



Care at Every Step



Hospital Management System (HMS) Using SQL

Hospital Insights Derived from Real-World HMS Data

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Care at Every Step

Description

Hospitals are a vital part of our lives, providing medical facilities to people suffering from various illnesses caused by factors like climate change, workload, and emotional stress. Maintaining daily hospital activities and records manually is difficult, which is why a database is needed to keep track of all hospital operations.

Hospitals interact with many people daily and manage activities such as doctor schedules, patient diagnoses, and medical histories. This project demonstrates how data related to these tasks can be managed more easily using databases.

By storing information in a relational database, daily hospital functions can be performed efficiently. The Hospital Database Management System (DBMS) is a comprehensive SQL project designed to streamline and optimize hospital management. It offers an efficient and user-friendly way to store, retrieve, and manipulate healthcare data.

This database contains 7 tables:

1. Physician
2. Affiliated with
3. Department
4. Nurse
5. Patient
6. Patient Diagnosis
7. Procedures





Objective

To design and develop a structured SQL-based Hospital Management System that efficiently stores, manages, and retrieves hospital-related data. The objective of this project is to streamline hospital operations by organizing information about physicians, patients, nurses, diagnoses, departments, and medical procedures in a relational database. This system aims to improve data accuracy, reduce manual workload, enhance accessibility, and support faster decision-making in day-to-day hospital activities.



Database Design

Tables Created:

1. Physician – Stores doctor information (ID, name, position)
2. Department – Stores hospital departments and their department heads
3. Affiliated_with – Maps physicians to departments (many-to-many link table)
4. Nurse – Stores nurse details, roles, and registration status
5. Patient – Stores patient personal information and their primary physician
6. Patient_Diagnosis – Stores diagnoses, physician who diagnosed, and prescriptions
7. Procedures – Stores medical procedures and their costs



Database Relationship

1. Physician → Patient (One-to-Many)

- One physician can treat many patients
- A patient has one primary_check physician
-

2. Physician ↔ Department (Many-to-Many via Affiliated_with)

- A physician can be affiliated with multiple departments
- A department can have multiple physicians
- The table Affiliated_with stores this relationship
-

3. Department → Physician (One-to-One for Head)

- Each department has one department head (a physician)
- A physician can head only one department
-

