Database Management System

Additional Group Activity report

On

Hospital Management System

Submitted for the partial fulfillment of Bachelor of Engineering

By

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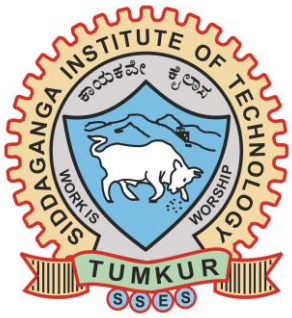

Department of Computer Science and Engineering

(Program Accredited by NBA)

Siddaganga Institute of Technology, Tumakuru – 572103

(An autonomous institution affiliated to VTU, Belagavi, Approved by AICTE, New Delhi, Accredited by NAAC with 'A++' grade & ISO 9001:2015 Certified)

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Problem Title:

Hospital Management System with MySQL

Develop a comprehensive Hospital Management System database that facilitates efficient management of hospital operations, patient records, medical staff, inventory, pharmacies associated and billing. The system should provide a user-friendly interface for hospital administrators, medical staff, and patients to access and manage relevant information securely.

Requirement Collection:

1. The hospital has various departments each identified by a unique department id. It also includes the department name. Department has doctors and nurses working in each of them.

2. Doctor is identified by a unique id and we store his name, salary, experience and the department in which he works. Each patient has a doctor associated with them but every doctor may not have a patient at the particular time to treat. A doctor may have more than one patient under them.

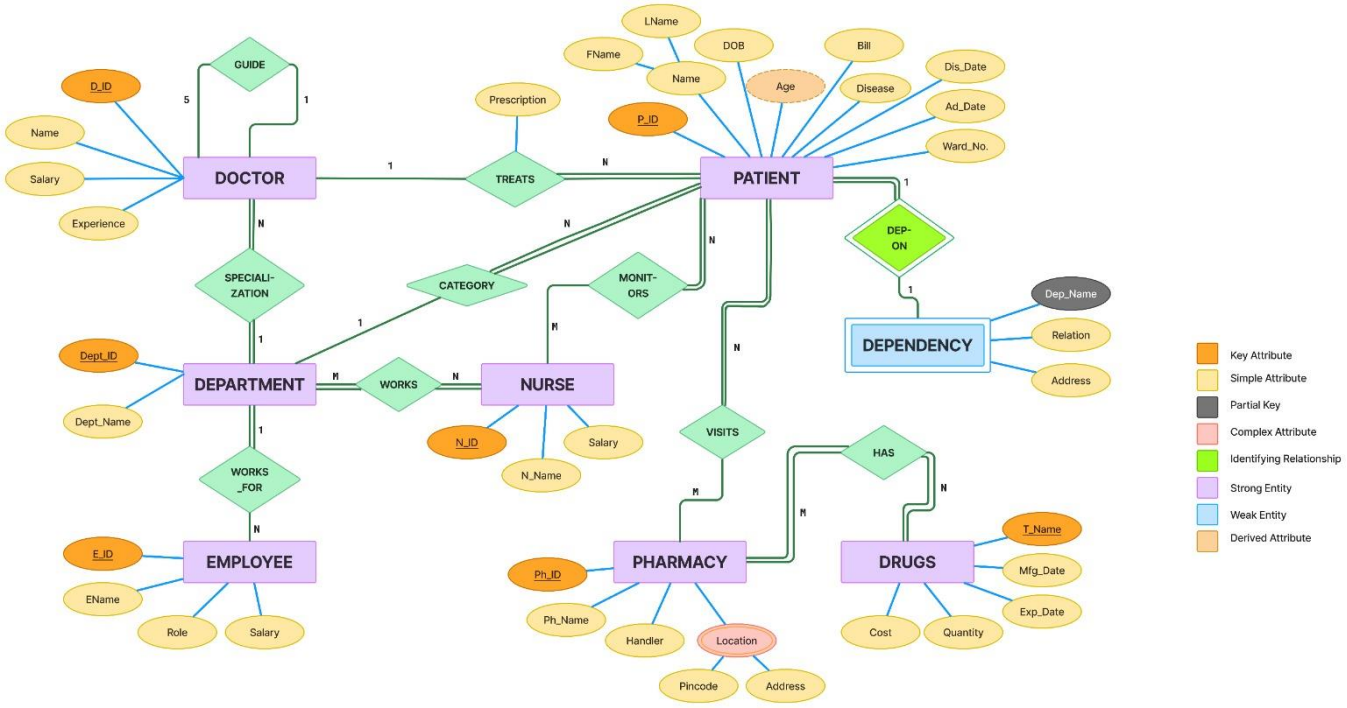
3. Nurse is identified by a unique id and their name and salary is stored. All nurse works for a department. Nurse may work in more than one department and a department may have more than one nurse.

4. Each patient is identified by a unique patient id and his details includes name (first name and last name), date of birth, disease, admit and discharge date, his ward number and his total bill. The patient also has his dependency who are not unique and their relation with the patient and address is stored.

