



CSCI 435: Hospital Management System

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➤ Problem Statement:

- Hospitals see hundreds of patients everyday. There must be some sort of system to keep track of each patient. Along with this, the doctors who work in the hospital must be kept track of as well. Each patient is assigned a specific doctor, creating a relationship that must be stored for later use. For a given hospital, our system will organize given patient and doctor information. Using this information, doctors can not only access their employment information, but also view their patients' details, like their previous health conditions, surgeries, medications they are taking, future appointments, etc. The system can also serve as an appointment guide to schedule appointments for patients and doctors. Finally, the doctor can keep track of the diagnosis they make and the medications they prescribed after their appointments.

Requirements:

- Each patients must have
 - Health Insurance ID
 - Gender
 - Name
 - Phone Number
 - Address
 - Patient Medication (if available)
 - Patient Appointment Data
 - Prescription
 - Type of Service
- Each Doctor must have:
 - Doctor Name
 - Doctor ID
 - Doctor Specialty

Features:

- Allows physicians to view/update their patients' medical history.
- Allows Hospital Staff and the patient to view/update his/her appointment dates/times.
- Allows patients and doctors to view (doctors can view/update) patient prescriptions and diagnoses made after appointment.
- Allows Hospital Staff to view patient symptoms and concerns.
- Patients and hospital staff can view doctor's schedules.
- View the payment plan/details of patient services

Attribute Catalog

Attribute Catalogue:								
Domain/Business Name:	dbname	domain	type	atomic	repeating group?	table	pk	Fk
Patient Name	Patient_Name	John Doe	varchar(128)	Y	N	Patient	N	N
Patient Address	Patient_Address	121-21 121ST	varchar(128)	Y	N	Patient	N	N
Patient Phone Number	Patient_Phone_Num	123-456-7890	varchar(12)	Y	N	Patient	N	N
Patient Gender	Patient_Gender	M,F,...	varchar(1)	Y	N	Patient	N	N
Patient Health Insurance ID	Patient_ID	53432, 54211, ...	int	Y	N	Patient	Y	Y
Patient Condition	Patient_Condition	Cancer, Covid, Flu,...	varchar(64)	Y	Y	Patient_Medical_Condition	Y	N
Patient Medication	Patient_Medication	Capsules, Drops, Injections,	varchar(64)	Y	Y	Medication	Y	N
Patient Appointment Date	Patient_Appointment_Date	12:00am, 1:00pm, ...	varchar(5)	Y	N	Service	N	N
Perscription_ID	Perscription	Amoxicillin, Lisinopril, ...	varchar(64)	Y	Y	Perscription	Y	N
Doctor Name	Doctor_Name	Micheal Thomas, Lee Roy, ..	varchar(128)	Y	N	Doctor	N	N
Doctor ID	Doctor_ID	2321, 3423, ...	int	Y	N	Doctor	Y	N
Doctor Specialty	Doctor_Specialty	Radiology, Cariology, ...	varchar(64)	Y	N	Doctor	N	N
Type of Service	TypeOfService	Doctor Consult, Dialysis..	varchar(64)	Y	N	Cost	N	N
Cost	Cost	\$10, \$100, \$1000, \$10000...	int	Y	Y	Cost	Y	N
Payer	Payer	Insurance, Self, Forgiven...	varchar(64)	Y	Y	Payment	Y	N
Amount Paid	Amount_Paid	\$21, \$232...	int	Y	Y	Payment	Y	N

Raw Data on Excel

Patient_ID	Patient_Name	Patient_Address	Patient_Phone_Num	Patient_Gender	Patient_Condition	Patient_Medication	Patient_Appointment_Date
34323	Billy Joel	839-34 134 St	646-323-2211	M	Diabetes	Repaglinide	11/12/22
32452	Yousef Feeney	12 S. Glendale St.	405-420-1215	M	Heart Disease, Obesity	Acebutolol, Nadolol	11/15/22
83212	Yasin Hayden	77 East Heather St.	769-524-3078	M	Kidney Disease, Liver Failure	Darbepoetin Alfa	11/05/22
66723	Bernice Carr	9 Lyme Court	214-506-0025	F	Arthritis	Naproxen, Capsaicin	12/01/22
44981	Adella Kaye	49 SW. Cherry Hill Drive	954-986-9824	F	Arrhythmia	Flecainide, Amiodarone	11/30/22
Perscription	TypeOfService	Doctor_Name	Doctor_ID	Doctor_Specialty	Cost	Payer	Amount Paid
Pseudoephedrine	Doctor Consult	James Webb	232	Family Physician	\$150	Insurance	\$75
Nitroglycerin	Doctor Consult	George King	325	Cardiologist	\$175	Self	\$175
Furosemide	Dialysis	Hilary Beattie	326	Nephrologist	\$345	Insurance	\$345
Amoxicilin	Doctor Consult	James Webb	232	Family Physician	\$150	Self	\$50
Netarsudil	Coronary bypass surgery	Mike Wazowski	567	Ophthalmologist	\$66,928	Forgiven	\$66,928