4. Physician → Patient_Diagnosis (One-to-Many)

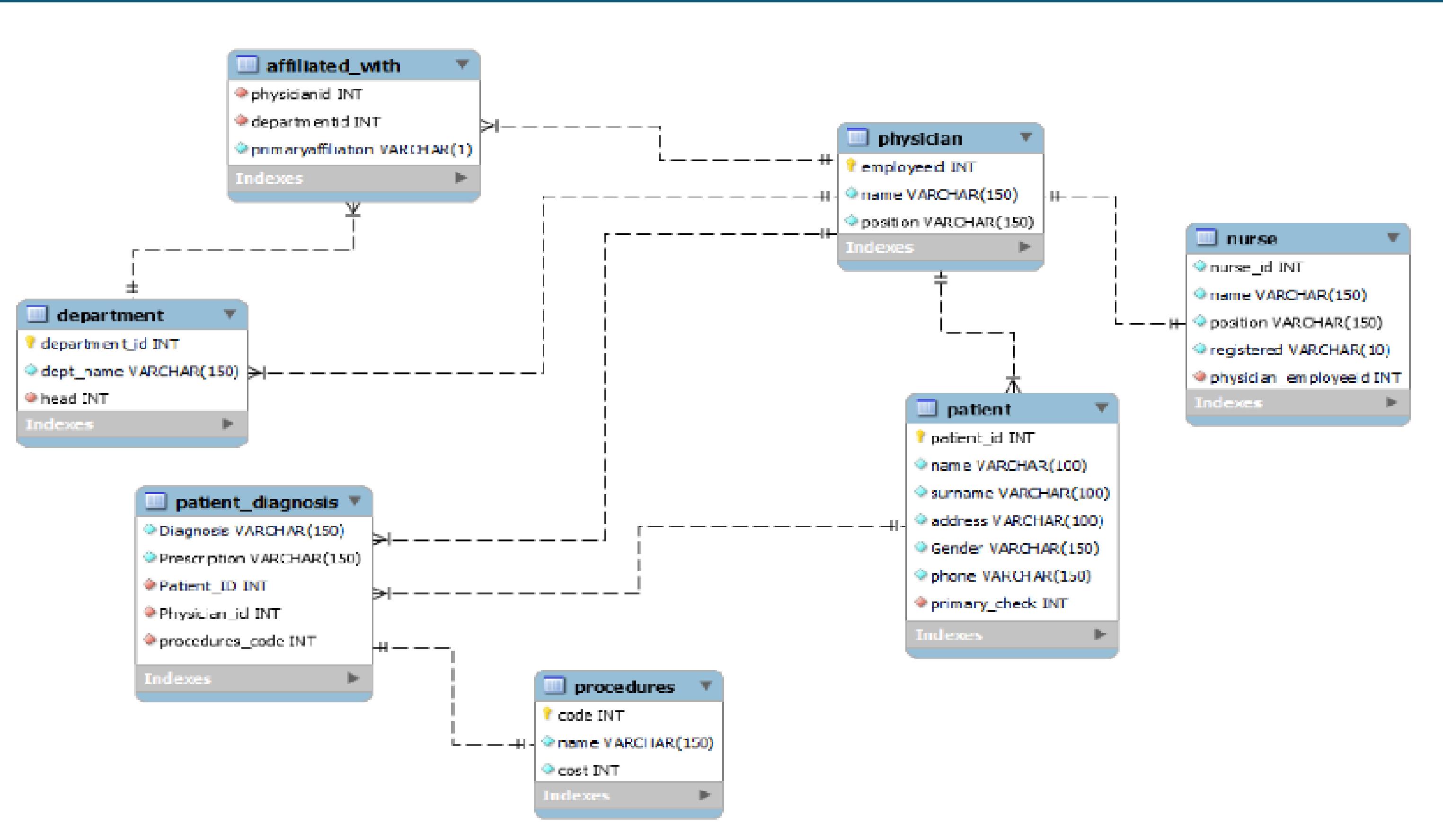
- A physician can diagnose multiple patients
- Each diagnosis is linked to one physician
-

5. Patient → Patient_Diagnosis (One-to-Many)

- A patient can have multiple diagnoses
- Each diagnosis entry belongs to one patient



ER-Diagram (entity Relationship Diagram) for Hospital Management System



1. Write a query in SQL to obtain the name of the physician in alphabetical order.



Solution:

```
SELECT  
    e_name  
FROM  
    physician AS PHYSICIAN_NAME  
ORDER BY e_name;
```

Output:

e_name
Dr.Estella Keller
Dr.Gavin Curtis
Dr.Imani Harper
Dr.Jamison Clayton
Dr.Jaxson Khan
Dr.Jesse Craig
Dr.John Dorian
Dr.John Wen
Dr.Keith Dudemeister
Dr.Luca Flowers
Dr.Mabel Leal
Dr.Molly Clock
Dr.Nancy James
Dr.Nico Galvan
Dr.Odin Banks
Dr.Percival Cox
Dr.Remy Cook
Dr.Richard Mitchell
Dr.Robert Suarez
Dr.Rosalie Vaughn
Dr.Saige Juarez
Dr.Scott Vaughan
Dr.Todd Quinlan
Dr.Willow Farmer

e_name
Dr.Estella Keller
Dr.Gavin Curtis
Dr.Imani Harper
Dr.Jamison Clayton
Dr.Jaxson Khan
Dr.Jesse Craig
Dr.John Dorian
Dr.John Wen
Dr.Keith Dudemeister
Dr.Luca Flowers
Dr.Mabel Leal
Dr.Molly Clock
Dr.Nancy James
Dr.Nico Galvan
Dr.Odin Banks
Dr.Percival Cox
Dr.Remy Cook
Dr.Richard Mitchell
Dr.Robert Suarez
Dr.Rosalie Vaughn
Dr.Saige Juarez
Dr.Scott Vaughan
Dr.Todd Quinlan
Dr.Willow Farmer

2. Write a query in SQL to obtain the fullname of the patients whose gender is male.



Solution:

```
SELECT  
    CONCAT(name, ' ', surname) AS Full_Name  
FROM  
    patient  
WHERE  
    gender = 'Male';
```