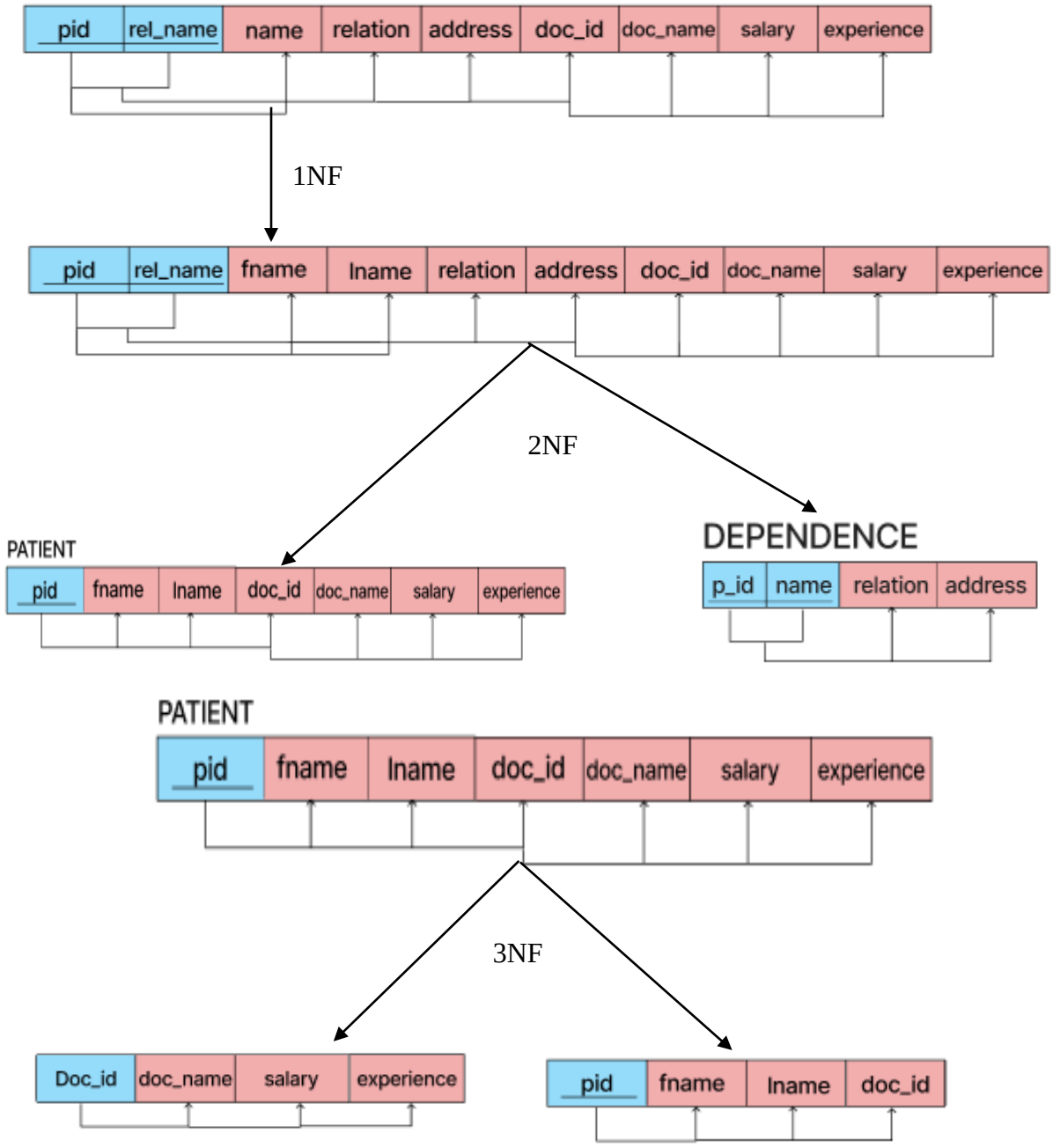
5. The hospital may have other employee identified by a unique id and we store their name, salary and what role they are handling.

6. Each patient visits pharmacy for tablets. The pharmacy identified by an id and it has its name, handler name and its location which includes pin code and address. The drugs are available in some pharmacies and drug is identified by its name and we store its manufacturing date, expiry date, quantity available and its cost.

ER Model:

