CS 306 Project
Zospital Istanbul

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The Description of Zospital Istanbul Database Project:

Zospital Istanbul is a healthcare institution in Istanbul, Turkey that believes in the power of technology and wants all complex systems in the hospital to work together in a smooth coordination. It is a full-fledged hospital where international doctors and health workers from various countries of the world, as well as academics from prestigious academic institutions meet, and is one of the world's leading authorities in the field of health. The hospital has 1923 rooms with beds to be used for inpatients. There is a responsible doctor and a responsible nurse specially appointed for each inpatient, and the patient's disease follow-up is constantly recorded in the online environment. Outpatients come by making an online appointment which is an appointment at a certain duration determined by the doctor with the help of artificial intelligence technologies according to the condition of the disease, and the patient, so that no incoming patient waits in line. Zospital Istanbul keeps the details of appointments, bills, medicines and diseases in its database so that makes them easily processable. All these facilitate the execution of hospital management systems in the light of technology.

The Descriptions of Entities and Relationships in the ER Diagram:

Employees: Employees stand for those who work in the hospital as a doctor or a nurse. Therefore, there is an IS-A hierarchy among doctors, nurses and employees. The employee ID is a unique primary key; some details about the employee such as name, e-mail address, home address, phone number, and salary are stored among other attributes of this entity.

Doctors: Doctors are the type of employees who work in Zospital Istanbul. They get appointments from the system which are requested by the patient and given after their approval. Consequently, they have a "Gets" relationship with "Appointments". In addition, doctors are assigned to inpatients to check their status. As a result, they have an "Assigned_D" relationship with "Inpatients" with whom they are responsible, this relationship also stores the duration of the assignment. Lastly, "Doctors" table stores two attributes that are the title and the department of the doctor, different from nurses.

Nurses: Nurses are the type of employees who work in Zospital Istanbul. Due to their work, they are assigned to inpatients to take care of their needs according to the doctor's instructions. Therefore, they have an attribute storing the amount of patients they are responsible for (pCount) which is an attribute different from doctors. Also, they have an "Assigned_N" relationship with the "Inpatients" they are responsible for, this relationship stores the duration of the assignment as well.

Patients: Patients are people who come to Zospital Istanbul for a treatment, they are the main entity of the database with a unique patient id. "Patients" table keeps the general details of the patient such as name, age, height, weight, blood type, phone number and home address. It has an IS-A hierarchy with the "Inpatients" table which is used to store the details for the inpatients, and the "Outpatients" table which contains the operations about outpatients. It also has three relationships: One of them is the "Has" relationship with the "Diseases" table which stores the

duration of the disease and the details of the diseases. Another one is the "Pays" relationship with the "Bills" table which saves the payment type and date in addition to the details of the bill. Lastly, it has a relationship "Takes" with the "Medicine" table which keeps the dose, amount and expiration date of the medicine with the other details of the medicine.

Outpatient: Outpatient is a type of patient who does not stay in a Zospital room. "Outpatients" table has a "Makes" relationship with the "Appointments" table, it stores the appointments made by outpatients under the approval of doctors. In addition to all the attributes that come from the patient, the table has an attribute storing the number of times the patient visits the ZI.

Appointments: It stores patients' appointments and allows doctors to get and approve them. Therefore, it has a "Gets" relationship with the "Doctors" table, and also has a "Makes" relationship with "Outpatients" table. The unique ID of the appointment is stored as a primary key, the table saves the duration, start and end times of the appointments with their dates. Additionally, it has the price of the appointment, and the approval status of the appointment.

Inpatient: Inpatient is a type of patient who stays in a Zospital room. "Inpatients" table has an "Assigned_D" relationship with the "Doctors" table, and an "Assigned_N" relationship with the "Nurses" table; these are responsible employees from inpatients. In addition to all attributes coming from the patient, it also keeps the arrival and leaving dates of the inpatient.

