**Entity Relationship Diagram and Planning**

Entities:

1. Hospital
2. Doctor
3. Patient
4. Medication
5. Prescription
6. Disease
7. Appointment
8. LabResult

Relationships:

* Hospital ↔ Doctor: One-to-many (Each hospital can have many doctors)
* Doctor ↔ Patient: One-to-many (Each doctor can have many patients; each patient has one doctor).
* Patient ↔ Prescription: One-to-many (A patient can have many prescriptions)
* Doctor ↔ Prescription: One-to-many (A doctor can prescribe many prescriptions)
* Medication ↔ Prescription: One-to-many (A medication can be prescribed to many patients)
* Disease ↔ Medication: Many-to-many (A disease can be treated with many medications, and a medication can treat many diseases)
* Disease ↔ Doctor: Many-to-many (A doctor can specialize in multiple diseases, and a disease can be treated by many doctors)
* Patient ↔ Appointment: One-to-many (A patient can have many appointments)
* Doctor ↔ Appointment: One-to-many (A doctor can have many appointments)
* Patient ↔ LabResult: One-to-many (A patient can have many lab results)
* Doctor ↔ LabResult: One-to-many (A doctor orders many lab tests)



**Figure 1:** **Entity relationship diagram to show the relationship between the different tables.** The diagram shows the cardinality of the relationships between the tables as either one to many or many to many (Lucidchart,2024).

**Pseudocode for MS Access Queries**

**• Add a new customer to the database, including being registered with one of the doctors.**

BEGIN

INPUT patient\_name, patient\_address, patient\_dob, doctor\_id

# Add the new customer

INSERT INTO Patient (Name, Address, DateOfBirth)

VALUES (PatientName, PatientAddress, PatientDateOfBirth)

# Get the new patient ID (assuming the system assigns an ID automatically)

SET PatientID = (SELECT MAX(PatientID) FROM Patient)

# Register the patient with the doctor

INSERT INTO Doctor (PatientID, DoctorID)

VALUES (PatientID, DoctorID)

END

**• Modify address details of an existing customer.**

BEGIN

INPUT PatientID, NewAddress

# Update the patient's address

UPDATE Patient

SET Address = NewAddress

WHERE PatientID = PatientID

END

• **Print a list of all patient names and addresses for patients registered to doctors**

**based at one particular hospital - that could be used for posting information mail to**

**all of one hospital’s registered patients.**

BEGIN

INPUT HospitalID

# Retrieve all patients registered with doctors at the given hospital

SELECT Patient.Name, Patient.Address

FROM Patient

INNER JOIN Doctor ON Patient.DoctorID = Doctor.DoctorID

WHERE Doctor.HospitalID = hospital\_id

END

**• Print a list of all doctors based at Teaching hospitals which were accredited between 2015-2024.**

BEGIN

# Retrieve all doctors working at Teaching Hospitals accredited between 2015 and 2024

SELECT Doctor.Name, Doctor.Specialization

FROM Doctor

INNER JOIN Hospital ON Doctor.HospitalID = Hospital.HospitalID

WHERE Hospital.Type = 'Teaching'

AND YEAR(Hospital.AccreditationYear) BETWEEN 2015 AND 2024

END

**• List all patients who may have a particular disease based on which medication they have been prescribed.**

BEGIN

INPUT disease\_name

# Retrieve the medications associated with the disease

SELECT MedicationID

FROM DiseaseMedication

WHERE DiseaseName = disease\_name

# Retrieve patients who have been prescribed the medications

SELECT Patient.Name, Patient.Address

FROM Patient

INNER JOIN Prescription ON Patient.PatientID = Prescription.PatientID

WHERE Prescription.Medication IN (medicationID)