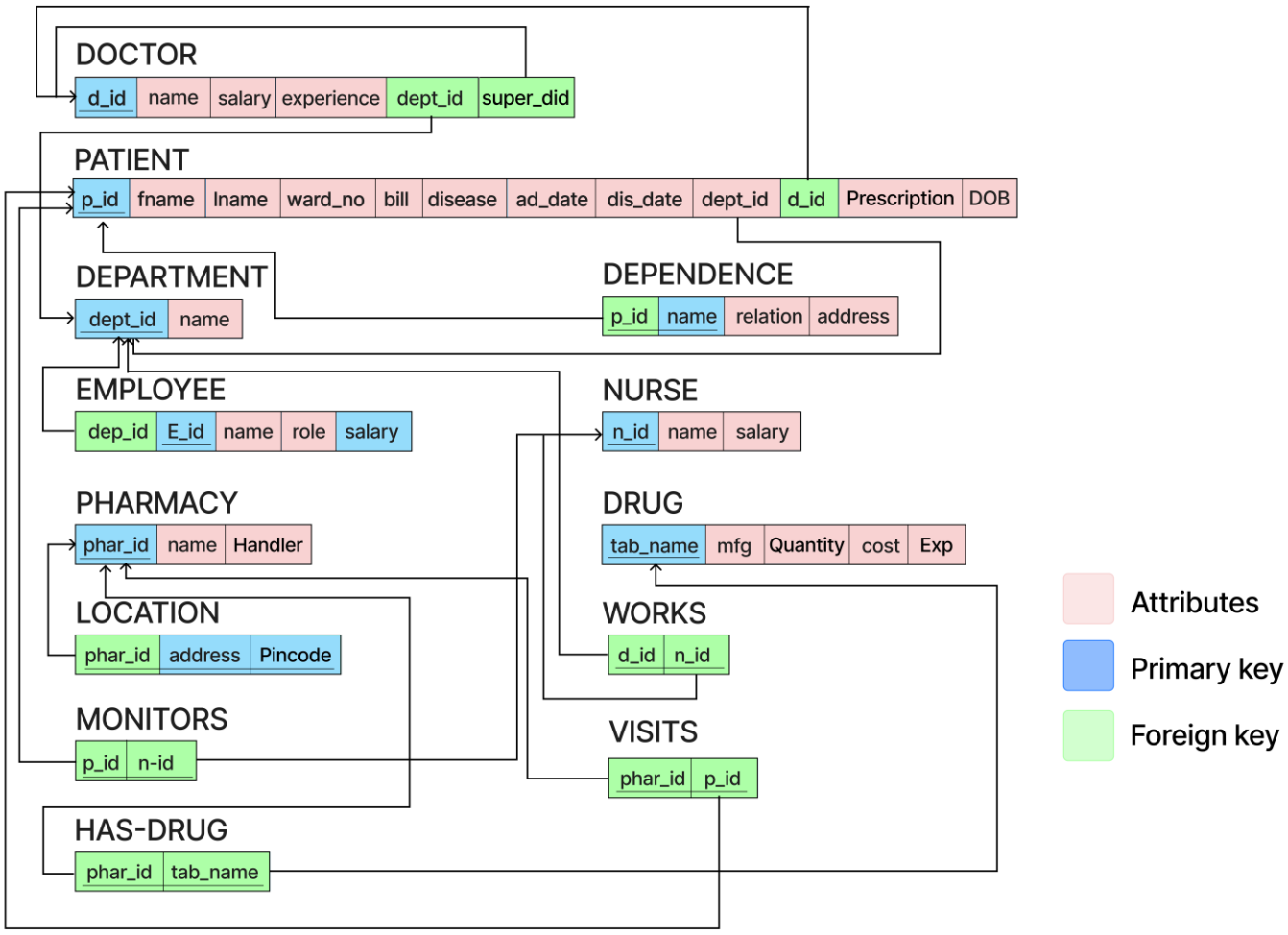

LName
FName
Name
DOB
Bill
Dis_Date
Age
Disease
Ad_Date
Ward_No.
GUIDE
D_ID
Name
Salary
Experience
Prescription
P_ID
DOCTOR
TREATS
PATIENT
DEP-ON
SPECIALI-ZATION
CATEGORY
MONIT-ORS
Dep_Name
Relation
Address
DEPENDENCY
Dept_ID
Dept_Name
DEPARTMENT
WORKS
NURSE
N_ID
Salary
N_Name
VISITS
HAS
WORKS _FOR
E_ID
EName
Role
Salary
EMPLOYEE
Ph_ID
Ph_Name
Handler
Location
Pincode
Address
PHARMACY
DRUGS
T_Name
Mfg_Date
Exp_Date
Cost
Quantity
Key Attribute
Simple Attribute
Partial Key
Complex Attribute
Identifying Relationship
Strong Entity
Weak Entity
Derived Attribute

Normalization up to BCNF:



Relational Mapping:

This is the normalized upto BCNF



DDL statements:

create database dbms
connect dbms

Department:
create table Department
(dept_id int,name varchar(25),primary key(dept_id));

```
mysql> desc Department;
+---------+-------------+------+-----+---------+-------+
| Field   | Type        | Null | Key | Default | Extra |
+---------+-------------+------+-----+---------+-------+
| dept_id | int         | NO   | PRI | NULL    |       |
| name    | varchar(25) | YES  |     | NULL    |       |
+---------+-------------+------+-----+---------+-------+
2 rows in set (0.02 sec)
```

Doctor:
create table Doctor
(d_id int,
name varchar(25),
salary int,
experiance int,
dept_id int,
primary key(d_id),
foreign key(dept_id) references Department(dept_id));

```
mysql> desc Doctor;
+------------+-------------+------+-----+---------+-------+
| Field      | Type        | Null | Key | Default | Extra |
+------------+-------------+------+-----+---------+-------+
| d_id       | int         | NO   | PRI | NULL    |       |
| name       | varchar(25) | YES  |     | NULL    |       |
| salary     | int         | YES  |     | NULL    |       |
| experiance | int         | YES  |     | NULL    |       |
| dept_id    | int         | YES  | MUL | NULL    |       |
+------------+-------------+------+-----+---------+-------+
5 rows in set (0.00 sec)
```

Patient:
create table Patient
(p_id int,fname varchar(25),
lname varchar(25),
ward_no int,
bill int,
desease varchar(25),

add_date date,
dis_date date,
dept_id int,
d_id int,
prescription varchar(25),
DOB date,
primary key(p_id),
foreign key(dept_id) references Department(dept_id),
foreign key(d_id) references Doctor(d_id));

```
mysql> desc Patient
    -> ;
+--------------+-------------+------+-----+---------+-------+
| Field        | Type        | Null | Key | Default | Extra |
+--------------+-------------+------+-----+---------+-------+
| p_id         | int         | NO   | PRI | NULL    |       |
| fname        | varchar(25) | YES  |     | NULL    |       |
| lname        | varchar(25) | YES  |     | NULL    |       |
| ward_no      | int         | YES  |     | NULL    |       |
| bill         | int         | YES  |     | NULL    |       |
| desease      | varchar(25) | YES  |     | NULL    |       |
| add_date     | date        | YES  |     | NULL    |       |
| dis_date     | date        | YES  |     | NULL    |       |
| dept_id      | int         | YES  | MUL | NULL    |       |
| d_id         | int         | YES  | MUL | NULL    |       |
| prescription | varchar(25) | YES  |     | NULL    |       |
| DOB          | date        | YES  |     | NULL    |       |
+--------------+-------------+------+-----+---------+-------+
12 rows in set (0.00 sec)
```

Dependency:
create table Dependency
(p_id int,
name varchar(25),
relation varchar(25),
address varchar(25),
primary key(p_id,name),
foreign key(p_id) references Patient(p_id));

```
mysql> desc Dependency;
+----------+-------------+------+-----+---------+-------+
| Field    | Type        | Null | Key | Default | Extra |
+----------+-------------+------+-----+---------+-------+
| p_id     | int         | NO   | PRI | NULL    |       |
| name     | varchar(25) | NO   | PRI | NULL    |       |
| relation | varchar(25) | YES  |     | NULL    |       |
| address  | varchar(25) | YES  |     | NULL    |       |
+----------+-------------+------+-----+---------+-------+
4 rows in set (0.00 sec)
```

Employee:
create table Employee
(e_id int,
dept_id int,
name varchar(25),
role varchar(25),
salary int,
primary key(e_id),
foreign key(dept_id) references Department(dept_id));

```
mysql> desc Employee
    -> ;
+---------+-------------+------+-----+---------+-------+
| Field   | Type        | Null | Key | Default | Extra |
+---------+-------------+------+-----+---------+-------+
| e_id    | int         | NO   | PRI | NULL    |       |
| dept_id | int         | YES  | MUL | NULL    |       |
| name    | varchar(25) | YES  |     | NULL    |       |
| role    | varchar(25) | YES  |     | NULL    |       |
| salary  | int         | YES  |     | NULL    |       |
+---------+-------------+------+-----+---------+-------+
5 rows in set (0.00 sec)

mysql>
```

