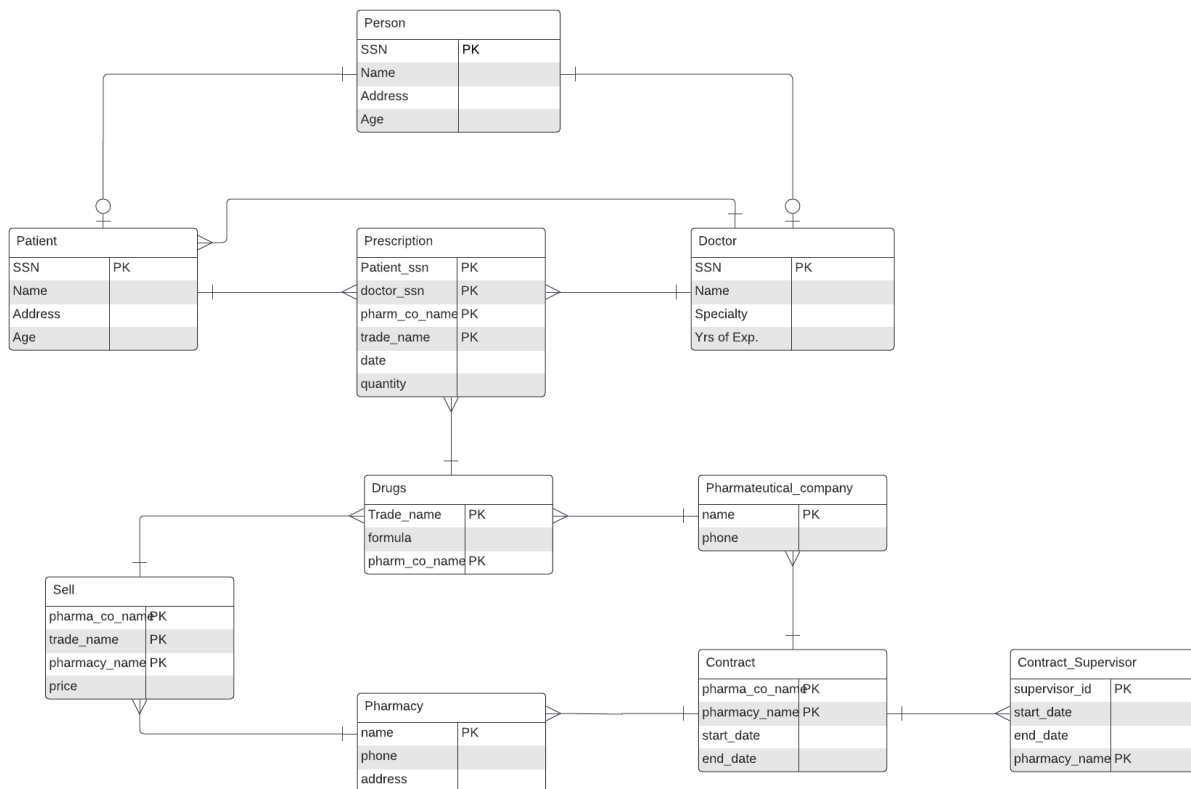


# COMP-SCI 470: Introduction to Database Management Systems

Winter 2023

Pharmacy:  
Logical Design

## 1. Refinement of the conceptual model - including a refined Enhanced Entity-Relationship (EER) diagram.



## 2. Derivation of relations from the refined conceptual model.

- Person(SSN PRIMARY KEY, Name, Address, Age)
- Patient(SSN PRIMARY KEY, PRIMARY PHYSICIAN FOREIGN KEY (Doctor\_SSN) REFERENCES Doctor(SSN))
- Doctor(SSN PRIMARY KEY, Speciality, Years\_of\_Experience)

- Drug(TradeName PRIMARY KEY, Formula, Pharma\_co\_Name FOREIGN KEY REFERENCES pharmacuetical\_company(pharmacuetical\_co\_name))
- Prescription(Patient\_SSN FOREIGN KEY REFERENCES Patient(SSN), Doctor\_SSN FOREIGN KEY REFERENCES Doctor(SSN), trade\_name FOREIGN KEY REFERENCES Drug(trade\_name), Date, Quantity)
- Pharmaceutical\_company(Name PRIMARY KEY, Phone)
- Pharmacy(Name PRIMARY KEY, Address, Phone)
- Contract(pharma\_co\_name FOREIGN KEY REFERENCES pharmacuetical\_company(pharma\_co\_name), pharmacy\_name FOREIGN KEY REFERENCES Pharmacy(pharmacy\_name), start\_date, end\_date)
- Contract\_supervisor(supervisor\_id PRIMARY KEY, start\_date, end\_date, pharmacy\_name FOREIGN KEY REFERENCES Pharmacy(pharmacy\_name))