1NF Removing Repeating Groups & Entities

Patient				
Patient_ID	Patient_Name	Patient_Address	Patient_Phone_Num	Patient_Gender
34323	Billy Joel	839-34 134 St	646-323-2211	M
32452	Yousef Feeney	12 S. Glendale St.	405-420-1215	M
83212	Yasin Hayden	77 East Heather St.	769-524-3078	M
66723	Bernice Carr	9 Lyme Court	214-506-0025	F
44981	Adella Kaye	49 SW. Cherry Hill Drive	954-986-9824	F

Removing Repeating Groups

Doctor		
Doctor_ID	Doctor_Name	Doctor_Specialty
232	James Webb	Family Physician
325	George King	Cardiologist
326	Hilary Beattie	Nephrologist
567	Mike Wazowski	Ophthalmologist

Perscription		
Perscription_ID	Medication_ID	Consult_ID
543	22	676
343	55	344
87	9	902
231	232	118
2321	122	98

Medication	
Medication_ID	Medication
22	Repaglinide
55	Bupropion-naltrexone
9	Acebutolol
232	Lactulose
122	Darbepoetin alfa
454	Naproxen
23	Flecainide

Patient_Medical_Condition	
Patient_ID	Patient_Condition
34323	Diabetes
32452	Heart Disease
32452	Obesity
83212	Kidney Disease
83212	Liver Failure
66723	Arthritis
44981	Arrhythmia

Removing Repeating Groups

Consult			
Consult_ID	Patient_ID	Patient_Condition	Doctor_ID
676	34323	Diabetes	232
344	32452	Heart Disease	325
902	83212	Obesity	326
118	66723	Kidney Disease	326
98	44981	Arrhythmia	567

Service			
Service_ID	Consult_ID	Appointment_Date	TypeOfService
32	676	11/20/22	Doctor Consult
66	344	11/12/22	Doctor Consult
231	902	8/7/21	Dialysis
54	118	12/05/22	Doctor Consult
421	98	12/01/20	Coronary bypass surgery

Payment			
Service_ID	Amount_Paid	Payer	
32	\$75	Insurance	
66	\$175	Self	
231	\$345	Insurance	
54	\$50	Self	
421	\$66,928	Forgiven	