Output:

Full_Name
John Smith
Remo Xavier
Dennis Doe
Robert Fernandez
Michael Williams
David Jones
Christopher Wilson
Matthew Martinez
Daniel Garcia
James Lopez
Joshua Perez
Ryan Flores
Andrew Cruz
Justin Morales
Brandon Nguyen
Austin Green
Tyler Baker
Dylan Ward
Ethan Rivera
Noah Diaz
Mason Powell

3. Write a query in SQL to find the name of the nurse who are the head of their department and are registered.



Solution:

```
SELECT
*
FROM
nurse
WHERE
position = 'Head Nurse'
AND registered = 'YES';
```

Output:

Full_Name
John Smith
Remo Xavier
Dennis Doe
Robert Fernandez
Michael Williams
David Jones
Christopher Wilson
Matthew Martinez
Daniel Garcia
James Lopez
Joshua Perez
Ryan Flores
Andrew Cruz
Justin Morales
Brandon Nguyen
Austin Green
Tyler Baker
Dylan Ward
Ethan Rivera
Noah Diaz
Mason Powell

4. Write a query in SQL to find the name of the nurse who are Team Leader or not registered.



Solution:

```
SELECT
  *
FROM
  nurse
WHERE
  position = 'Team Leader'
    AND registered = 'NO';
```

Output:

Result Grid			
nurse_id	name	position	registered
4	Anna Rubel	Team Leader	No

5. Write a query to obtain the avg cost of all the medical procedures.



Solution:

```
SELECT  
    ROUND(AVG(cost), 2) AS Average_Cost  
FROM  
    procedures;
```

Output:

Result Grid	
	Average_Cost
	2552.50

6 Write a query to obtain name and cost of the procedure whose cost is greater than 2000.



Solution:

```
SELECT  
    name AS Procedure_Name, cost AS procedure_Cost  
FROM  
    procedures  
WHERE  
    cost > 2000;
```

Output:

Procedure_Name	procedure_Cost
MRI-Brain	5000
MRI-Spine	6000
CT Scan-Abdomen	3000
CT Scan-Pelvis	3500
Ultrasound-Obstetric	2500
PET-CT Scan	5000
Fluoroscopy - Upper GI Series	7000
Fluoroscopy - Barium Enema	4500
MRI-Knee	4000

7. Write a query to update the name of the patient to Robert Fernandez having patientid as 5.



Solution:

```
UPDATE patient
SET
    name = 'Robert',
    surname = 'Fernandez'
WHERE
    patient_id = 5;
```

Output:

patient_id	name	surname	address
3	Remo	Xavier	101 Omgbbq Street
4	Dennis	Doe	1100 Foobaz Avenue
5	Robert	Fernandez	123 Main St
6	Emily	Johnson	56 Elm St
7	Michael	Williams	789 Oak St

8. Second maximum cost of medical procedure



Solution:

```
SELECT  
    MAX(cost) AS second_Highest_Cost  
FROM  
    procedures  
WHERE  
    cost != (SELECT  
        MAX(cost)  
    FROM  
        procedures AS Max_Cost);
```

Output:

second_Highest_Cost
6000

9. Write a query in SQL to obtain the name of the patients starting with letter A.



Solution:

```
SELECT  
    CONCAT(name, ' ', surname) AS patient_Name  
FROM  
    patient  
WHERE  
    CONCAT(name, ' ', surname) LIKE 'A%';
```

Output:

patient_Name
Ashley Taylor
Amanda Hernandez
Andrew Cruz
Austin Green

10. Write a query in SQL to obtain the name of the patients whose third letter is M.



Solution:

```
SELECT  
    CONCAT(name, ' ', surname) AS patient_Name  
FROM  
    patient  
WHERE  
    CONCAT(name, ' ', surname) LIKE '_M%';
```

Output:

patient_Name
Remo Xavier
Samantha Anderson
James Lopez

11. Write a query in SQL to obtain the name of the patients whose name start with letter J and ends with Z.



Solution:

```
SELECT  
    CONCAT(name, ' ', surname) AS patient_Name  
FROM  
    patient  
WHERE  
    CONCAT(name, ' ', surname) LIKE 'J%Z';
```

