Version	Changes Made	Date	Name	Changes
1	Initial Document	10/10/2019	Aditya	Rules for new entities
2	Second Edition Document	10/31/2019	Aditya	Attributes defined, subject areas defined, minor changes, clusters, in the 'in-scope' requirements.

OVERVIEW

The assignment aims at designing and implementing a database for dental healthcare system in a real-world environment. The system should allow patients to schedule an appointment at the dentist office, the system should be able to store in demographics of the patient, allow the dentist & patient to track the dental procedures through treatment catalogue, allow the office to keep a track of the medical & electronic equipment for their maintenance, bill the patient for the treatment received & communicate the treatment expenditures with the insurance companies for clearing the invoices.

MAIN SUBJECT AREAS

1. DENTIST: This entity houses the demographic details of a provider in the dental system. This person must be licensed by the state they are operating in to perform general dentistry. Dental assistants and other office staff are not represented here.

2. PATIENT: The entity represents the demographic details & medical history of a person to receive the dental healthcare. The entity also reflects the contact details & billing information of the person.

3. APPOINTMENT: The entity houses as the center of information needed to serve other entities of the dentistry model. The appointment must be scheduled by the patient & attended by both patient & doctor. The appointment functions within constraints of date, time & appointment room.

4. ROOM: The entity represents the physical space available for the appointment to take place. It is necessary that the room is contained within the physical space of the entire dentist health center. The room can be accessed by the patient & doctor only through appointment.

5. TREATMENT CATALOGUE: The entity houses the details of different dental plans available at a dental center. The dental plans must plan details, name of the plan, duration of treatment, number of visits required for that plan and price of the plan.

6. ELECTRONIC EQUIPMENT: The entity houses the details of different electronic equipment available at a dental center. The record must mention the unique identification number of electronic equipment, model number, name of the equipment, quantity, date scheduled for maintenance, availability.

7. SUPPLIES & STOCKS: The entity hosts the details of various drugs, their names, quantity, expiration date, suppliers & price. Dentist or patient name utilizing that medicine need not be mentioned here. Supplies are the items that used & billed for during the treatment.

8. PRESCRIPTION: Given to the patient by the provider at the practice. Contains the name, consumption quantity & time-period for which the medications are allocated to the patient. Can be accessed strictly by the dentist & the patient only.

9. PATIENT HISTORY: A summary of the patient's medical history that is updated when first visiting the practice & yearly thereafter. It is a list of medications, medical conditions & allergies.

10. INVOICE: An entity which sends the bill generated from a dentist's office to a patient or an insurance company/companies.

11. INSURANCE: The entity is responsible to store the details of insurances of the patient. It allows to patient to have a maximum of three insurances. It receives the invoices from the dentist office & directs them towards the insurance company/companies.

12. PAYMENT: The entity is responsible to store the amount to be paid (if any) by the patient after the invoice has been generated and been partially paid by the insurance company.

CLUSTERS

1. **Recipient:** Contains the main subject areas related to the patient. It mainly contains the attributes relating to the patient such as the demographics & those that directly affect the patient for instance prescription assigned to the patient and any medical conditions or allergies the patient has i.e. patient history. Subject areas in this cluster are:
   a. Patient
   b. Patient History
   c. Prescription

2. **Billing:** Contains the main subject areas related to charging the patient for the services used at the healthcare facility. It also contains the details of the payment methods, details of the insurance companies and amount to be recovered from patient and Insurance company/companies.
   a. Invoice
   b. Payment
   c. Insurance

3. **Arrangement:** Contains the main subject areas related to the appointment & its location. The cluster provides support to subject areas such as room and appointment. It hosts details regarding the appointment such as day-date-time of the appointment, location of the room selected for the appointment, availability of the room etc.
   a. Appointment
   b. Room

4. **Resources:** It is the cluster that stores information for all the physical resources which includes both electronic equipment and regular frequently used supplies. It contains information for their types, prices, manufacturers, availability etc. Subject areas in this cluster are:
   a. Supplies and stocks
   b. Electronic equipment

5. **Healthcare treatment:** It is a cluster that stores all the information regarding the provider of the healthcare i.e. the dentist as well as the treatment details such as duration, cost and steps available for the patient at the unit. Subject areas in this cluster are:
   a. Dentist
   b. Treatment Catalogue

INSCOPES

ID	RULE	AREA
IS01	Capture patient demographic information	Patient
IS02	Capture patient appointments	Appointment
IS03	Each appointment can serve only one patient.	Appointment
IS04	The scheduled appointment SHOULD follow the time & the room restrictions.	Appointment
IS05	One room can host multiple appointments in a day.	Room
IS06	ONLY a health care provider (dentist) is allowed to provide prescription to a patient.	Prescription
IS07	The patient can have access to the dentist only through an appointment.	Appointment
IS08	Every appointment treatment must generate invoice sent to the patient & the insurance company/ companies from the dentist office.	Invoice
IS09	Patient can have multiple insurances.	Insurance
IS10	A patient cannot schedule more than one appointment at a given time.	Appointment
IS11	A patient cannot have Insurance companies or payment methods outside those accepted by the dental care unit.	Insurance
IS12	Patient is assigned an appointment only if the location of patient's residence is within the state of the location of the dental clinic.	Room