Pharmacy:
create table Pharmacy
(phar_id int,
name varchar(25),
handler varchar(25),
primary key(phar_id));

```
mysql> desc Pharmacy;
+---------+-------------+------+-----+---------+-------+
| Field   | Type        | Null | Key | Default | Extra |
+---------+-------------+------+-----+---------+-------+
| phar_id | int         | NO   | PRI | NULL    |       |
| name    | varchar(25) | YES  |     | NULL    |       |
| handler | varchar(25) | YES  |     | NULL    |       |
+---------+-------------+------+-----+---------+-------+
3 rows in set (0.00 sec)
```

Location:
create table Location
(phar_id int,
address varchar(25),
pincode int,
primary key(phar_id,address,pincode),
foreign key(phar_id) references Pharmacy(phar_id));

```
mysql> desc Location;
+---------+-------------+------+-----+---------+-------+
| Field   | Type        | Null | Key | Default | Extra |
+---------+-------------+------+-----+---------+-------+
| phar_id | int         | NO   | PRI | NULL    |       |
| address | varchar(25) | NO   | PRI | NULL    |       |
| pincode | int         | NO   | PRI | NULL    |       |
+---------+-------------+------+-----+---------+-------+
3 rows in set (0.00 sec)
```

Nurse:
create table Nurse
(n_id int,
name varchar(25),
salary int,
primary key(n_id));

```
mysql> desc Nurse;
+--------+-------------+------+-----+---------+-------+
| Field  | Type        | Null | Key | Default | Extra |
+--------+-------------+------+-----+---------+-------+
| n_id   | int         | NO   | PRI | NULL    |       |
| name   | varchar(25) | YES  |     | NULL    |       |
| salary | int         | YES  |     | NULL    |       |
+--------+-------------+------+-----+---------+-------+
3 rows in set (0.00 sec)
```

Drug:
create table Drug
(tab_name varchar(25),
mfg date,
quantity int,
cost int,
exp date,
primary key(tab_name));

```
mysql> desc Drug;
+----------+-------------+------+-----+---------+-------+
| Field    | Type        | Null | Key | Default | Extra |
+----------+-------------+------+-----+---------+-------+
| tab_name | varchar(25) | NO   | PRI | NULL    |       |
| mfg      | date        | YES  |     | NULL    |       |
| quantity | int         | YES  |     | NULL    |       |
| cost     | int         | YES  |     | NULL    |       |
| exp      | date        | YES  |     | NULL    |       |
+----------+-------------+------+-----+---------+-------+
5 rows in set (0.00 sec)
```

Dn_works:
create table dn_works
(dept_id int,
n_id int,
primary key(dept_id,n_id),
foreign key(dept_id) references Department(dept_id),
foreign key(n_id) references Nurse(n_id));

```
mysql> desc dn_works;
+---------+------+------+-----+---------+-------+
| Field   | Type | Null | Key | Default | Extra |
+---------+------+------+-----+---------+-------+
| dept_id | int  | NO   | PRI | NULL    |       |
| n_id    | int  | NO   | PRI | NULL    |       |
+---------+------+------+-----+---------+-------+
2 rows in set (0.00 sec)
```

pp_visits:
create table pp_visits
(phar_id int,
p_id int,
primary key(phar_id,p_id),
foreign key(phar_id) references Pharmacy(phar_id),
foreign key(p_id) references Patient(p_id));

```
mysql> desc pp_visits;
+---------+------+------+-----+---------+-------+
| Field   | Type | Null | Key | Default | Extra |
+---------+------+------+-----+---------+-------+
| phar_id | int  | NO   | PRI | NULL    |       |
| p_id    | int  | NO   | PRI | NULL    |       |
+---------+------+------+-----+---------+-------+
2 rows in set (0.00 sec)
```

Monitors:
create table np_monitors
(p_id int,
n_id int,
primary key(p_id,n_id),
foreign key(p_id) references Patient(p_id),
foreign key(n_id) references Nurse(n_id));

```
mysql> desc np_monitors;
+-------+------+------+-----+---------+-------+
| Field | Type | Null | Key | Default | Extra |
+-------+------+------+-----+---------+-------+
| p_id  | int  | NO   | PRI | NULL    |       |
| n_id  | int  | NO   | PRI | NULL    |       |
+-------+------+------+-----+---------+-------+
2 rows in set (0.00 sec)
```

Phar_drug_has:
create table phar_drug_has
(phar_id int,
tab_name varchar(25),
primary key(phar_id,tab_name),
foreign key(phar_id) references Pharmacy(phar_id),
foreign key(tab_name) references Drug(tab_name));

```
mysql> desc phar_drug_has;
+----------+-------------+------+-----+---------+-------+
| Field    | Type        | Null | Key | Default | Extra |
+----------+-------------+------+-----+---------+-------+
| phar_id  | int         | NO   | PRI | NULL    |       |
| tab_name | varchar(25) | NO   | PRI | NULL    |       |
+----------+-------------+------+-----+---------+-------+
2 rows in set (0.00 sec)
```

alter table Doctor add
(super_d_id int,
foreign key(super_d_id)
references Doctor(d_id));

Insert statements:

Department:
insert into Department values(1,'Emergency');
insert into Department values(2,'Cardiology');
insert into Department values(3,'Ent');

```
mysql> select * from department;
+---------+-------------+
| dept_id | name        |
+---------+-------------+
|       1 | Emergency   |
|       2 | Cardiology  |
|       3 | Ent         |
+---------+-------------+
3 rows in set (0.00 sec)
```

Doctor:
insert into Doctor values(1,"Dr.Anil",100000,5,1);
insert into Doctor values(2,"Dr.Anoop",200000,6,1);
insert into Doctor values(3,"Dr.Chaitra",150000,7,2);
insert into Doctor values(4,"Dr.Raj",50000,1,2);
insert into Doctor values(5,"Dr.Raksha",80000,2,3);

```
mysql> select * from doctor;
+------+------------+--------+------------+---------+------------+
| d_id | name       | salary | experiance | dept_id | super_d_id |
+------+------------+--------+------------+---------+------------+
|    1 | Dr.Anil    | 100000 |          5 |       1 |          5 |
|    2 | Dr.Anoop   | 200000 |          6 |       1 |          3 |
|    3 | Dr.Chaitra | 150000 |          7 |       2 |       NULL |
|    4 | Dr.Raj     |  50000 |          1 |       2 |          3 |
|    5 | Dr.Raksha  |  80000 |          2 |       3 |       NULL |
+------+------------+--------+------------+---------+------------+
5 rows in set (0.00 sec)
```

