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| EE-436L Database Engineering |
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| Project Report |

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# Introduction

Pharmacies are essential component of healthcare in the Pakistan and handle the function of selling medical drugs. Even though the pharmacies do not seem different than any other shop, their functioning is very different due to various laws regarding drugs.

For example, most of the drugs available in a pharmacy cannot be purchased without a prescription. Even with a signed prescription, there is a limit on the quantity that can be purchased. Additionally, pharmacist can do a background check on customer’s medical history to ensure that they are not involved in drug abuse.

In addition, there are other laws on the operations of pharmacy like requirement for safe disposal of expired medicine and requirement of license for employees that mix/prepare the drugs.

Thus, preparing a Database Management System for a pharmacy not only requires study of how things are handled from a customer or employee point of view but also the relevant laws. With this project, our aim was to develop a comprehensive system that could deal with challenges faced in day to day operation of a modern pharmacy. We studied the relevant laws and prepared a system that complies with the required Federal and State laws.

# Requirements

During research phase, we arrived at following requirements based on the pharmacy flow:

## Customer

When a customer arrives in the pharmacy, we identify them based on their SSN. If they are a new customer, they are asked for their name, date of birth, phone number, gender and address.

## Insurance

20-25% of Pakistan population has health insurance coverage. If a customer has health insurance, we store the insurance ID (unique for each customer), company name, start date, end date and Co-Insurance. Co-Insurance is a percentage amount that insurance company pays for a medicinal purchase (Managing your healthcare costs, n.d.). Given the customer SSN and insurance ID, the system should be able to automatically calculate the amount paid by insurance company and customer.

## Employee

An employee has same details as a customer but they are also given a company ID, that is unique for them. An employee has to have one of the following roles:

1. Pharmacist
2. CPhT (Certified Pharmacy Technician)
3. Intern (can work in the pharmacy part time)
4. Cashier

Apart from cashier, all other roles require a license from Pakistan Medical Commission as they directly deal with mixing and preparation of drugs.

## Prescription

Most of the drugs in the pharmacy can only be sold with a prescription. A prescription contains customer’s SSN, the prescribing Doctor’s ID (required by law) and when the prescription was prescribed.

Each prescription contains a number of prescribed drugs with drug name, quantity and refill limit of each of them. By law, a pharmacy cannot sell more than prescribed quantity or anything that is not listed on prescription.

## Order

An order is created from the prescription. This data has to be stored separately because customer may:

1. Buy less medicine than prescription specifies
2. Come back for refills based on same prescription

Each order has a unique Order ID that is automatically assigned by the system. Each order can have multiple drugs, each with their ordered quantity and price. We also record batch number of the drug. This data can be requested by the government and has to be stored.

## Bill

Once an order has been completed, a bill is generated by the system. This bill is handed over to the customer and contains order information, insurance information as well as breakdown of amount paid.

The breakdown should be automatically calculated by the system based on insurance, customer and medicine data.

## Medicine(Inventory)

Drugs are divided into “over the counter”, “restricted” and “prescription only”. Federal Law only divides restricted drugs into 5 schedules and require “readily accessible” inventory for schedule 2 drugs.

While not needed by law everywhere, it is beneficial to store an up to date inventory for record keeping as well knowing when we run out of stock.

## Notifications

The system should be able to generate notifications based on the following four events:

