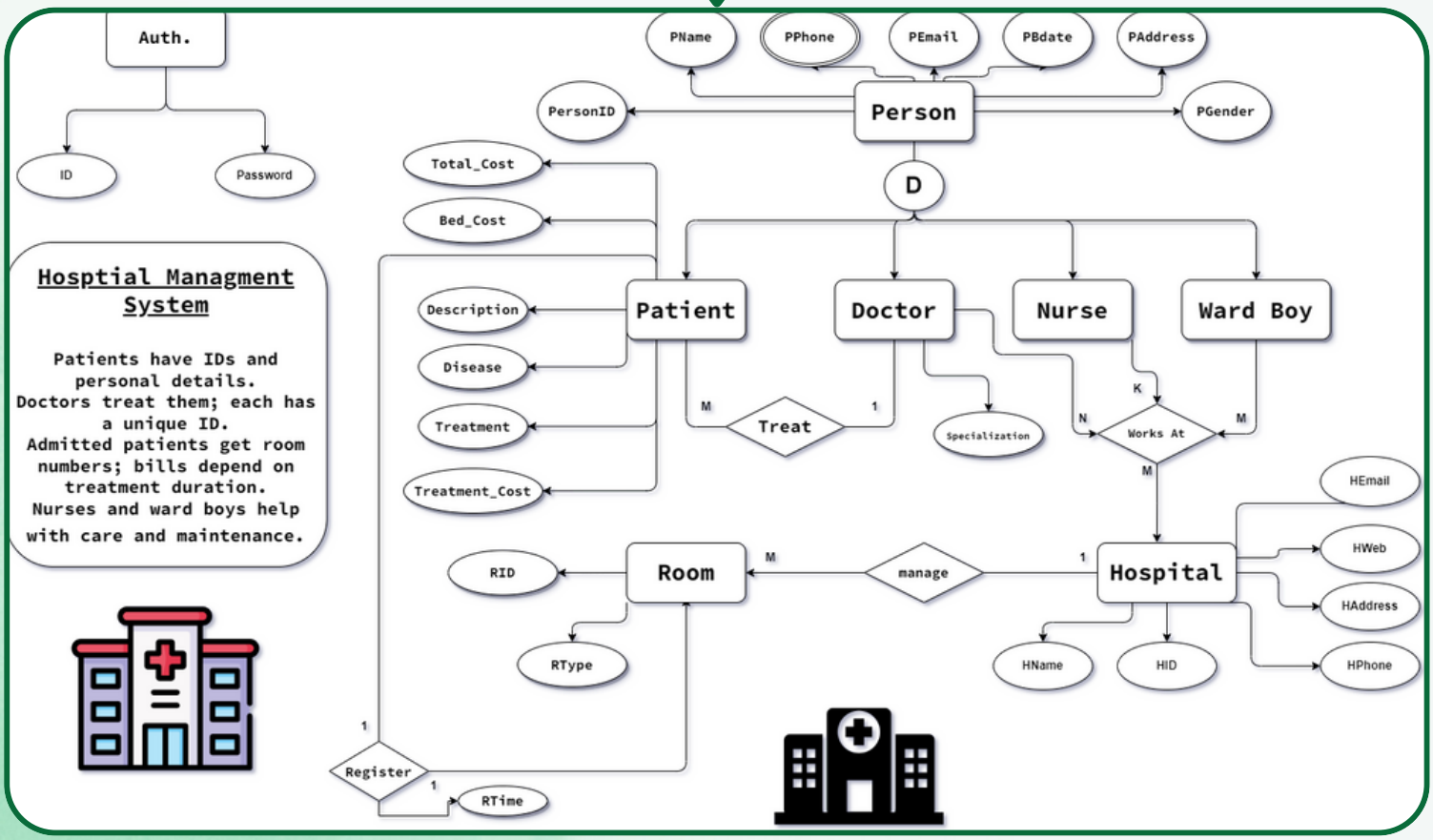
Hospital Managment System

ER Diagram Design

In the hospital management system
each patient is assigned a unique Patient ID, and comprehensive details such as personal information, contact number, diagnosed disease, and ongoing treatment are recorded.
The interaction between doctors and patients is facilitated, allowing each doctor to oversee multiple patients, each identified by a unique ID.
Patients may require admission to the hospital, with specific room assignments, including those for Operation Theatres and Intensive Care Units (ICU).
The healthcare system also involves the presence of nurses and ward boys responsible for hospital maintenance and patient care.
Billing is determined based on the duration of hospital stay and the associated treatment, generating a comprehensive financial record.