### 3. Validation of logical model using normalization to BCNF.

- Person
  - Doctor and Patient derive from Person superclass, making it 2NF with no partial dependencies
- Drug: Drug is a 2NF since it has a single primary key (TradeName).
- Pharmaceutical\_company: Pharmaceutical is in 2NF since it has a single primary key (pharma\_co\_name).
- Pharmacy: Pharmacy is in 2NF since it has a single primary key (pharmacy\_name)

### 4. Validation of logical model against corresponding user transactions.

#### Prescribing a Drug:

User Transaction: A doctor prescribes a drug to a patient.

- Validation: This transaction involves creating a record in the Prescription table, linking the doctor, patient, and drug through foreign keys. Prescription table has valid references to Doctor, Patient, and Drug.
- Updating Patient Information:
  - User Transaction: Updating the SSN of a patient.

- Validation: This transaction involves modifying the Address attribute in the Person table where the SSN matches the patient. The logical model should allow updates to the Person table.
- Querying for Contract Information:
  - User Transaction: Agreements regarding contracts between pharmaceutical companies and pharmacies.
  - Validation: This transaction involves querying the Contract table and joining it with the pharmaceutical companies and Pharmacies based on foreign keys.
- Adding a New Pharmaceutical Company:
  - User Transaction: Adding a new pharmaceutical company to the system.
  - Validation: This transaction involves inserting a new record into the Company table, along with drugs sold in the company
- Querying for Patients and Their Prescriptions:
  - User Transaction: Retrieving a list of patients and their prescriptions.
  - Validation: This transaction involves querying the Person and Prescription tables, joining them based on foreign keys. The logical model should support such queries.
- Ending a Contract and Assigning a New Supervisor:
  - User Transaction: Ending a pharmaceutical company contract with a pharmacy and assigning a new supervisor.
  - Validation: This transaction involves updating the Contract table to change the EndDate, updating the Contract\_Supervisor table to reflect the new supervisor and start date. The logical model should support these updates.

## 5. Definition of integrity constraints including:

### Primary Key Constraints:

Person, Patient, Doctor: SSN

Drugs: Trade\_name

pharmaceutical company: pharma\_co\_name

pharmacy: pharmacy\_name

contract\_supervisor: supervisor\_id

### Referential Integrity (foreign key) constraints

Prescription: SSN(Patient),SSN(Doctor), pharma\_co\_name,  
trade\_name

Drugs: pharma\_co\_name

Sells: pharma\_co\_name, pharma\_name, trade\_name

Contract: pharma\_co\_name, pharmacy\_name

### Entity integrity (NULL and default value) constraints.

1. The SSN column in the Person table may have a NOT NULL constraint, ensuring all people have a Social Security Number and correlate to Patient and Doctor

2. The StartDate column in the Contract table may have a default value of the contract start date if not explicitly provided.

### Alternate key constraints.

3. The Age column in the Patient table cannot be NULL, to ensure patient records include their accurate date of birth.

4. The Years\_of\_Experience column in the Doctor table has a default value of 0, if the number of years of experience is not provided, it is assumed to be 0.

5. The Formula column in the Drug table allows NULL values, Not all drugs may have a well-defined chemical formula.

6. The Phone column in the pharmaceutical company table allows NULL values, Some pharmaceutical companies may not have a listed phone number.

7. The Quantity column in the Prescription table has a default value of 1, If the quantity is not explicitly provided in the prescription, it is assumed to be 1.

### Alternate Key Constraints:

1. The Name column in the Pharmaceutical company table could be an alternate key, providing an alternative means of identifying companies.

2. The Formula and Pharmaceutical Company in the Drug table can be alternate keys because different drugs may have the same formula, but when combined with the pharmaceutical company, it becomes unique.

3. The combination of Start\_date, end\_date, pharma\_co\_name, and pharmacy\_name in the contract table because it might have the same start and end dates, but when combined with the company and pharmacy, it becomes unique.