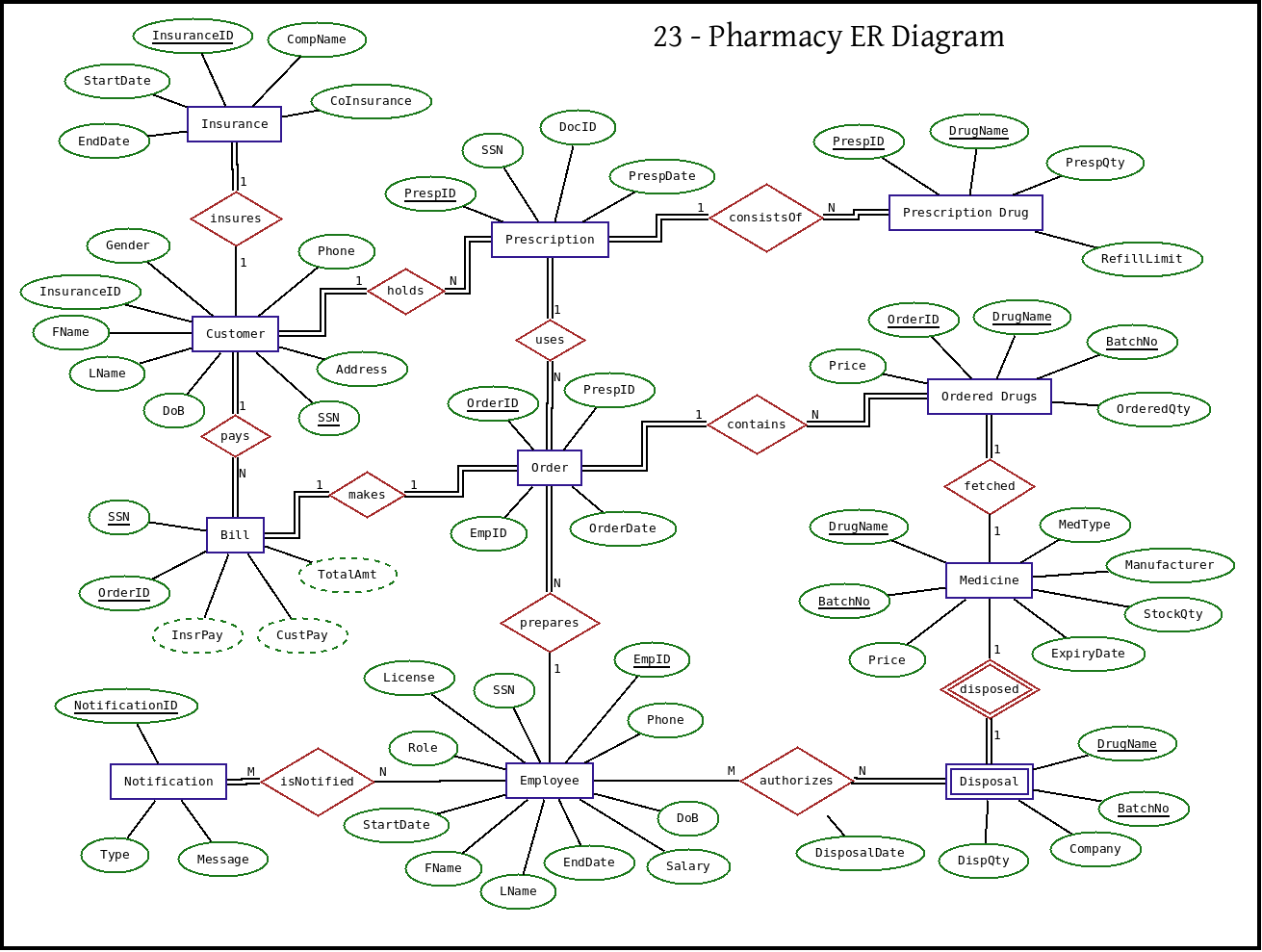
1. Stock for a medicine is low (less than 100 tablets)
2. Some medicine will expire in next 60 days
3. Drugs are marked for disposal
4. Drugs are successfully disposed

The notifications are sent to all the employees who are Pharmacists.