IS13	Electronic equipment under maintenance should be cleared off the availability list.	Electronic Equipment
IS14	Every invoice generated for a patient must have a breakdown of charges.	Invoice
IS15	In case the dentist cancels an appointment, patient should be notified, room & equipment should be made available again.	Appointment
IS16	License needs to be captured for the provider & one provider can hold multiple licenses.	Dentist
IS17	Appointment reminder sent from dentist office to both dentist & patient should be prior to the hours scheduled meeting.	Appointment
IS18	A patient can clear the invoice through multiple payment methods at multiple intervals.	Payment
IS19	The system allows the patient to see multiple dentists during the course of treatment.	Patient

OUTSCOPES

ID	RULE	AREA
OS01	Payroll & human resource information	_
OS02	People who work in the office but do not participate in the care of a patient are not tracked in the system.	_
OS03	Storing scanned files of patient documents	
OS04	Allowing patients to book multiple appointments in a day.	Appointment
OS05	Allowing patients to book emergency appointments.	Appointment
OS06	Time spent by the patient in waiting room.	_
OS07	Online consulting between patient & dentist.	Dentist
OS08	Patient feedback or rating system for dentist & clinic.	_
OS09	Number of patients treated, or number of surgeries performed by the dentist.	Dentist
OS10	Any sensitive piece of information (say SSN) as primary key.	_
OS11	Dental plans or discount schemes.	Treatment Catalogue

ATTRIBUTE DEFINITIONS

DENTIST			
dentist_ID	Int	Primary Key (PK) Not Null (NN)	A unique id given to every dentist to identify them within the system. Eg:2
dentist_fname	Char(10)	Not Null	It is defined as the first name of the dentist used in the system. Eg: Adam
dentist_lname	Varchar(20)	__	It is defined as the last name of the dentist used in the system Eg: Green
dentist_email	Varchar(20)	Not Null	It is defined as the email address stored in the system used to contact the dentist. Eg: adam.g@gmail.com
dentist_license_id	Char(10)	Not Null	It is defined as the unique identification number of the license issued to the dentist by the licensing authority. Eg: CVZ1326
PATIENT			
patient_id	Int	Primary Key (PK), Not Null(NN)	A unique id given to every patient to identify them within the system. Eg: 128

patient_name	Char(10)	Not Null (NN)	It is defined as the first name of the person used in the system. Eg: Steve
patient_lname	Char(10)	_	It is defined as the last name of the patient used in the system. Eg: Peterson
patient_email	Varchar(20)	Not Null (NN)	It is defined as the email address stored in the system used to contact the patient. steve.p@gmail.com
patient_phone	Varchar(15)	Not Null (NN)	It is defined as the phone number of the patient used to contact them. Eg: +1 8573477647
patient_address	Varchar(200)	Not Null	Contains the physical address of the patient's residence. Eg: 22 Buckley Ave, Boston, MA -02115.
APPOINTMENT			
appointment_id	Int	Not Null (NN) Primary Key (PK)	An identification number used to identify & track each appointment uniquely. Eg: 12

appointment_date	Date	Not Null	Contains the date field on which appointment will take place. 11/1/2019
appointment_time	Time	Not Null	Contains the time field at which the appointment will take place. 2.04 pm
ROOM			
room_number	Char(10)	Not Null (NN) Primary Key (PK)	Contains the field used to store the room number where appointment is scheduled. Eg: 33B
room_availability	Boolean	Not Null	It is defined as a flag that determines the availability of the room. Eg: Yes
room_address	Varchar(200)	Not Null (NN)	It is defined as the physical address of the room. 23 Buckey Ave, Boston, MA.
PATIENT HISTORY			
patient_history_id	Int	Not Null (NN) Primary Key (PK)	Contains the identification number used to uniquely fetch the patient's history and records.