Creation for data base about people

Person

This table stores information about individuals associated with the hospital, including doctors, nurses, ward boys, and patients. It includes details such as name, phone number, email, date of birth, address, and gender.

Doctor

This table represents information specific to doctors, including their specializations. It has a foreign key relationship with the Person table, linking each doctor to a corresponding person.

Staff

Ward Boy

This table is dedicated to ward boys, with a foreign key linking to the Person table.

NURSE

Similar to the Doctor table, the Nurse table holds details about nurses and has a foreign key linking to the Person table.

Patient

The Patient table stores information about patients, including a description, diagnosed disease, treatment details, associated doctor (via foreign key), and various costs related to treatment and bed usage.

Creation for data base about Infrastructure

Hospital

This table contains details about different hospitals, including their email, website, address, phone number, and name.

Room

Rooms within hospitals are represented in this table, with information about room type and a foreign key linking to the Hospital table.

WorksAt

This table establishes associations between doctors, nurses, ward boys, and hospitals, indicating where each person is employed. It utilises foreign keys to link to the respective tables.

Register

The Register table is designed for recording patient registrations, documenting the patient, associated doctor, and the time of registration.

Auth

This table manages authentication credentials, specifically an ID and password. Currently, it seems to store a single admin account with the ID 'Admin' and the password 'Admin'.

SCHEMA

Person (**PersonID**,PName,PPhone,PEmail,PDate,PAddress,PGender)
Doctor (**PersonID**, Specialization)
Nurse (**PersonID**)
WardBoy (**PersonID**)
Patient (**PersonID**, Description, Disease, Treatment,**DoctorID**,Treatment_Cost,Bed_Cost,Total_Cost)
Hospital (**HID**,Hemail, HWeb, HAddress, HPhone, HName)
Room (**RID**, RType,HID)
Works At (**DoctorID**, **NurseID**, **WardBoyID**, **HID**)
Register (**PatientID**, **DoctorID**, RTime)
Auth. (**ID**, Password)

Normalization

Person Table (PersonID, PName, PPhone, PEmail, PDate, PAddress, PGender)
Appears to be in 3NF. No transitive dependencies.

Doctor Table (PersonID, Specialization)
In 3NF. The Specialization depends only on the PersonID (the primary key).

Nurse Table (PersonID)
In 3NF. There is only one attribute (PersonID) which is the primary key.

WardBoy Table (PersonID)
In 3NF. Similar to the Nurse table, with PersonID as the primary key.

Patient Table (PersonID, Description, Disease, Treatment, DoctorID, Treatment_Cost, Bed_Cost, Total_Cost)
This table Perfrom in 3NF well.

Hospital Table (HID, Hemail, HWeb, HAddress, HPhone, HName)
Appears to be in 3NF. No transitive dependencies.

Room Table (RID, RType, HID)
Appears to be in 3NF. No transitive dependencies.

Works At Table (DoctorID, NurseID, WardBoyID, HID)
Appears to be in 3NF. No transitive dependencies.

Register Table (PatientID, DoctorID, RTime)
Appears to be in 3NF. No transitive dependencies.

Auth. Table (ID, Password)
Appears to be in 3NF. No transitive dependencies.

DATA INSERTION

We will insert doctors, nurses and ward boys into person table.

PersonID	PName	PPhone	PEmail	PDate	PAddress	PGender
1001	Doctor 1	111-222-3333	doctor1@email.com	1980-06-15	123 Main Street	Male
1002	Doctor 2	222-333-4444	doctor2@email.com	1982-08-20	456 Oak Avenue	Female
1003	Doctor 3	333-444-5555	doctor3@email.com	1985-10-25	789 Pine Road	Male
1004	Doctor 4	444-555-6666	doctor4@email.com	1988-12-30	101 Elm Lane	Female
1005	Doctor 5	555-666-7777	doctor5@email.com	1991-03-05	202 Cedar Drive	Male
1006	Doctor 6	666-777-8888	doctor6@email.com	1993-05-10	303 Oak Street	Female
1007	Doctor 7	777-888-9999	doctor7@email.com	1985-07-18	404 Pine Avenue	Male
1008	Doctor 8	888-999-0000	doctor8@email.com	1978-09-23	505 Maple Road	Female
1009	Doctor 9	999-000-1111	doctor9@email.com	1982-03-08	606 Cedar Lane	Male
1010	Doctor 10	111-222-3333	doctor10@email.com	1975-12-15	707 Elm Drive	Female

We have 4 different formulas of primary keys
PERSONID that starts with **1 is** assigned **for doctors**
PERSONID that starts with **2 is** assigned **for patients.**
PERSONID that starts with **3 is** assigned **for nurses**
PERSONID that starts with **4 is** assigned **for ward boys.**

As shown above, We inserted 10 doctors.
In purpose of saving the space and avoid repetition,We will insert 10 patients , nurses and wardboys with the same way.