Cost	
Service_ID	Cost
32	\$150
66	\$175
231	\$345
54	\$150
421	\$66,928



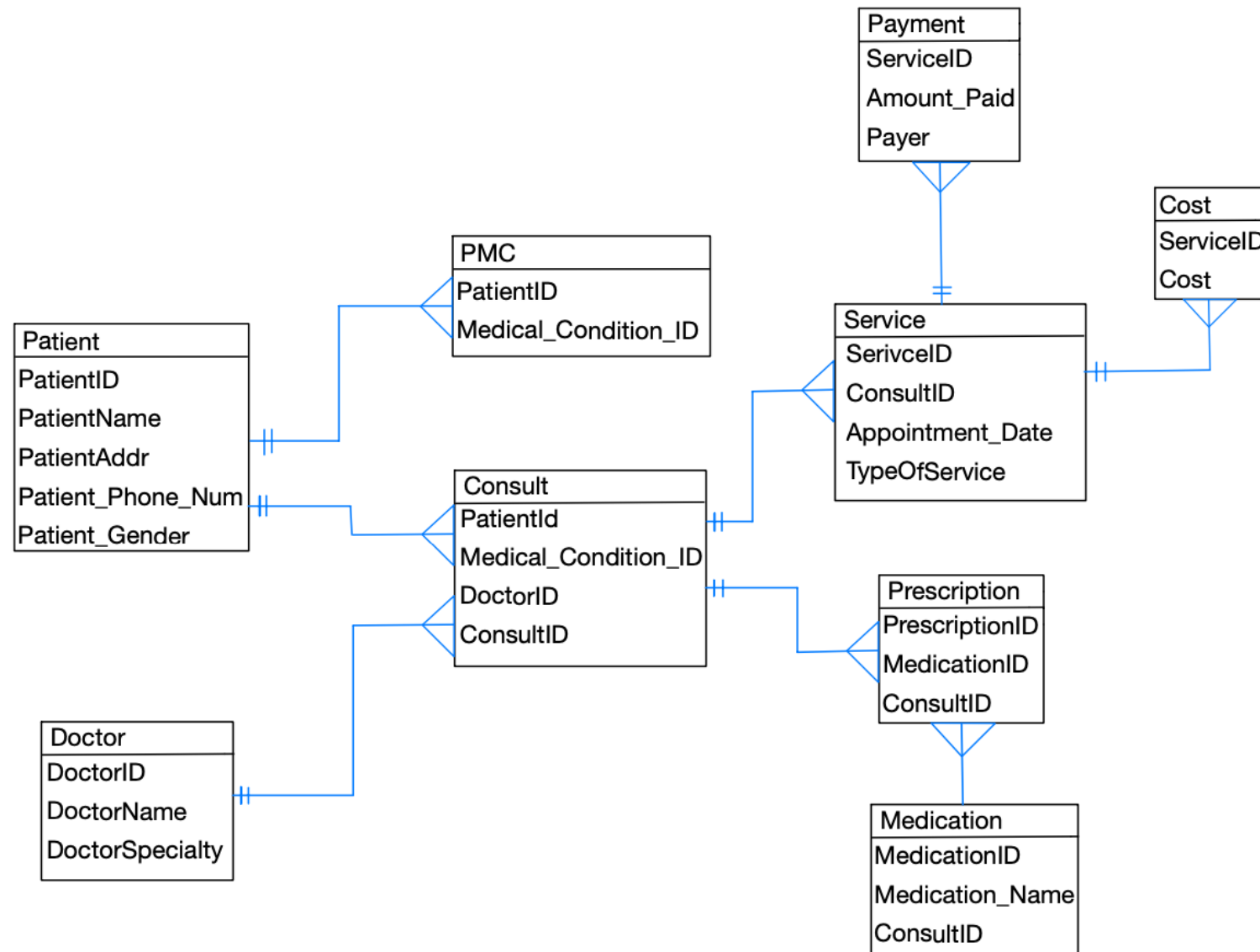
2NF

- Partial Dependency occurs when a non-prime attribute (an attribute, which is not a prime key) is functionally dependent on part of a primary key (a single key or a group of multiple keys that uniquely identify row in a table)
 - If you look at our tables in 1NF we don't have partial dependency because the primary key of the table that have non-prime attributes is made up of only one key.
 - The table that have a primary key consisting of more than one key have no partial dependencies.

3NF

- A transitive dependency in a database is an indirect relationship between values in the same table that causes a functional dependency ($A \rightarrow B$, $B \rightarrow C$, then $A \rightarrow C$). To achieve 3NF transitive dependency must be eliminated. (One non-key attribute depends on another key attribute, which in return depends on the PK)
 - To have a transitive dependency, you need to have a minimum of three attributes.
 - As a result, there is not Transitive Dependency in Patient Medical Condition, Medication, and Cost tables.
 - The Doctor table has three attributes, however, both doctor name and doctor specialty depend on the Doctor ID \Rightarrow No Transitive Dependency
 - The same goes for Prescription, Consult, Service, Payment, and Patient Table.

ER Diagram



Tables in SQL

```
mysql> CREATE TABLE raw_data (
-> Patient_Name varchar(64),
-> Patient_ID int,
-> Patient_Address varchar(128),
-> Patient_Phone_Num varchar(12),
-> Patient_Gender varchar(1),
-> Patient_Condition varchar(64),
-> Patient_Medication varchar(64),
-> Patient_Appointment_Date varchar(5),
-> Perscription varchar(64),
-> Doctor_Name varchar(64),
-> Doctor_ID int,
-> Doctor_Specialty varchar(64),
-> TypeOfService varchar(64),
-> Cost int,
-> Payer varchar(64),
-> Amount_Paid int
-> );
Query OK, 0 rows affected (0.01 sec)
```

```
mysql> select * from hospital_raw_data;
```

Patient_ID	Patient_Name	Patient_Address	Patient_Phone_Num	Patient_Gender	Patient_Condition_1	Patient_Condition_2	Patient_Medication_1	Patient_Medication_2
34323	Billy Joel	839-34 134 St	646-323-2211	M	diabetes		Repaglinide	
32452	Yousef Feeney	12 S. Glendale St.	405-420-1215	M	heart disease	obesity	Acebutolol	Nadolol
83212	Yasin Hayden	77 East Heather St.	769-524-3078	M	kidney disease	liver failure	Darbepoetin alfa	
66723	Bernice Carr	9 Lyme Court	214-506-0025	F	Arthritis		Naproxen	Capsaicin
44981	Adella Kaye	49 SW. Cherry Hill Drive	954-986-9824	F	Arrhythmia		Flecainide	Amiodarone

Patient_Appointment_Date	Perscription	TypeOfService	Doctor_Name	Doctor_ID	Doctor_Specialty	Cost	Payer	Amount Paid
11/12/22	Pseudoephedrine	Doctor Consult	James Webb	232	Family Physician	\$150	Insurance	\$75
11/15/22	Nitroglycerin	Doctor Consult	George King	325	Cariologist	\$175	Self	\$175
11/05/22	furosemide	Dialysis	Hilary Beattie	326	nephrologist	\$345	Insurance	\$345
12/01/22	Amoxicilin	Doctor Consult	James Webb	232	Family Physician	\$150	Self	\$50
11/30/22	netarsudil	Coronary bypass surgery	Mike Wazowski	567	ophthalmologist	\$66,928	Forgiven	\$66,928

```
mysql> select * from patient;
```

Patient_ID	Patient_Name	Patient_Address	Patient_Phone_Num	Patient_Gender
34323	Billy Joel	839-34 134 St	646-323-2211	M
32452	Yousef Feeney	12 S. Glendale St.	405-420-1215	M
83212	Yasin Hayden	77 East Heather St.	769-524-3078	M
66723	Bernice Carr	9 Lyme Court	214-506-0025	F
44981	Adella Kaye	49 SW. Cherry Hill Drive	954-986-9824	F

```
mysql> select * from doctor;
```

Doctor_ID	Doctor_Name	Doctor_Specialty
232	James Webb	Family Physician
325	George King	Cardiologist
326	Hilary Beattie	Nephrologist
567	Mike Wazowski	Ophthalmologist

```
mysql> select * from PMC;
```

Patient_ID	Patient_Condition
34323	Diabetes
32452	Heart Disease
32452	Obesity
83212	kidney disease
83212	liver failure
66723	Arthritis
44981	Arrhythmia

```
mysql> select * from Medication;
```

Medication_ID	Medication
22	Repaglinide
55	Bupropion-naltrexone
9	Acebutolol
232	Lactulose
122	Darbepoetin alfa
454	Naproxen
23	Flecainide

```
mysql> select * from Consult;
```

Consult_ID	Patient_ID	Patient_Condition	Doctor_ID
676	34323	Diabetes	232
344	32452	Heart Disease	325
902	83212	Obesity	326
118	66723	Kidney Disease	326
98	44981	Arrhythmia	567

```
mysql> select * from Perscription;
```

Perscription_ID	Medication_ID	Consult_ID
543	22	676
343	55	344
87	9	902
231	232	118
2321	122	98

```
mysql> select * from Service;
```

Service_ID	Consult_ID	Appointment_Date	TypeOfService
32	676	11/20/22	Doctor Consult
66	344	11/12/22	Doctor Consult
231	902	8/7/21	Dialysis
54	118	12/05/22	Doctor Consult
421	98	12/01/20	Coronary bypass surgery

```
mysql> select * from Payment;
```

Service_ID	Amount_Paid	Payer
32	75	Insurance
66	175	Self
231	345	Insurance
54	50	Self
421	66928	Forgiven

```
mysql> select * from Cost;
```

Service_ID	Cost
32	150
66	175
231	345
54	150
421	66928

Query #1:

```
SELECT patient_name,  
       medication_id,  
       Count(*) AS np  
FROM   (SELECT pt.patient_name,  
              p.medication_id  
        FROM   consult AS c  
              natural JOIN perscription AS p  
              natural JOIN patient AS pt) AS x  
GROUP BY 1,  
        2;
```

patient_name	medication_id	num_med
Billy Joel	22	1
Yousef Feeney	55	1
Yasin Hayden	9	1
Bernice Carr	232	1
Adella Kaye	122	1

Query #2:

```
SELECT patient_name,  
       amount_paid  
FROM   (payment  
       natural JOIN service  
       natural JOIN consult  
       natural JOIN patient);
```

patient_name	amount_paid
Billy Joel	75
Yousef Feeney	175
Yasin Hayden	345
Bernice Carr	50
Adella Kaye	66928



Queries

- `select patient_name, medication_id, count(*) as np from (select pt.patient_name, p.medication_id from consult as c natural join perscription as p natural join patient as pt) as x group by 1,2;`
- `select patient_name, amount_paid from (payment natural join service natural join consult natural join patient);`
- `select patient_name, cost from (cost natural join service natural join consult natural join patient);`
- `select patient_name, sum(cost) from (cost natural join service natural join consult natural join patient) group by patient_name;`



Thanks!