Patient:
insert into Patient values(1,"Ishaan","s",1,10000,"Snake Bite",'2024-02-28',NULL,1,1,"Antivenom",'2000-01-21');
insert into Patient values(2,"Rashmika","Bamandi",2,15000,"Blood loss",'2020-01-27','2020-02-02',1,1,"vitcofol",'2002-11-11');
insert into Patient values(3,"Ajay","Raj",3,150000,"Heart Attack",'2021-11-27','2022-02-12',2,3,"ecmo",'1990-12-11');

insert into Patient values(4,"Aditi","M",4,15000,"Heart Attack",'2023-11-27','2023-12-12',2,4,"Angiotensin",'1999-08-09');
insert into Patient Values(5,"Sahil","K",5,25000,"Ear Pain",'2024-11-28','2024-11-30',3,5,"decongestants",'1880-01-12');

```
mysql> select * from patient;
+------+---------+---------+---------+--------+--------------+------------+------------+---------+------+----------------+------------+
| p_id | fname   | lname   | ward_no | bill   | desease      | add_date   | dis_date   | dept_id | d_id | prescription   | DOB        |
+------+---------+---------+---------+--------+--------------+------------+------------+---------+------+----------------+------------+
|    1 | Ishaan  | s       |       1 |  10000 | Snake Bite   | 2024-02-28 | NULL       |       1 |    1 | Antivenom      | 2000-01-21 |
|    2 | Rashmika| Bamandi |       2 |  15000 | Blood loss   | 2020-01-27 | 2020-02-02 |       1 |    1 | vitcofol       | 2002-11-11 |
|    3 | Ajay    | Raj     |       3 | 150000 | Heart Attack | 2021-11-27 | 2022-02-12 |       2 |    3 | ecmo           | 1990-12-11 |
|    4 | Aditi   | M       |       4 |  15000 | Heart Attack | 2023-11-27 | 2023-12-12 |       2 |    4 | Angiotensin    | 1999-08-09 |
|    5 | Sahil   | K       |       5 |  25000 | Ear Pain     | 2024-11-28 | 2024-11-30 |       3 |    5 | decongestants  | 1880-01-12 |
|    8 | Surya   | s       |       1 |  10000 | Snake Bite   | 2024-02-28 | NULL       |       1 |    1 | Antivenom      | 2000-01-21 |
+------+---------+---------+---------+--------+--------------+------------+------------+---------+------+----------------+------------+
6 rows in set (0.00 sec)
```

Dependency:
insert into Dependency values(1,"Ramesh","Brother","Tumkur");
insert into Dependency values(2,"Manjula","Mother","Tumkur");
insert into Dependency values(3,"Sneha","Sister","Tumkur");
insert into Dependency values(4,"Ananth","Brother","Tumkur");
insert into Dependency values(5,"Chandrika","Wife","Tumkur");

```
mysql> select * from dependency;
+------+-----------+----------+---------+
| p_id | name      | relation | address |
+------+-----------+----------+---------+
|    1 | Ramesh    | Brother  | Tumkur  |
|    2 | Manjula   | Mother   | Tumkur  |
|    3 | Sneha     | Sister   | Tumkur  |
|    4 | Ananth    | Brother  | Tumkur  |
|    5 | Chandrika | Wife     | Tumkur  |
+------+-----------+----------+---------+
5 rows in set (0.00 sec)
```

Employee:
insert into Employee values(1,1,"Sahana","X-ray technician",10000);
insert into Employee values(2,1,"Rachana","clerk",10000);
insert into Employee values(3,2,"Bharat","human resources manager",10000);
insert into Employee values(4,2,"Mohit","clerk",10000);
insert into Employee values(5,3,"Prakash","clerk",10000);

```
mysql> select * from employee;
+------+---------+---------+-------------------------+--------+
| e_id | dept_id | name    | role                    | salary |
+------+---------+---------+-------------------------+--------+
|    1 |       1 | Sahana  | X-ray technician        |  10000 |
|    2 |       1 | Rachana | clerk                   |  10000 |
|    3 |       2 | Bharat  | human resources manager |  10000 |
|    4 |       2 | Mohit   | clerk                   |  10000 |
|    5 |       3 | Prakash | clerk                   |  10000 |
+------+---------+---------+-------------------------+--------+
5 rows in set (0.00 sec)
```

Nurse:
insert into Nurse values(1,"Ranjana",15000);
insert into Nurse values(2,"Karthik",43000);
insert into Nurse values(3,"Suhana",12000);
insert into Nurse values(4,"Ganesh",35000);
insert into Nurse values(5,"Harsh",25000);

```
mysql> select * from nurse;
+------+---------+--------+
| n_id | name    | salary |
+------+---------+--------+
|    1 | Ranjana |  15000 |
|    2 | Karthik |  43000 |
|    3 | Suhana  |  12000 |
|    4 | Ganesh  |  35000 |
|    5 | Harsh   |  25000 |
+------+---------+--------+
5 rows in set (0.00 sec)
```

Drug:
insert into Drug values("Acarbose",'2020-03-21',10,180,'2026-01-21');
insert into Drug values("BCG Vaccine",'2016-12-11',10,180,'2028-01-15');
insert into Drug values("Alprazolam",'2023-05-22',10,180,'2027-12-18');
insert into Drug values("Metformin",'2014-01-23',10,180,'2025-11-16');
insert into Drug values("Acebutolol",'2010-06-13',10,180,'2024-06-21');
insert into Drug values("Acebutolol-G",'2010-06-13',10,500,'2024-06-21');
insert into Drug values("Acarbose-2",'2020-03-21',10,680,'2026-01-21');
insert into Drug values("BCG Vaccine-2",'2016-12-11',10,100,'2028-01-15');
insert into Drug values("Acebutolol-G",'2010-06-13',10,500,'2024-06-21');

```
mysql> select * from drug;
+---------------+------------+----------+------+------------+
| tab_name      | mfg        | quantity | cost | exp        |
+---------------+------------+----------+------+------------+
| Acarbose      | 2020-03-21 |       10 |  180 | 2026-01-21 |
| Acarbose-2    | 2020-03-21 |       10 |  680 | 2026-01-21 |
| Acebutolol    | 2010-06-13 |       10 |  180 | 2024-06-21 |
| Acebutolol-G  | 2010-06-13 |       10 |  500 | 2024-06-21 |
| Alprazolam    | 2023-05-22 |       10 |  180 | 2027-12-18 |
| BCG Vaccine   | 2016-12-11 |       10 |  180 | 2028-01-15 |
| BCG Vaccine-2 | 2016-12-11 |       10 |  100 | 2028-01-15 |
| Metformin     | 2014-01-23 |       10 |  180 | 2025-11-16 |
+---------------+------------+----------+------+------------+
8 rows in set (0.00 sec)
```

dn_works:
insert into dn_works values(1,1);
insert into dn_works values(1,2);
insert into dn_works values(2,3);
insert into dn_works values(2,4);
insert into dn_works values(3,5);

```
mysql> select * from dn_works;
+---------+------+
| dept_id | n_id |
+---------+------+
|       1 |    1 |
|       1 |    2 |
|       2 |    3 |
|       2 |    4 |
|       3 |    5 |
+---------+------+
5 rows in set (0.00 sec)
```

Pharmacy:
insert into Pharmacy values(1,"MedPlus","Hemanth");
insert into Pharmacy values(2,"Apollo","Kushal");
insert into Pharmacy values(3,"Bilva","Rahul");
insert into Pharmacy values(4,"Wealth","Prakruthi");
insert into Pharmacy values(5,"M Plus","Chetana");

```
mysql> select * from pharmacy;
+---------+---------+-----------+
| phar_id | name    | handler   |
+---------+---------+-----------+
|       1 | MedPlus | Hemanth   |
|       2 | Apollo  | Kushal    |
|       3 | Bilva   | Rahul     |
|       4 | Wealth  | Prakruthi |
|       5 | M Plus  | Chetana   |
+---------+---------+-----------+
5 rows in set (0.00 sec)
```

Location:
insert into Location values(1,"Davangere",577001);
insert into Location values(2,"Tumkur",5772101);
insert into Location values(3,"Tumkur",577002);
insert into Location values(4,"Shivamogga",577201);
insert into Location values(5,"Bidar",585401);

```
mysql> select * from location;
+---------+-----------+---------+
| phar_id | address   | pincode |
+---------+-----------+---------+
|       1 | Davangere |  577001 |
|       2 | Tumkur    | 5772101 |
|       3 | Tumkur    |  577002 |
|       4 | Shivamogga |  577201 |
|       5 | Bidar     |  585401 |
+---------+-----------+---------+
5 rows in set (0.00 sec)
```

np_monitors:
insert into np_monitors values(1,1);
insert into np_monitors values(2,3);
insert into np_monitors values(3,2);
insert into np_monitors values(4,5);
insert into np_monitors values(5,4);

```
mysql> select * from np_monitors;
+------+------+
| p_id | n_id |
+------+------+
|    1 |    1 |
|    3 |    2 |
|    2 |    3 |
|    5 |    4 |
|    4 |    5 |
+------+------+
5 rows in set (0.00 sec)
```

phar_drug:

```
insert into phar_drug_has values(1,"Acarbose");
insert into phar_drug_has values(2,"BCG Vaccine");
insert into phar_drug_has values(3,"Alprazolam");
insert into phar_drug_has values(4,"Metformin");
insert into phar_drug_has values(5,"Acebutolol");
insert into phar_drug_has values(1,"Acebutolol-G");
insert into phar_drug_has values(3,"Acarbose-2");
insert into phar_drug_has values(5,"BCG Vaccine-2");
```

```
mysql> select * from phar_drug_has;
+---------+---------------+
| phar_id | tab_name      |
+---------+---------------+
|       1 | Acarbose      |
|       3 | Acarbose-2    |
|       5 | Acebutolol    |
|       1 | Acebutolol-G  |
|       3 | Alprazolam    |
|       2 | BCG Vaccine   |
|       5 | BCG Vaccine-2 |
|       4 | Metformin     |
+---------+---------------+
8 rows in set (0.00 sec)
```

pp_visits:

```
insert into pp_visits values(1,5);
insert into pp_visits values(2,4);
insert into pp_visits values(3,3);
insert into pp_visits values(4,2);
insert into pp_visits values(5,1);
```

```
mysql> select * from pp_visits;
+---------+------+
| phar_id | p_id |
+---------+------+
|       5 |    1 |
|       4 |    2 |
|       3 |    3 |
|       2 |    4 |
|       1 |    5 |
+---------+------+
5 rows in set (0.00 sec)
```

Inserting into doctor after altering the table:
update Doctor set super_d_id=5 where d_id=1;
update Doctor set super_d_id=3 where d_id=2;
update Doctor set super_d_id=3 where d_id=4;

Queries:

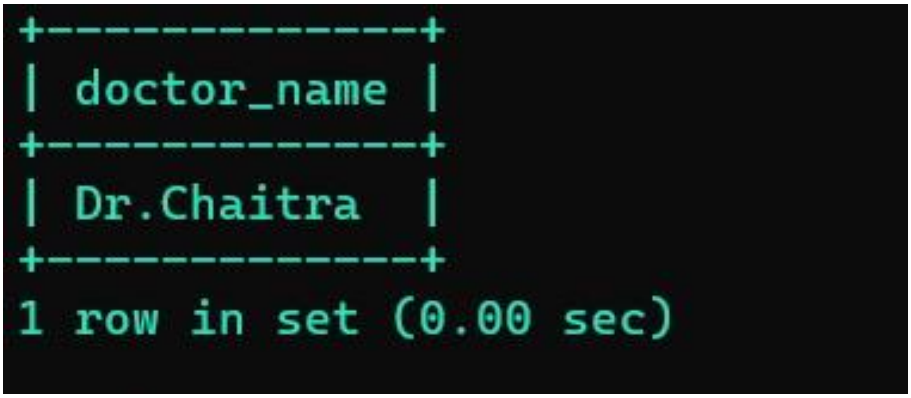
1. **List the pharmacies along with the total cost of drugs they have and the highest cost drug in each pharmacy. Include the pharmacy's location using correlated nested subqueries:**