PersonID	PName	PPhone	PEmail	PDate	PAddress	PGender
2001	Patient 1	777-888-9999	patient1@email.com	1975-04-12	321 Oak Street	Female
2002	Patient 2	888-999-0000	patient2@email.com	1980-11-18	456 Pine Avenue	Male
3001	Nurse 1	333-444-5555	nurse1@email.com	1982-07-25	543 Pine Road	Female
3002	Nurse 2	444-555-6666	nurse2@email.com	1986-12-13	678 Maple Avenue	Male
3003	Nurse 3	555-666-7777	nurse3@email.com	1990-04-30	789 Cedar Drive	Female
3004	Nurse 4	666-777-8888	nurse4@email.com	1995-10-05	876 Oak Lane	Male
4007	Ward Boy 7	666-777-8888	wardboy7@email.com	2002-07-05	707 Elm Drive	Female
4008	Ward Boy 8	777-888-9999	wardboy8@email.com	2007-12-20	808 Oak Street	Male
4009	Ward Boy 9	888-999-0000	wardboy9@email.com	2012-05-05	909 Pine Avenue	Female
4010	Ward Boy 10	999-000-1111	wardboy10@email.com	2017-10-20	1010 Main Road	Male

Now we will insert records in each table individually.

DOCTORS TABLE

INSERT INTO Doctor **(PersonID, Specialization)**VALUES
-- Doctor 1
(1001, 'Cardiologist'),
-- Doctor 2
(1002, 'Dermatologist'),
-- Doctor 3
(1003, 'Orthopedic Surgeon'),
-- Doctor 4
(1004, 'Neurologist')..**etc**

PersonID	Specialization
1001	Cardiologist
1002	Dermatologist
1003	Orthopedic Surgeon
1004	Neurologist

NURSE TABLE

INSERT INTO Nurse (PersonID) VALUES
-- Nurse 1
((SELECT PersonID FROM Person WHERE PersonID = 3001)),
-- Nurse 2
((SELECT PersonID FROM Person WHERE PersonID = 3002)),
-- Nurse 3
((SELECT PersonID FROM Person WHERE PersonID = 3003))

PersonID
3001
3002
3003

Ward Boy

INSERT INTO WardBoy (PersonID) VALUES
-- Ward Boy 1
((SELECT PersonID FROM Person WHERE PersonID = 4001)),
-- Ward Boy 2
((SELECT PersonID FROM Person WHERE PersonID = 4002)),
-- Ward Boy 3
((SELECT PersonID FROM Person WHERE PersonID = 4003))

PersonID
4001
4002
4003

PATIENT

INSERT INTO Patient (PersonID, Description, Disease, Treatment, DoctorID, Treatment_Cost, Bed_Cost)VALUES
-- Patient 1
(2001, 'Patient 1 Description', 'Fever', 'Rest and Medication', (SELECT PersonID FROM Doctor WHERE PersonID = 1001), 150.00, 300.00),
-- Patient 2
(2002, 'Patient 2 Description', 'Fracture', 'Orthopedic Consultation and Cast', (SELECT PersonID FROM Doctor WHERE PersonID = 1002), 200.00, 400.00),
-- Patient 3
(2003, 'Patient 3 Description', 'Migraine', 'Neurological Evaluation and Medication', (SELECT PersonID FROM Doctor WHERE PersonID = 1003), 180.00, 350.00)

PersonID	Description	Disease	Treatment	Doctor ID	Treatment _Cost	Bed_Cost	Total_Cost
2001	Patient 1 Description	Fever	Rest and Medication	1001	150.0	300.0	450.0
2002	Patient 2 Description	Fracture	Orthopedic Consultation and Cast	1002	200.0	400.0	600.0
2003	Patient 3 Description	Migraine	Neurological Evaluation and Medication	1003	180.0	350.0	530.0
2004	Patient 4 Description	Allergy	Dermatological Consultation and Medication	1004	170.0	320.0	490.0