			Eg: 45
patient_age	Int	Not Null	Contains the age of the patient. Eg: 22
patient_gender	Varchar(10)	_	Contains the gender of the patient. Eg: Male
medical_conditions	Varchar(200)	_	Defined as any diseases, medical and/or hereditary conditions of a patient Eg: Hypersensitive gums, high blood pressure.
allergies	Varchar(200)	_	Consists a list of allergies associated with the patient. Eg: Latex allergy
patient_id	Int	Foreign Key (FK)	Patient ID from patient table acts as a foreign key here.
ELECTRONIC EQUIPMENT			
equipment_id	Int	Not Null (NN), Primary Key (PK)	Contains the identification number used to uniquely identify the equipment. Eg: 12
equipment_name	Char(15)	Not Null (NN)	Contains the common name use to address the equipment. Eg: ultra-sonic scalar

equipment_price	Float	Not Null (NN)	Contains the price at which equipment was purchased. Eg 450.75.
maintenance_date	Date	Not Null (NN)	Contains the date at which maintenance of the equipment is scheduled. 11/1/2019
availability	Boolean	Not Null (NN)	Used to determine the availability of the electronic equipment. Eg: Yes.
manufacturing_details	Varchar(100)	_	Used to store the details of the manufacturing of the equipment such as model, manufacturer name. Eg: Bonart Electronics
appointment_id	Int	Not Null (NN) Foreign Key	Appointment ID from the appointment table acts as a foreign key here.
INVOICE			
invoice_id	Char(10)	Not Null (NN), Primary Key (PK)	Used to identify and track each invoice uniquely. Eg: AX210
amount	float	Not Null (NN)	Amount to be paid to the dentist office.

invoice_date	Date	Not Null (NN)	It is the date at which invoice has been generated. 11/1/2019
status	Boolean	Not Null (NN)	Used to check the status of the payment. Eg: Yes.

INSURANCE

company_id	Int	Not Null (NN) Primary Key (PK)	An identification number that is used to uniquely identify the insurance company. Eg: 12
company_name	Char(15)	Not Null (NN)	Contains the name of the insurance company. Eg: Sunshine Insurances.
contact_details	Varchar(50)	Not Null (NN)	Contains the contact details of the insurance company. Eg: sunshine123@gmail.com
claim_id	Char(10)	Not Null (NN)	Contains the id of the claim submitted at the insurance office. Eg: MX2129
amount_covered	Int	Not Null (NN)	Contains the amount covered by the insurance company for a particular claim. Eg: 45.

SUPPLY AND STOCKS			
item_id	Int	Not Null (NN) Primary Key (PK)	Contains the identification number used to uniquely identify an item. Eg: 42
item_name	Char(20)	Not Null (NN)	Contains the common name of the item. Eg: Syringes
item_price	Float	Not Null (NN)	Contains the cost at which the item is priced. Eg: 12
item_availability_number	Int	Not Null(NN)	Contains the number of available items. Eg:50
appointment_id	Int	Not Null (NN) Foreign Key	Appointment ID from the appointment table acts as a foreign key here.
PRESCRIPTION			
prescription_id	Int	Not Null (NN) Primary Key (PK)	Contains the identification number used to identify and track each prescription uniquely. Eg:122
prescription_name	Char(20)	Not Null (NN)	Contains the name of the prescription. Eg: Ibuprofen
prescription_details	Varchar(200)	Not Null (NN)	Contains details of the prescription such as

| | | | consumption amount, number of times of consumption and duration of consumption. Eg: 250gm, 2 times a day. |
| patient_id | Int | Foreign Key (FK) | Patient ID from patient table acts as a foreign key here. |

PAYMENT

payment_id	Int	Not Null (NN) Primary Key (PK)	Contains the payment identification number used to identify and track each payment individually. Eg: 23
payment_type	Varchar(20)	Not Null (NN)	Used to store the method of payment used by the patient. Eg: Debit Card
payment_amount	Int	Not Null (NN)	Used to store the amount to be paid at the dentist office by the patient. Eg: 200
billing_address	Varhchar (50)	Not Null (NN)	Used to store the billing address of the patient. Eg: 22 Buckley Ave, Boston-02115, MA.

patient_id	Int	Foreign Key (FK)	Patient ID from patient table acts as a foreign key here.

TREATMENT CATALOGUE

treatment_id	Int	Not Null (NN) Primary Key (PK)	Used to identify each treatment individually. Eg: 44
treatment_name	Varchar(20)	Not Null (NN)	Used to store name of the treatment to be done on the patient. Eg: Root Canal
treatment_duration	Varchar(10)	Not Null	Used to store the number of the days for which the treatment shall last. Eg: 4 weeks
treatment_cost	Float	Not Null	Used to store the overall cost of the treatment. Eg: 200
Treatment_description	Varchar(200)	-	Used to describe the complexities of the treatment, procedural complications, steps, notes etc.

			Eg: Braces measure to be taken after X-ray.

HIGH LEVEL DIAGRAM

Arrangement

Healthcare treatment

Recipient

Billing

Patient History	IX_Relationship9 (IX1

Room	has

isAssigned

has a

has a

Dentist	

Patient	

schedules

Appointment	

Treatment Catalogue	

has

has

generates

maintains

Electronic Equipment	IX_Relationship11 (IX1)

Invoice	

coveredBy

Insurance	

Prescription	IX_has a (IX1)

Supply & Stocks	

paidBy

Payment	IX_Relationship15 (