SELECT ph.phar_id, ph.name pharmacy_name, l.address location_address, l.pincode location_pincode,
(SELECT SUM(d.cost) FROM phar_drug_has pdh JOIN Drug d ON pdh.tab_name = d.tab_name WHERE pdh.phar_id = ph.phar_id) total_cost,
(SELECT MAX(d.cost) FROM phar_drug_has pdh JOIN Drug d ON pdh.tab_name = d.tab_name WHERE pdh.phar_id = ph.phar_id) highest_cost_drug
FROM Pharmacy ph
JOIN Location l ON ph.phar_id = l.phar_id
ORDER BY total_cost DESC;

```
+---------+--------------+------------------+------------------+------------+-------------------+
| phar_id | pharmacy_name | location_address | location_pincode | total_cost | highest_cost_drug |
+---------+--------------+------------------+------------------+------------+-------------------+
|       1 | MedPlus       | Davangere        |           577001 |        180 |               180 |
|       2 | Apollo        | Tumkur           |          5772101 |        180 |               180 |
|       3 | Bilva         | Tumkur           |           577002 |        180 |               180 |
|       4 | Wealth        | Shivamogga       |           577201 |        180 |               180 |
|       5 | M Plus        | Bidar            |           585401 |        180 |               180 |
+---------+--------------+------------------+------------------+------------+-------------------+
5 rows in set (0.01 sec)
```

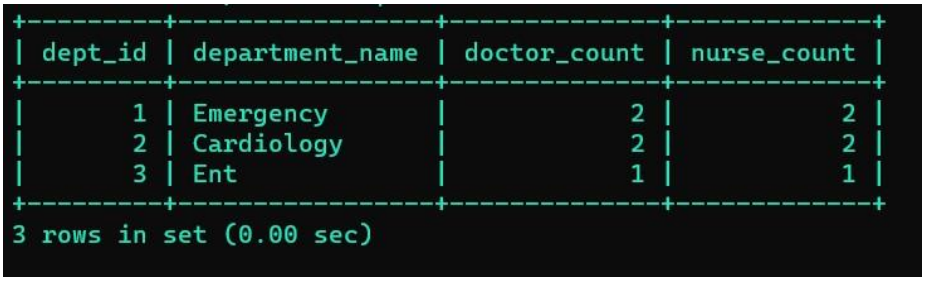
2. **Retrieve the names of doctors who have patients with bills exceeding the average bill amount:**

```
SELECT d.name AS doctor_name
FROM Doctor d
WHERE EXISTS (
   SELECT 1
   FROM Patient p
   WHERE p.d_id = d.d_id AND p.bill > (
      SELECT AVG(bill)
      FROM Patient
   )
);
```



3. **The departments along with the number of doctors and nurses in each department**

```
SELECT d.dept_id, d.name AS department_name,
(SELECT COUNT(*) FROM Doctor doc WHERE doc.dept_id = d.dept_id) AS doctor_count,
(SELECT COUNT(*) FROM Nurse n JOIN dn_works dw ON n.n_id = dw.n_id WHERE dw.dept_id = d.dept_id) AS nurse_count
FROM Department d;
```



4. **Retrieve patients with their doctors and pharmacies, and limit the results to patients in a specific department:**

```
SELECT p.fname, p.lname, d.name doctor_name, ph.name pharmacy_name
FROM Patient p
JOIN Doctor d ON p.d_id = d.d_id
LEFT JOIN pp_visits pp ON p.p_id = pp.p_id
LEFT JOIN Pharmacy ph ON pp.phar_id = ph.phar_id
WHERE p.dept_id = (
   SELECT dept_id
   FROM Department
   WHERE name = 'Emergency'
);
```

```
+----------+---------+-------------+---------------+
| fname    | lname   | doctor_name | pharmacy_name |
+----------+---------+-------------+---------------+
| Ishaan   | s       | Dr.Anil     | M Plus        |
| Rashmika | Bamandi | Dr.Anil     | Wealth        |
+----------+---------+-------------+---------------+
2 rows in set (0.00 sec)
```

5. **Find doctors with the highest and lowest average patient bills among those with at least 1 patients. Include the department details for each doctor using nested subqueries:**

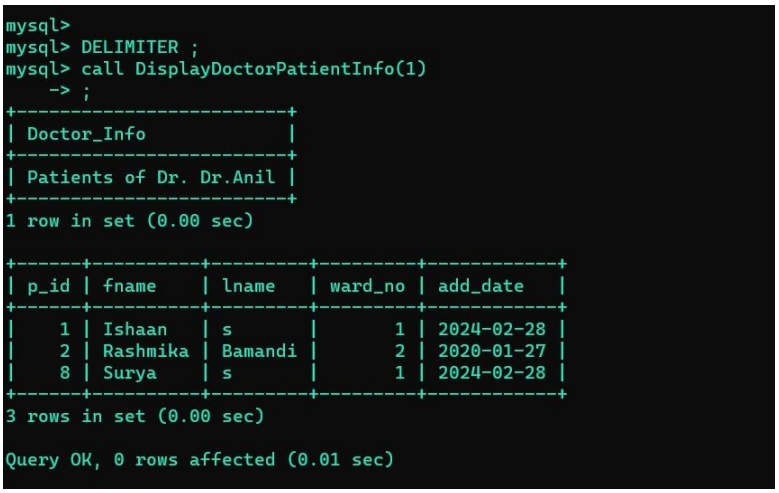
```
(SELECT d.d_id, d.name AS doctor_name, d.dept_id AS doctor_department,
    (SELECT AVG(p.bill) FROM Patient p WHERE p.d_id = d.d_id) AS avg_patient_bill
 FROM Doctor d
 WHERE (SELECT COUNT(p.p_id) FROM Patient p WHERE p.d_id = d.d_id) >= 1
 ORDER BY avg_patient_bill DESC
 LIMIT 1)

UNION

(SELECT d.d_id, d.name AS doctor_name, d.dept_id AS doctor_department,
    (SELECT AVG(p.bill) FROM Patient p WHERE p.d_id = d.d_id) AS avg_patient_bill
 FROM Doctor d
 WHERE (SELECT COUNT(p.p_id) FROM Patient p WHERE p.d_id = d.d_id) >= 1
 ORDER BY avg_patient_bill ASC
 LIMIT 1);
```

```
+------+-------------+-------------------+------------------+
| d_id | doctor_name | doctor_department | avg_patient_bill |
+------+-------------+-------------------+------------------+
|    3 | Dr.Chaitra  |                 2 |      150000.0000 |
|    1 | Dr.Anil     |                 1 |       12500.0000 |
+------+-------------+-------------------+------------------+
2 rows in set (0.00 sec)
```