HOSPITAL

INSERT INTO Hospital (HID, Hemail, HWeb, HAddress, HPhone, HName)VALUES
--Hospital1
(1, 'hospital1@email.com', 'www.hospital1.com', '123 Medical Avenue', '111-222-3333', 'General Hospital 1'),
--Hospital2
(2, 'hospital2@email.com', 'www.hospital2.com', '456 Health Street', '222-333-4444', 'Medical Centre 2'),
--Hospital3
(3, 'hospital3@email.com', 'www.hospital3.com', '789 Wellness Road', '333-444-5555', 'Healthcare Hub 3'),
--Hospital4
(4, 'hospital4@email.com', 'www.hospital4.com', '101 Healing Lane', '444-555-6666', 'Wellbeing Clinic 4')

HID	Hemail	HWeb	HAddress	HPhone	HName
1	hospital1@email.com	www.hospital1.com	123 Medical Avenue	111-222-3333	General Hospital 1
2	hospital2@email.com	www.hospital2.com	456 Health Street	222-333-4444	Medical Centre 2
3	hospital3@email.com	www.hospital3.com	789 Wellness Road	333-444-5555	Healthcare Hub 3
4	hospital4@email.com	www.hospital4.com	101 Healing Lane	444-555-6666	Wellbeing Clinic 4

Room

INSERT INTO Room (RID, RType, HID)VALUES
--Room1
(1, 'Standard', 1),
--Room2
(2, 'Deluxe', 2),
--Room3
(3, 'Private', 3),
--Room4
(4, 'Shared', 4)

RID	RType	HID
1	Standard	1
2	Deluxe	2
3	Private	3
4	Shared	4

Works at

INSERT INTO WorksAt (DoctorID, NurseID, WardBoyID, HID)VALUES

((SELECT PersonID FROM Doctor WHERE PersonID = 1001), (SELECT PersonID FROM Nurse WHERE PersonID = 3001), (SELECT PersonID FROM WardBoy WHERE PersonID = 4001), (SELECT HID FROM Hospital WHERE HID = 1)),

((SELECT PersonID FROM Doctor WHERE PersonID = 1002), (SELECT PersonID FROM Nurse WHERE PersonID = 3002), (SELECT PersonID FROM WardBoy WHERE PersonID = 4002), (SELECT HID FROM Hospital WHERE HID = 2)),

((SELECT PersonID FROM Doctor WHERE PersonID = 1003), (SELECT PersonID FROM Nurse WHERE PersonID = 3003), (SELECT PersonID FROM WardBoy WHERE PersonID = 4003), (SELECT HID FROM Hospital WHERE HID = 3)),

((SELECT PersonID FROM Doctor WHERE PersonID = 1004), (SELECT PersonID FROM Nurse WHERE PersonID = 3004), (SELECT PersonID FROM WardBoy WHERE PersonID = 4004), (SELECT HID FROM Hospital WHERE HID = 4))

DoctorID	NurseID	WardBoyID	HID
1001	3001	4001	1
1002	3002	4002	2
1003	3003	4003	3
1004	3004	4004	4

Register :-

INSERT INTO Register (PatientID, DoctorID, RTime)VALUES
((SELECT PersonID FROM Patient WHERE PersonID = 2001), (SELECT PersonID FROM Doctor WHERE PersonID = 1001), '2023-01-01 08:00:00'),
((SELECT PersonID FROM Patient WHERE PersonID = 2002), (SELECT PersonID FROM Doctor WHERE PersonID = 1002), '2023-01-02 09:30:00'),
((SELECT PersonID FROM Patient WHERE PersonID = 2003), (SELECT PersonID FROM Doctor WHERE PersonID = 1003), '2023-01-03 11:15:00'),
((SELECT PersonID FROM Patient WHERE PersonID = 2004), (SELECT PersonID FROM Doctor WHERE PersonID = 1004), '2023-01-04 13:45:00')

PatientID	DoctorID	RTime
2001	1001	2023-01-01 08:00:00
2002	1002	2023-01-02 09:30:00
2003	1003	2023-01-03 11:15:00
2004	1004	2023-01-04 13:45:00

Auth :-

```
INSERT INTO Auth (ID, Password)
VALUES ('Admin', 'Admin');
```

ID	Password
Admin	Admin

Applying Index On table

```
CREATE INDEX Person_Indices ON
Person (PersonID);
```

Reason for putting index on person id, because he works as the kernel of the database.