# ER Modeling

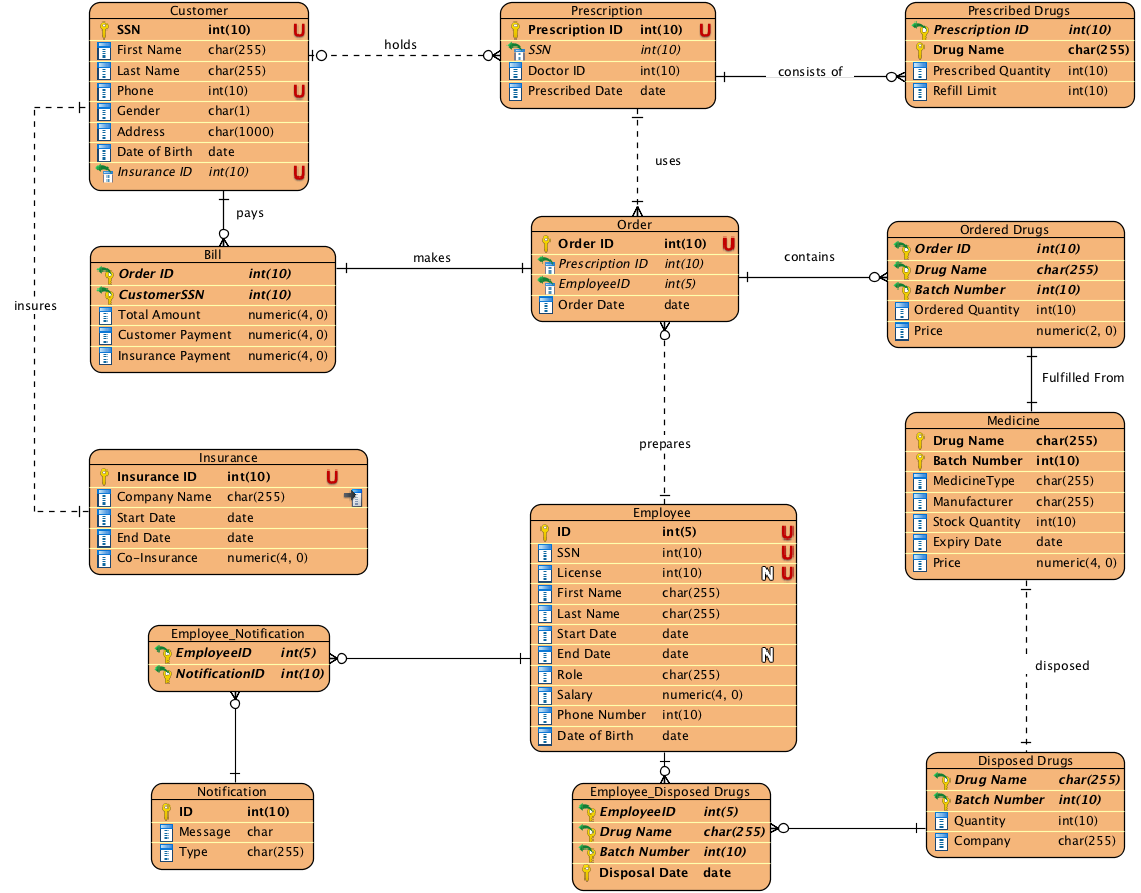
The final ER diagram and UML diagram are shown below with explanations.

## ER Diagram





## Relational Schema



1. A single customer can have multiple prescriptions. Thus, the relation between them is one to many.
2. A prescription consists of multiple drugs, so the relation is one to many. In case of refills, a prescription can generate multiple orders. So, this relation is one to many as well.
3. A single order can contain multiple drugs, thus relationship is one to many. One order, however, can generate only one bill. Thus, the relation between bill and order is one to one.
4. A customer can make multiple purchases and hence, the relation between customer and bill is one to many. This is due to the fact that every bill has only one customer.
5. In medicine table (stock), drug name and batch number can uniquely identify every drug we have in inventory. Batch number is assumed to be unique among manufacturers.
6. Disposed drugs are weak entity and use foreign key Drug Name and Batch Number as their primary key.
7. One employee can receive multiple notifications and one notification can be sent to multiple employees, thus relationship is many to many.
8. Multiple employees can dispose same drug. Similarly, one employee can dispose multiple drugs. Hence, relationship is many to many.
9. One employee can prepare multiple orders. However, a specific order can only be prepared by one employee. Thus, relationship is one to many.