Output:

patient_Name
James Lopez
Jennifer Gonzalez
Joshua Perez

12. Write a query to obtain patient details having patient_id 11 to 20.



Solution:

```
select * from patient  
where patient_id between 11 AND 20;  
  
-- or  
  
select * from patient  
limit 10,10;
```

Output:

patient_id	name	surname	address	Gender	primary_check
11	Christopher	Wilson	890 Birch St	Male	5
12	Ashley	Taylor	111 Walnut St	Female	33
13	Matthew	Martinez	222 Cherry St	Male	3
14	Samantha	Anderson	333 Spruce St	Female	18
15	Daniel	Garcia	444 Sycamore St	Male	6
16	Amanda	Hernandez	555 Pineapple St	Female	19
17	James	Lopez	666 Banana St	Male	15
18	Jennifer	Gonzalez	777 Orange St	Female	26
19	Joshua	Perez	888 Grape St	Male	6
20	Brittany	Torres	999 Lemon St	Female	20

13. Write a query in SQL to obtain the name of the physicians who are the head of each department



Solution:

```
SELECT
    physician.e_name
FROM
    physician
    JOIN
        department ON department.head = physician.employee_id;
```

Output:

e_name
Dr.Bob Kelso
Dr.John Wen
Dr.Molly Clock
Dr.Imani Harper
Dr.Scott Vaughan
Dr.Nancy James
Dr.Mabel Leal
Dr.Remy Cook
Dr.Cali Vazquez
Dr.Jesse Craig
Dr.Alexis Estes
Dr.Nico Galvan
Dr.Ariya Bradley
Dr.Robert Suarez

Dr.Alexis Estes
Dr.Nico Galvan
Dr.Ariya Bradley
Dr.Robert Suarez

14. Write a query in SQL to obtain the name of the patients with their physicians by whom they got their preliminary treatment



Solution:

```
SELECT  
    CONCAT(p.name, ' ', p.surname) AS PATIENT_NAME,  
    ph.e_name AS PHY_WHO_DID_PRI_TREATMENT  
FROM  
    patient p  
    LEFT JOIN  
    physician ph ON p.primary_check = ph.employee_id;
```

Output:

PATIENT_NAME	PHY_WHO_DID_PRI_TREATMENT
Grace Ritchie	Dr.Elliot Reid
Remo Xavier	Dr.Molly Clock
Dennis Doe	Dr.Rosalie Vaughn
Robert Fernandez	Dr.Gavin Curtis
Emily Johnson	Dr.John Wen
Michael Williams	Dr.Nancy James
Sarah Brown	Dr.Alexis Estes
David Jones	Dr.Dallas Gutierrez
Jessica Davis	Dr.Aaliyah Craig
Christopher Wilson	Dr.Bob Kelso
Ashley Taylor	Dr.Jamison Clayton
Matthew Martinez	Dr.Christopher Turk
Samantha Ander	Dr.Remy Cook

PATIENT_NAME	PHY_WHO_DID_PRI_TREATMENT
Samantha Ander...	Dr.Remy Cook
Daniel Garcia	Dr.Todd Quinlan
Amanda Hernandez	Dr.Aaliyah Craig
James Lopez	Dr.Mabel Leal
Jennifer Gonzalez	Dr.Estella Keller
Joshua Perez	Dr.Todd Quinlan
Brittany Torres	Dr.Odin Banks
Ryan Flores	Dr.Dallas Gutierrez
Lauren Ramirez	Dr.Todd Quinlan
Andrew Cruz	Dr.Alexis Estes
Nicole Scott	Dr.Aaliyah Craig
Justin Morales	Dr.Gavin Curtis

15. Write a query in SQL to obtain the name of the physician with the department who are done with affiliation.



Solution:

```
SELECT
    p.e_name AS physician_name, d.dept_name AS department_name
FROM
    physician p
        INNER JOIN
    affiliated_with a ON a.physician_id = p.employee_id
        INNER JOIN
    department d ON a.departmentid = d.department_id
WHERE
    a.primaryaffiliation = 't';
```

Output:

physician_name	department_name
Dr.Aaliyah Craig	Neurology
Dr.Cali Vazquez	Orthopedics
Dr.Jesse Craig	Neonatal
Dr.Gavin Curtis	Physiotherapy
Dr.Alexis Estes	Critical care
Dr.Nico Galvan	Physiotherapy
Dr.Dallas Gutierrez	Urology
Dr.Luca Flowers	Critical care
Dr.Ariya Bradley	Neurology
Dr.Jamison Clayton	Neonatal
Dr.Saige Juarez	Gastroenterology
Dr.Robert Suarez	Urology

16. Write a query to obtain physician name,position and department they are affiliated with.



Solution:

```
select p.e_name AS physician_Name,p.position AS position,d.dept_name  
AS department_Name from physician p  
Inner join affiliated_with a  
on a.physician_id= p.employee_id  
inner join department d  
on d.department_id=a.departmentid  
where a.primaryaffiliation= 't';
```

Output:

physician_Name	position	department_Name
Dr.Remy Cook	Head chief of Gastroenterology	Gastroenterology
Dr.Aaliyah Craig	Assistant Neuro Surgeon	Neurology
Dr.Cali Vazquez	Head Chief of Orthopedics	Orthopedics
Dr.Jesse Craig	Head chief of neonatal	Neonatal
Dr.Gavin Curtis	Assistant Physiotherapist	Physiotherapy
Dr.Alexis Estes	Senior Intensivist	Critical care
Dr.Nico Galvan	Head chief of physiotherapy	Physiotherapy
Dr.Dallas Gutierrez	Senior attending Urologist	Urology
Dr.Luca Flowers	Intensivist	Critical care
Dr.Ariya Bradley	Senior Attending Neurologist	Neurology
Dr.Jamison Clayton	Assistant neonatologist	Neonatal
Dr.Saige Juarez	Senior Resident	Gastroenterology
Dr.Robert Suarez	Head Chief of Urology	Urology

17. Write a query in SQL to obtain the patient name from which physician they get primary_checkup and also mention the patient diagnosis with prescription.



Solution:

```
select concat(p.name, ' ', p.surname) AS patient_Name,p.Gender AS Gender,
pd.Diagnosis AS Diagnosis ,pd.prescription AS prescription
from patient p
Inner join physician ph
on ph.employee_id=p.primary_check
inner join patient_diagnosis pd
on pd.Physician_id=ph.employee_id;
```

Output:

patient_Name	Gender	Diagnosis	prescription
John Smith	Male	Hypertension	Lisinopril
John Smith	Male	Asthma	Albuterol
John Smith	Male	Generalized Anxiety Disorder (GAD)	Buspirone
Grace Ritchie	Female	Hypertension	Lisinopril
Grace Ritchie	Female	Asthma	Albuterol
Grace Ritchie	Female	Generalized Anxiety Disorder (GAD)	Buspirone
Remo Xavier	Male	Anxiety Disorder	Fluoxetine
Remo Xavier	Male	Depression	Fluoxetine
Dennis Doe	Male	Arthritis	Naproxen & Aspirin
Robert Fernandez	Male	Muscular Dystrophy	Corticosteroids
Robert Fernandez	Male	Chronic Obstructive Pulmonary Dis...	Breathing exercises
Emily Johnson	Female	Chronic Pain	Tramadol

18. Write a query in SQL to obtain the maximum cost of the medical procedure.



Solution:

```
SELECT  
    Name, Cost  
FROM  
    procedures  
WHERE  
    cost IN (SELECT  
        MAX(cost)  
    FROM  
        procedures);
```

Output:

Name	Cost
Fluoroscopy - Upper GI Series	7000

19. Write a query in SQL to obtain the details of patient who has diagnosed with chronic pain.



Solution:

```
select * from patient
where patient.patient_id IN(
    select patient_ID from patient_diagnosis
    where Diagnosis='chronic pain');
```

Output:

patient_id	name	surname	address	Gender	primary_check
6	Emily	Johnson	56 Elm St	Female	7
13	Matthew	Martinez	222 Cherry St	Male	3

20. Write a query to drop phone column from patient table.



Solution:

```
alter table patient  
drop column phone;
```

```
SELECT * FROM patient;
```

Output:

patient_id	name	surname	address	Gender	primary_check
1	John	Smith	42 Foobar Lane	Male	2
2	Grace	Ritchie	37 Snafu Drive	Female	2
3	Remo	Xavier	101 Omqbbq Street	Male	9
4	Dennis	Doe	1100 Foobaz Avenue	Male	17
5	Robert	Fernandez	123 Main St	Male	24

21. Write a query in SQL to obtain the procedure name and cost whose cost is greater than the avg cost of all the procedure.