Medicine: It is a table to store all medicines used in the ZI's system so that it consists of all medicines that the doctors can give to the patients. In addition to the unique ID of the medicines, their names and selling prices are stored. "Medicine" table has a relationship with the "Patients" table used to keep specific details for a specific medicine given to a patient, it stores the amount and the dose of the medicine, and also the expiration date of it.

Diseases: It stores the details of the diseases with their unique disease codes. Each disease has attributes to differentiate from one another such as name, risk of disease and the type of disease. Also, it has a "Has" relationship with the "Patients" table storing patients' diseases.

Bills: It stores details of all bills used in the Zospital Istanbul with each bill having a unique ID. The table stores the billing date, and the costs of services such as medicalCost, roomCost and the otherCharges separately. Additionally, it has a "Pays" relationship with the "Patients" table where the information about the payment type and date are stored.

Rooms: In the Zospital Istanbul, there are 1923 rooms with beds; but when all types of rooms are added together, the total number of rooms becomes 2663. "Rooms" entity stores all of these rooms' details, such as their block, floor and room numbers. It also stores the type of the room, availability of the room, and the cost of the room (if applicable). Additionally, it has a "Stays_in" relationship with the "Inpatients" table which is used to match the rooms with the inpatients to easily follow them.

The Main MySQL Codes of Zospital Istanbul Database Project:

Employees, Doctors, Nurses / IS-A Relationship

Employees

```
CREATE TABLE Employees
(
    eID INTEGER AUTO_INCREMENT NOT NULL,
    eName CHAR(25) NOT NULL,
    ePhoneNo CHAR(12),
    eMail CHAR(30),
    eAddress CHAR(80),
    salary INTEGER,
    PRIMARY KEY(eID)
);
```

Doctors

```
CREATE TABLE Doctors
(
    dID INTEGER NOT NULL,
    title CHAR(40),
    department CHAR(70),
    PRIMARY KEY(dID),
    FOREIGN KEY(dID) REFERENCES Employees(eID)
        ON DELETE CASCADE
        ON UPDATE CASCADE
);
```

Nurses

```
CREATE TABLE Nurses
(
    nID INTEGER NOT NULL,
    pCount INTEGER,
    PRIMARY KEY(nID),
    FOREIGN KEY(nID) REFERENCES Employees(eID)
        ON DELETE CASCADE
        ON UPDATE CASCADE
);
```

- **Relationship:** Doctors - Gets - Appointments

```
CREATE TABLE Gets(
   dID INTEGER,
   aID INTEGER,
   PRIMARY KEY(aID),
   FOREIGN KEY(dID) REFERENCES Doctors(dID),
   FOREIGN KEY(aID) REFERENCES Appointments(aID)
);
```

- **Relationship:** Doctors - Assigned_D - Inpatients

```
CREATE TABLE Assigned_D(
   dID INTEGER,
   iID INTEGER,
   dSince DATE,
   PRIMARY KEY(dID, iID),
   FOREIGN KEY(dID) REFERENCES Doctors(dID),
   FOREIGN KEY(iID) REFERENCES Inpatients(iID)
);
```

- **Relationship:** Nurses - Assigned_N - Inpatients

```
CREATE TABLE Assigned_N(
   nID INTEGER,
   iID INTEGER,
   nSince DATE,
   PRIMARY KEY(nID, iID),
   FOREIGN KEY(nID) REFERENCES Nurses(nID),
   FOREIGN KEY(iID) REFERENCES Inpatients(iID)
);
```

Patients, Inpatients, Outpatients / IS-A Relationship

Patients

```
CREATE TABLE Patients
(
    pID INTEGER AUTO_INCREMENT NOT NULL,
    pName CHAR(25) NOT NULL,
    bloodType CHAR(4),
    age INTEGER,
    weight DECIMAL(4,1),
    height INTEGER,
    pPhoneNo CHAR(12),
    pMail CHAR(30),
    pAddress CHAR(80),
    PRIMARY KEY(pID)
);
```