OUTPUT patient\_list

END

**• List all doctors based at who specialize in a particular disease.**

BEGIN

INPUT DiseaseName

# List all doctors specializing in the given disease

SELECT DISTINCT Doctor.Name

FROM Doctor

INNER JOIN DiseaseDoctor ON Doctor.DoctorID = DiseaseDoctor.DoctorID

INNER JOIN Disease ON DiseaseDoctor.DiseaseID = Disease.DiseaseID

WHERE Disease.Name = disease\_name

END

**• List all lab results for all patients over the age of 60.**

BEGIN

# List all lab results for patients over the age of 60

SELECT LabResult.TestType, LabResult.Result, Patient.Name

FROM LabResult

INNER JOIN Patient ON LabResult.PatientID = Patient.PatientID

WHERE DATEDIFF(YEAR, Patient.DateOfBirth, CURRENT\_DATE) > 60

END

• **Print a list of all appointments for a given patient.**

BEGIN

INPUT PatientID

# Retrieve all appointments for the given patient

SELECT Appointment.Date, Appointment.Time, Doctor.Name

FROM Appointment

INNER JOIN Doctor ON Appointment.DoctorID = Doctor.DoctorID

WHERE Appointment.PatientID = PatientID

END

**• Print a list of all appointments for a given doctor.**

BEGIN

INPUT DoctorID

# Retrieve all appointments for the given doctor

SELECT Appointment.Date, Appointment.Time, Patient.Name

FROM Appointment

INNER JOIN Patient ON Appointment.PatientID = Patient.PatientID

WHERE Appointment.DoctorID = DoctorID

END

**• Print all prescriptions made from a particular hospital ordered alphabetically by the name of the medication being prescribed - The output of this SQL query should**

**include only these 4 columns: the medication name, the name of doctor who**

**prescribed it, the name of the patient, and the name of hospital.**

BEGIN

INPUT HospitalID

# Retrieve prescriptions ordered by the name of the medication

SELECT Medication.Name, Doctor.Name, Patient.Name, Hospital.Name

FROM Prescription

INNER JOIN Doctor ON Prescription.DoctorID = Doctor.DoctorID

INNER JOIN Patient ON Prescription.PatientID = Patient.PatientID

INNER JOIN Hospital ON Doctor.HospitalID = Hospital.HospitalID

INNER JOIN Medication ON Prescription.MedicationID = Medication.MedicationID

WHERE Hospital.HospitalID = HospitalID

ORDER BY Medication.Name ASC

END

**• Print a list of all lab results from all hospitals that were accredited between 2013-**

**2020.**

BEGIN

# Retrieve all lab results from hospitals accredited between 2013 and 2020

SELECT LabResult.TestType, LabResult.Result, Patient.Name, Hospital.Name

FROM LabResult

INNER JOIN Patient ON LabResult.PatientID = Patient.PatientID

INNER JOIN Doctor ON Patient.DoctorID = Doctor.DoctorID

INNER JOIN Hospital ON Doctor.HospitalID = Hospital.HospitalID

WHERE YEAR(Hospital.AccreditationDate) BETWEEN 2013 AND 2020

END

**• Identify which doctor has made the most prescriptions.**

BEGIN

# Find the doctor who made the most prescriptions

SELECT Doctor.Name, COUNT(Prescription.PrescriptionID) AS PrescriptionCount

FROM Prescription

INNER JOIN Doctor ON Prescription.DoctorID = Doctor.DoctorID

GROUP BY Doctor.Name

ORDER BY PrescriptionCount DESC

LIMIT 1

END

**• Print a list of all doctors at the hospital with biggest size (number of beds).**

BEGIN

# Find the hospital with the biggest number of beds

SELECT MAX(Hospital.Size) AS MaxSize

FROM Hospital

#Retrieve all doctors at the hospital with the biggest size

SELECT Doctor.Name

FROM Doctor

INNER JOIN Hospital ON Doctor.HospitalID = Hospital.HospitalID

WHERE Hospital.Size = MaxSize

END

• **A list of all hospital names which were accredited prior to 2015 and do have**

**Emergency Service facilities.**

BEGIN

# Retrieve all hospitals accredited prior to 2015 with Emergency Service facilities

SELECT Hospital.Name

FROM Hospital

WHERE Hospital.AccreditationStatus = 'Accredited'

AND YEAR(Hospital.AccreditationDate) < 2015

AND Hospital.Type = EmergencyService

END

• **A list of patients registered with doctors who are based at hospital with <400 beds**

BEGIN

# Retrieve all patients with doctors based at hospitals with fewer than 400 beds

SELECT Patient.Name, Patient.Address

FROM Patient

INNER JOIN Doctor ON Patient.DoctorID = Doctor.DoctorID

INNER JOIN Hospital ON Doctor.HospitalID = Hospital.HospitalID

WHERE Hospital.Size < 400

END