Queries Time

Non-OPTI

```
SET profiling = 1;
SELECT *
FROM Patient,
Person
WHERE
Patient.PersonID =
Person.PersonID;
SHOW PROFILE;
```

Executing	0.000019

Optimized

```
SET profiling = 1;
SELECT *
FROM Patient
JOIN Person ON
Patient.PersonID =
Person.PersonID;
SHOW PROFILE;
```

Executing	0.000009

Non-OPTI

```
SET profiling = 1;
SELECT PName,
Specialization
FROM Doctor,
Person
WHERE
Doctor.PersonID =
Person.PersonID;
SHOW PROFILE;
```

Executing	0.000011

Optimized

```
SET profiling = 1;
SELECT *
FROM Patient
SET profiling = 1;
SELECT PName,
Specialization
FROM Doctor
JOIN Person ON
Doctor.PersonID =
Person.PersonID;
SHOW PROFILE;
```

Executing	0.000010

Non-OPTI

```
SET profiling = 1;
SELECT HName,
COUNT(Patient.Person
ID) AS
NumberOfPatients
FROM Hospital, Room,
Patient
WHERE Hospital.HID =
Room.HID
AND Room.HID =
Patient.PersonID
GROUP BY HName;
SHOW PROFILE;
```

Executing	0.000009

Optimized

```
SET profiling = 1;
SELECT HName,
COUNT(Patient.PersonID
) AS NumberOfPatients
FROM Hospital
LEFT JOIN Room ON
Hospital.HID = Room.HID
LEFT JOIN Patient ON
Room.HID =
Patient.PersonID
GROUP BY HName;
SHOW PROFILE;
```

Executing	0.000009

Non-OPTI

```
SET PROFILING = 1;
SELECT HNAME,
COUNT(ROOM.RID)
AS NUMBEROFBEDS
FROM HOSPITAL,
ROOM
WHERE
HOSPITAL.HID =
ROOM.HID
GROUP BY HNAME;
SHOW PROFILE;
```

Executing	0.000018

Optimized

```
SET PROFILING = 1;
SELECT HNAME,
COUNT(ROOM.RID)
AS NUMBEROFBEDS
FROM HOSPITAL
LEFT JOIN ROOM ON
HOSPITAL.HID =
ROOM.HID
GROUP BY HNAME;
SHOW PROFILE;
```

Executing	0.000010

WE HAVE APPLIED TRIGGER ON TOTAL COST, WHICH DEALING WITH TREATMENT COST + BED COST BY PERFORMING 2 TYPE OF TRIGGERS

1. BEFORE UPDATE
2. BEFORE INSERT

AFTER THOSE 2 PROCESSES WILL

Trigger	Event	Table	Statement	Timing
update_total_cost_insert_trigger	INSERT	patient	BEGIN SET NEW.Total_Cost = NEW.Bed_Cost + NEW...	BEFORE
update_total_cost_update_trigger	UPDATE	patient	BEGIN SET NEW.Total_Cost = NEW.Bed_Cost + NEW...	BEFORE

View

View for Room

```
CREATE VIEW V1
AS
SELECT HName,
COUNT(Room.RID)
AS NumberOfBeds
FROM Hospital
LEFT JOIN Room
ON Hospital.HID =
Room.HID
GROUP BY HName;
```

shows the count of beds (NumberOfBeds) in each hospital (HName), considering both hospitals with rooms and those without rooms.

For Total Cost

```
CREATE VIEW
TotalCostViewSorted AS
SELECT
PersonID,
SUM(Treatment_Cost) AS
Total_Treatment_Cost,
SUM(Bed_Cost) AS
Total_Bed_Cost,
SUM(Treatment_Cost + Bed_Cost)
AS Total_Cost
FROM
patient
GROUP BY
PersonID
HAVING
Total_Cost > 300
ORDER BY
Total_Cost;
```

This SQL statement creates TotalCostViewSorted, summarizing costs per person from Patient, filtering for totals above 300, and ordering by total cost.

We have connected it with PHP!

Name	ID
Mahmoud Essam Fathy	20221460231
Abduallah hussein	20221427861
Abdelrhman Ashraf	20221374041
Muhammed Hassan	20221444041
Ziad Ashraf	20221369225
Fares Muhammed	20221461330