



A Simple Database for the Pharmaceutical Industry

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Catalogue

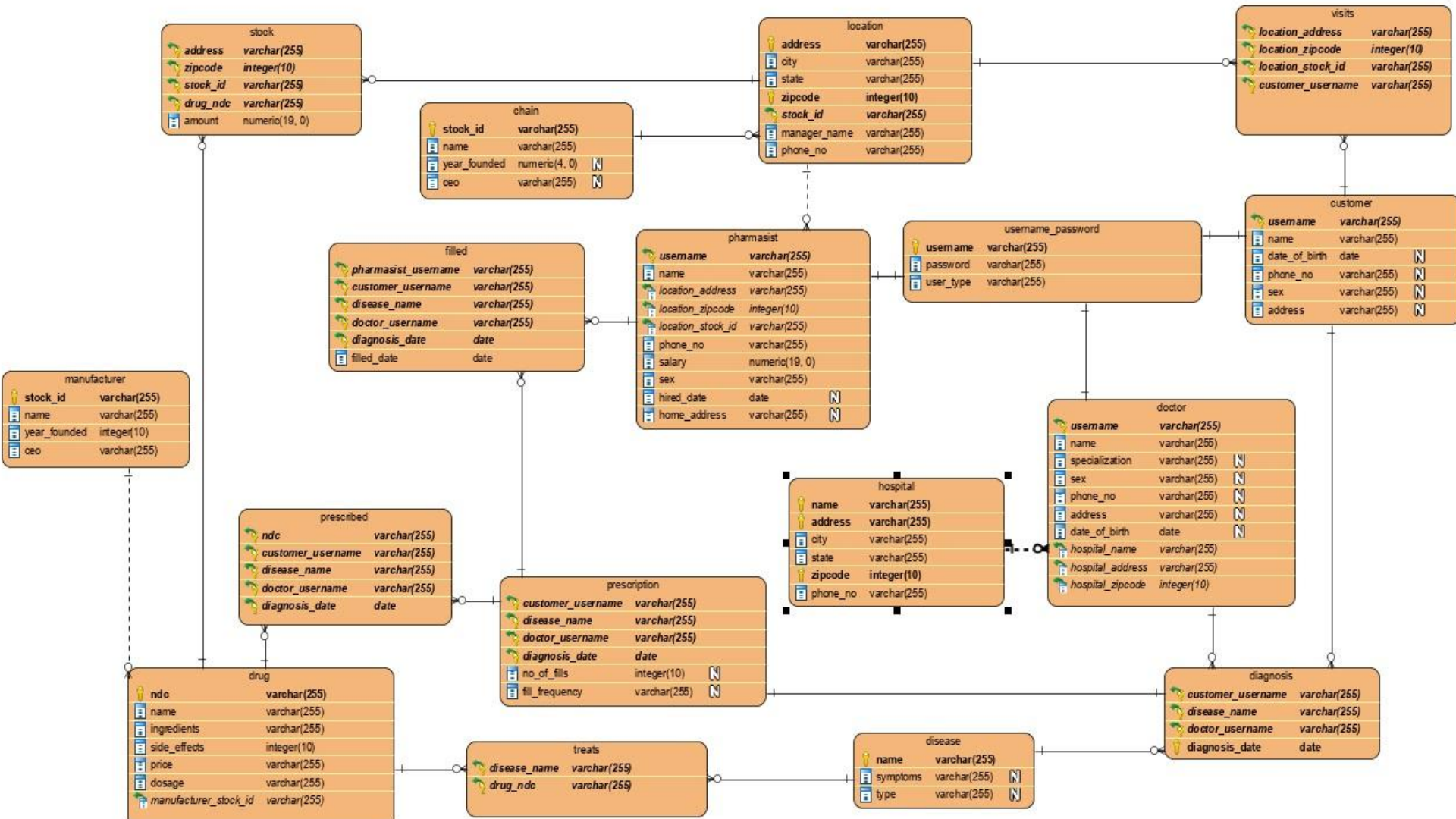
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Overview

- Healthcare is a complicated Industry with a lot of information to keep track of.
- Our database integrates information about pharmacies, drugs, doctors, hospitals, customers and their own medical histories.
- Our database could track of the various aspects of prescriptions, and possibly help prevent the abuse of prescription painkillers.
- Customers could have a clear and organized database to search for medication they may need, and also make sure they know the risks associated with it.

Functional Requirements

- Pharmacists
 - Keep track of the time when prescriptions are filled and when they need to be filled.
 - Search for the amount of a drug in stock.
 - Make a list of customers that are taking a certain drug.
- Customers
 - Search for their own medical history.
 - Find doctors, or pharmacies close to them.
 - Find drugs required by prescriptions, and where to purchase.
- Doctors
 - Search for the medical history of their patients.
 - Search for pharmacies that sell certain drugs to let their patients know where to go.
 - Search for the information of a certain drug.



Schema and 4NF Analysis

username_password: (username, password, user_type)

chain: (stock_id, name, year_founded, ceo)

location: (address, city, state, zipcode, stock_id, manager_name, phone_no)

pharmacist: (username, name, location_address, location_zipcode, location_stock_id, phone_no, salary, sex, hired_date, home_address)

hospital: (name, address, city, state, zipcode, phone_no)

doctor: (username, name, specialization, sex, phone_no, address, dob, hospital_name, hospital_address, hospital_zipcode)

customer: (username, name, dob, phone_no, sex, address)

visits: (location_address, location_zipcode, location_stock_id, customer_username)

manufacturer: (stock_id, name, year_founded, ceo)

drug: (ndc, name, ingredients, side_effects, price, dosage, manufacturer_stock_id)

disease: (name, symptoms, disease_type)

treats: (disease_name, drug_ndc)

diagnosis: (customer_username, doctor_username, disease_name, diagnosis_date)

prescription: (customer_username, doctor_username, disease_name, diagnosis_date, no_of_fills, fill_frequency)

prescribed: (ndc, customer_username, doctor_username, disease_name, diagnosis_date)

filled: (pharmacist_username, customer_username, doctor_username, disease_name, diagnosis_date, filled_date)

stock: (address, zipcode, stock_id, drug_ndc, amount)

Sample Queries for a Pharmacist

Find the names and usernames of all customers that are taking 'Humira':

WITH

```
r1 as (  
    SELECT *  
    FROM customer,prescribed  
    WHERE customer.username =  
           prescribed.customer_username)
```

```
SELECT r1.name, customer_username  
FROM r1 JOIN drug USING(ndc)  
WHERE drug.name = 'Humira';
```

name	customer_username
Rhia Dillon	Dillon79
Alec Perkins	Perkins98
(2 rows)	

Find all the drugs and their amounts that are in stock at the location where Leopold Cortez works:

WITH

```
r1 as (  
    SELECT *  
    FROM stock,drug  
    WHERE stock.drug_ndc = drug.ndc)
```

```
SELECT r1.name, r1.ndc, r1.amount  
FROM r1,pharmacist
```

```
WHERE pharmacist.name = 'Leopold Cortez' AND pharmacist.location_address = r1.address;
```

name	ndc	amount
Venclexta	00074-0561	10
Amoxil	50090-0308	100
Adenocard	76126-0104	0
Imbruvica	57962-0140	33
efavirenz	65862-0104	0
ATRIPLA	53808-0208	0
(6 rows)		

Sample Queries for a Customer

Show a list of stores that carry drug Amoxil in Canton:

```
SELECT
    stock_id, address
FROM
    stock JOIN drug ON drug_ndc = ndc
NATURAL JOIN
    location
WHERE
    amount > 0 and name = 'Amoxil' and city = 'Canton';
```

stock_id	address
WBA	97 E Main St
(1 row)	

Show a list of drugs and their dosage that user Sharpe17 need to take for his/her prescription on 2019. 7.26, with doctor Alison Hartley:

```
SELECT
    drug.name, dosage
FROM
    prescribed NATURAL JOIN drug JOIN doctor ON doctor_username = username
WHERE
    customer_username = 'Sharpe17' AND diagnosis_date = '2019-07-26' AND doctor.name = 'Alison Hartley';
```

name	dosage
Adenocard	12 mg adenosine injection
(1 row)	

Sample Queries for a Doctor

Doctors can look up a drug and let his patients know where they can buy it:

WITH

```
r1 as(  
    SELECT drug_ndc  
    FROM treats  
    WHERE drug_ndc='50090-0308'  
),  
r2 as(  
    SELECT *  
    FROM r1 NATURAL JOIN stock  
    WHERE r1.drug_ndc = stock.drug_ndc)
```

SELECT DISTINCT *

FROM r2;

drug_ndc	address	zipcode	stock_id	amount
50090-0308	195 Dorset St	5403	VSI	50
50090-0308	97 E Main St	13617	WBA	100

(2 rows)

Show all drugs that treat HIV:

```
SELECT name, disease_name  
FROM drug JOIN treats on  
ndc = drug_ndc WHERE disease_name = 'HIV';
```

name	disease_name
ATRIPLA	HIV
efavirenz	HIV

(2 rows)

Database in JSON

```
{
  "chain": [{
    "stock_id": "CVS",
    "name": "CVS Health",
    "year_founded": 1963,
    "ceo": "Larry J. Merlo"
  }],

  "location": [{ "address": "39 Meadow St",
    "city": "Clinton",
    "state": "NY",
    "zipcode": 13323,
    "stock_id": "CVS",
    "manager_name": "Javier Cummings",
    "phone_no": "(315) 853-5528"
  }],

  "prescription": [{
    "customer_username": "Sparrow78",
    "doctor_username": "mantle cell lymphoma",
    "disease_name": "Blevins66",
    "diagnosis_date": "2019-02-04",
    "no_of_fills": 5,
    "fill_frequency": "weekly"
  }],

  "drug": [{
    "ndc": "00074-3799",
    "name": "Humira",
    "ingredients": "Adalimumab",
    "side_effects": "infections",
    "price": "2250/ 10mg",
    "dosage": "40 mg every other week",
    "manufacturer_stock_id": "ABBV"
  }],

  "doctor": [{
    "username": "Blevins66",
    "name": "Micah Blevins",
    "specialization": "Immunology",
    "sex": "F",
    "phone_no": null,
    "address": "264 W. Beach Rd, Woodside, NY, 11377",
    "date_of_birth": "1966-08-22",
    "hospital_name": "Canton-Potsdam Hospital",
    "hospital_address": "50 Leroy St",
    "hospital_zipcode": 13676
  }],

  "stock": [{
    "address": "39 Meadow St",
    "zipcode": 13323,
    "stock_id": "CVS",
    "drug_ndc": "76126-0104",
    "amount": 5
  }],
  .....}
}
```

Conclusion

What we Learned:

- Pharmaceutical Drugs are uniquely identified by NDC (National Drug Code)
- ER Diagrams are important!
- We should first understand relationship and connectivity between tables to figure out how to set up the ER Diagram.
- Takeda(a pharmaceutical company from Japan) was founded in 1781!

What was difficult:

- Figuring out one to one, many to many, and one to many relationship.
- Lack of knowledge in medical fields.
- Finding and inserting data.
- Coming up with functional requirements without thinking of tables.
- Choosing Primary Keys for certain tables.

Questions