Solution:

```
SELECT
    name AS procedure_Name, Cost
FROM
    procedures
WHERE
    cost > (SELECT
                AVG(cost) AS average_Cost
            FROM
                procedures);
```

Output:

procedure_Name	Cost
MRI-Brain	5000
MRI-Spine	6000
CT Scan-Abdomen	3000
CT Scan-Pelvis	3500
PET-CT Scan	5000
Fluoroscopy - Upper GI Series	7000
Fluoroscopy - Barium Enema	4500
MRI-Knee	4000

22. Write a query in SQL to obtain the procedure name and cost whose cost is less than the avg cost of all the procedure.



Solution:

```
SELECT
    name AS procedure_Name, Cost
FROM
    procedures
WHERE
    cost < (SELECT
                AVG(cost) AS average_Cost
            FROM
                procedures);
```

Output:

procedure_Name	Cost
X-ray-Chest	1000
X-ray-Abdomen	1200
X-ray-Skull	900
X-ray-Spine	1500
Ultrasound-Abdomen	700
Ultrasound-Obstetric	2500
Mammogram	1200
Bone Density Scan (DEXA)	1800
Nuclear Medicine - Thyroid Scan	450
Angiography - Cerebral	800
Interventional Radiology - Biopsy	700
X-ray-Extremities	300

23. Write a query in SQL to obtain the physician name who are either head chief or senior in their respective department.



Solution:

```
select * from physician
where position in
(select position from physician where
position like "%senior%" or
position like "%head chief %");
```

Output:

employee_id	e_name	position
4	Dr.Percival Cox	Senior Attending Physician
5	Dr.Bob Kelso	Head Chief of pulmonology
10	Dr.Imani Harper	Senior Attending Nephrologist
12	Dr.Scott Vaughan	Senior Attending Gynecologist
15	Dr.Mabel Leal	Senior ENT Surgeon
18	Dr.Remy Cook	Head chief of Gastroenterology
21	Dr.Cali Vazquez	Head Chief of Orthopedics
22	Dr.Jesse Craig	Head chief of neonatal
25	Dr.Alexis Estes	Senior Intensivist
27	Dr.Nico Galvan	Head chief of physiotherapy
28	Dr.Dallas Gutierrez	Senior attending Urologist
30	Dr.Ariya Bradley	Senior Attending Neurologist
31	Dr.Richard Mitchell	Senior Resident

24. Write a query in SQL to obtain the employee_id, physician name and position whose primary affiliation has not been done.



Solution:

```
• SELECT  
    employee_id, e_name, position  
FROM  
    physician  
WHERE  
    employee_id IN (SELECT  
        physician_id  
    FROM  
        affiliated_with  
    WHERE  
        primaryaffiliation = 'f');|
```

Output:

employee_id	e_name	position
3	Dr. Christopher Turk	Surgical Attending Physician
7	Dr. John Wen	Surgical Attending Physician
11	Dr. Berkley McKenzie	Resident
14	Dr. Jaxson Khan	Assistant Intensivist
16	Dr. Cedric Kelley	Junior Resident
20	Dr. Odin Banks	Junior Intensivist
23	Dr. Brynn Harrison	Staff Internist
26	Dr. Estella Keller	Assistant Gastro Surgeon
31	Dr. Richard Mitchell	Senior Resident
32	Dr. Willow Farmer	Junior Resident



Conclusion

In conclusion, this SQL Project was made to help hospital staff maintain information and improve access, making the retrieval process easier. The Hospital database management must be improved or upgraded to meet any situation. The EER diagram and its associated relational schema show the conceptual and logical designs of the system. We also defined data types and constraints for each attribute in the relations. The next step is to implement this database and change the design accordingly. The developed system and its evaluation should be carried out to improve the database system and management processes in hospitals. The project Hospital Management System is for computerizing the working in a hospital. It takes care of all the requirements of an average hospital and is capable to provide easy and effective storage of information related to patients that come up to the hospital.

Thank You