Stored procedures:

1. **Write a procedure to retrieve all the patients information of a doctor with a specific id**

```
DELIMITER //

CREATE PROCEDURE DisplayDoctorPatientInfo(
   IN p_d_id INT
)
BEGIN
DECLARE doctor_name VARCHAR(50);

SELECT name INTO doctor_name FROM Doctor WHERE d_id = p_d_id;

IF doctor_name IS NOT NULL THEN
SELECT CONCAT('Patients of Dr. ', doctor_name) AS Doctor_Info;

SELECT p.p_id, p.fname, p.lname, p.ward_no, p.add_date
FROM Patient p
WHERE p.d_id = p_d_id;

ELSE
SELECT 'Doctor not found!' AS Error_Message;
END IF;

END //

DELIMITER ;
```



```
mysql>
mysql> DELIMITER ;
mysql> call DisplayDoctorPatientInfo(1)
    -> ;
+-------------------------+
| Doctor_Info             |
+-------------------------+
| Patients of Dr. Dr.Anil |
+-------------------------+
1 row in set (0.00 sec)

+------+----------+---------+---------+------------+
| p_id | fname    | lname   | ward_no | add_date   |
+------+----------+---------+---------+------------+
|    1 | Ishaan   | s       |       1 | 2024-02-28 |
|    2 | Rashmika | Bamandi |       2 | 2020-01-27 |
|    8 | Surya    | s       |       1 | 2024-02-28 |
+------+----------+---------+---------+------------+
3 rows in set (0.00 sec)

Query OK, 0 rows affected (0.01 sec)
```

2. **Write a procedure to retrieve the doctor details along with their supervisor for a specific id**

```
DELIMITER //

CREATE PROCEDURE DisplayDoctorDetails2(
IN p_d_id INT
)
BEGIN
DECLARE doctor_id INT;
DECLARE doctor_name VARCHAR(50);
DECLARE doctor_salary INT;
DECLARE department_name VARCHAR(50);
DECLARE supervisor_name VARCHAR(50);

SELECT d.d_id, d.name, d.salary, dept.name AS department, CONCAT('Dr. ', s.name) AS supervisor
INTO doctor_id, doctor_name, doctor_salary, department_name, supervisor_name
FROM Doctor d
JOIN Department dept ON d.dept_id = dept.dept_id
LEFT JOIN Doctor s ON d.super_d_id = s.d_id
WHERE d.d_id = p_d_id;

IF doctor_id IS NOT NULL THEN
SELECT 'Doctor ID:', doctor_id AS Doctor_ID;
SELECT 'Doctor Name:', doctor_name AS Doctor_Name;
SELECT 'Salary:', doctor_salary AS Salary;
SELECT 'Department:', department_name AS Department;
SELECT 'Supervisor:', supervisor_name AS Supervisor;
ELSE
SELECT 'Doctor not found!' AS Error_Message;
END IF;
END //

DELIMITER ;
```

```
mysql> CALL DisplayDoctorDetails2(1);
+------------+-----------+
| Doctor ID: | Doctor_ID |
+------------+-----------+
| Doctor ID: |         1 |
+------------+-----------+
1 row in set (0.00 sec)

+--------------+-------------+
| Doctor Name: | Doctor_Name |
+--------------+-------------+
| Doctor Name: | Dr.Anil     |
+--------------+-------------+
1 row in set (0.00 sec)

+---------+--------+
| Salary: | Salary |
+---------+--------+
| Salary: | 100000 |
+---------+--------+
1 row in set (0.00 sec)

+-------------+------------+
| Department: | Department |
+-------------+------------+
| Department: | Emergency  |
+-------------+------------+
1 row in set (0.01 sec)

+-------------+---------------+
| Supervisor: | Supervisor    |
+-------------+---------------+
| Supervisor: | Dr. Dr.Raksha |
+-------------+---------------+
1 row in set (0.01 sec)

Query OK, 0 rows affected (0.01 sec)
```

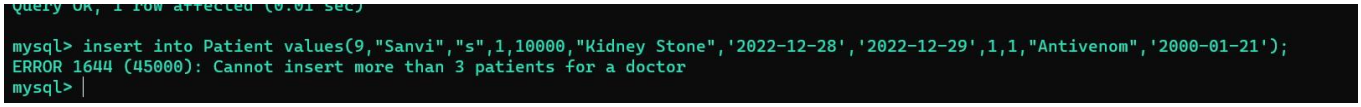
Triggers:

1. **Write an insertion trigger to check the constraint that a doctor cannot have more than 3 patients at a time**

   DELIMITER //

   CREATE TRIGGER check_patient_limit
   AFTER INSERT ON Patient
   FOR EACH ROW
   BEGIN
   DECLARE patient_count INT;

```
SELECT COUNT(*) INTO patient_count
FROM Patient
WHERE d_id = NEW.d_id;

IF patient_count > 3 THEN
SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'Cannot insert more than 3 patients for a doctor';
END IF;
END;
//

DELIMITER ;
```



2. Write a deletion trigger which does not allow deleting a doctor who has undischarged patients

```
DELIMITER //

CREATE TRIGGER prevent_doctor_deletion
BEFORE DELETE ON Doctor
FOR EACH ROW
BEGIN
DECLARE patient_count INT;

SELECT COUNT(*) INTO patient_count
FROM Patient
WHERE d_id = OLD.d_id AND dis_date IS NULL;

IF patient_count > 0 THEN
SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'Cannot delete doctor, undischarged patients exist';
END IF;
END;
//
DELIMITER ;
```