Inpatients

```
CREATE TABLE Inpatients
(
    iID INTEGER NOT NULL,
    arrivalDate DATE,
    leavingDate DATE,
    PRIMARY KEY(iID),
    FOREIGN KEY(iID) REFERENCES Patients(pID)
        ON DELETE CASCADE
        ON UPDATE CASCADE
);
```

Outpatients

```
CREATE TABLE Outpatients
(
    oID INTEGER NOT NULL,
    aCount INTEGER,
    PRIMARY KEY(oID),
    FOREIGN KEY(oID) REFERENCES Patients(pID)
        ON DELETE CASCADE
        ON UPDATE CASCADE
);
```

- **Relationship:** Patients - Takes - Medicine

```
CREATE TABLE Takes(
    pID INTEGER,
    mID INTEGER,
    dose CHAR(30),
    quantity INTEGER,
    expirationDate DATE,
    PRIMARY KEY(pID, mID),
    FOREIGN KEY(pID) REFERENCES Patients(pID),
    FOREIGN KEY(mID) REFERENCES Medicine(mID)
);
```

- **Relationship:** Patients - Pays - Bills

```
CREATE TABLE Pays(
    pID INTEGER,
    bID INTEGER,
    pDate DATE,
    paymentType CHAR(15),
    PRIMARY KEY(bID),
    FOREIGN KEY(pID) REFERENCES Patients(pID),
    FOREIGN KEY(bID) REFERENCES Bills(bID)
);
```

- **Relationship:** Patients - Has - Diseases

```
CREATE TABLE Has(
    pID INTEGER,
    dCode INTEGER,
    dSince DATE,
    PRIMARY KEY(pID, sID),
    FOREIGN KEY(pID) REFERENCES Patients(pID),
    FOREIGN KEY(dCode) REFERENCES Diseases(dCode)
);
```

- **Relationship:** Outpatients - Makes - Appointments

```sql
CREATE TABLE Makes(
    oID INTEGER,
    aID INTEGER,
    rMomentT TIME,
    rMomentD DATE,
    PRIMARY KEY(aID),
    FOREIGN KEY(oID) REFERENCES Outpatients(oID),
    FOREIGN KEY(aID) REFERENCES Appointments(aID)
);
```

- **Relationship:** Inpatients - Stays_in - Rooms

```sql
CREATE TABLE Stays_in(
    iID INTEGER,
    rID INTEGER,
    sSince DATE,
    PRIMARY KEY(iID),
    FOREIGN KEY(iID) REFERENCES Inpatients(iID),
    FOREIGN KEY(rID) REFERENCES Rooms(rID)
);
```

Appointments

```
CREATE TABLE Appointments
(
    aID INTEGER AUTO_INCREMENT NOT NULL,
    aDate DATE,
    price INTEGER,
    startTime TIME,
    endTime TIME,
    duration INTEGER,
    aApproval BOOLEAN,
    PRIMARY KEY(aID)
);
```

Rooms

```
CREATE TABLE Rooms
(
    rID INTEGER AUTO_INCREMENT NOT NULL,
    rBlock CHAR(4),
    rFloor INTEGER,
    rCode INTEGER,
    rCost INTEGER,
    rType CHAR(12),
    availability BOOLEAN,
    PRIMARY KEY(rID)
);
```

Medicine

```
CREATE TABLE Medicine
(
    mID INTEGER AUTO_INCREMENT NOT NULL,
    mName CHAR(20) NOT NULL,
    mCost INTEGER,
    PRIMARY KEY(mID)
);
```

Diseases

```
CREATE TABLE Diseases
(
    dCode INTEGER AUTO_INCREMENT NOT NULL,
    dName CHAR(25) NOT NULL,
    risk CHAR(1),
    dType CHAR(20),
    PRIMARY KEY(dCode)
);
```

Bills

```
CREATE TABLE Bills
(
    bID INTEGER AUTO_INCREMENT NOT NULL,
    bDate DATE,
    medicalCost INTEGER,
    roomCost INTEGER,
    otherCharges INTEGER,
    bStatus BOOLEAN,
    PRIMARY KEY(bID)
);
```

The ER Diagram of Zospital Istanbul Database Project: