# Final Project Report
# Medicine Management System Database

## 1 Application Description

**This project aims to build a medicine management database for a pharmacy. The database stores the basic data needed for a pharmacy.**

**It contains:**

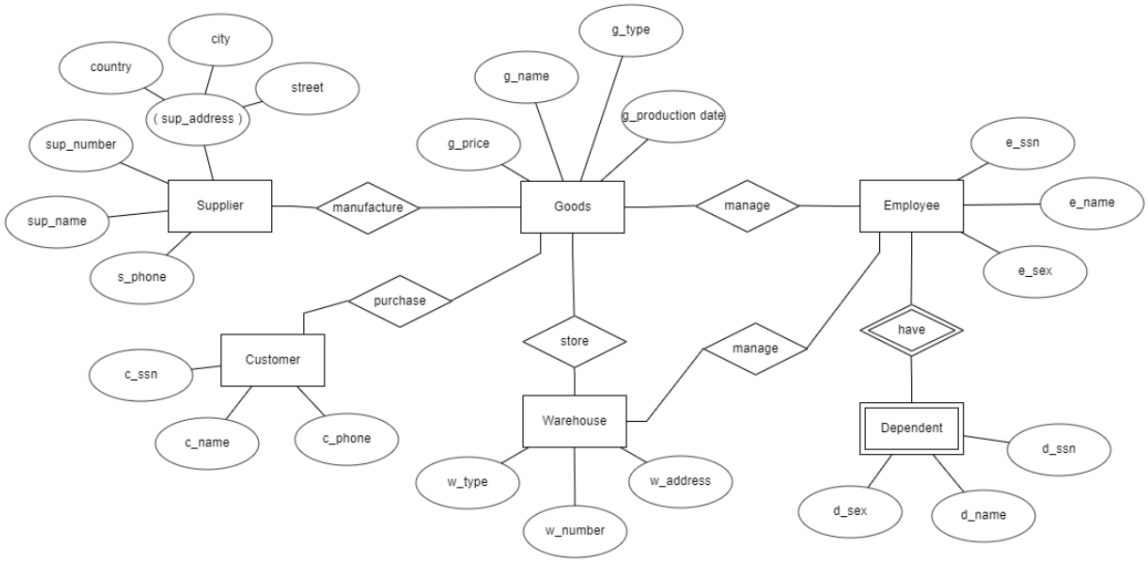
- 6 entities: Medicine, Customer, Supplier, order, employee, and their dependencies.
- 5 relationships: manufacture, order, return, stock, and depend. [1]

**Technology used:**

- Oracle 11g Database
- Latex

## 2 Conceptual Model

**ER Diagram (draft):**
This ER Diagram is the first draft and it has some flaws.

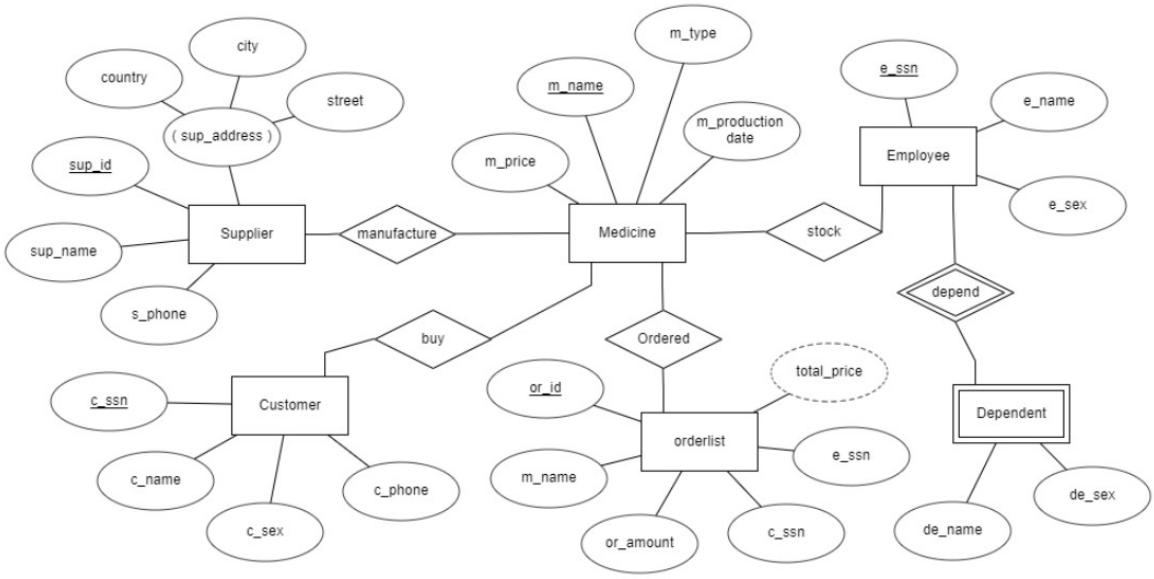



2

[1] More detail will be provide in the Conceptual Model part.
[2] The final version of ER Diagram is in the next page.

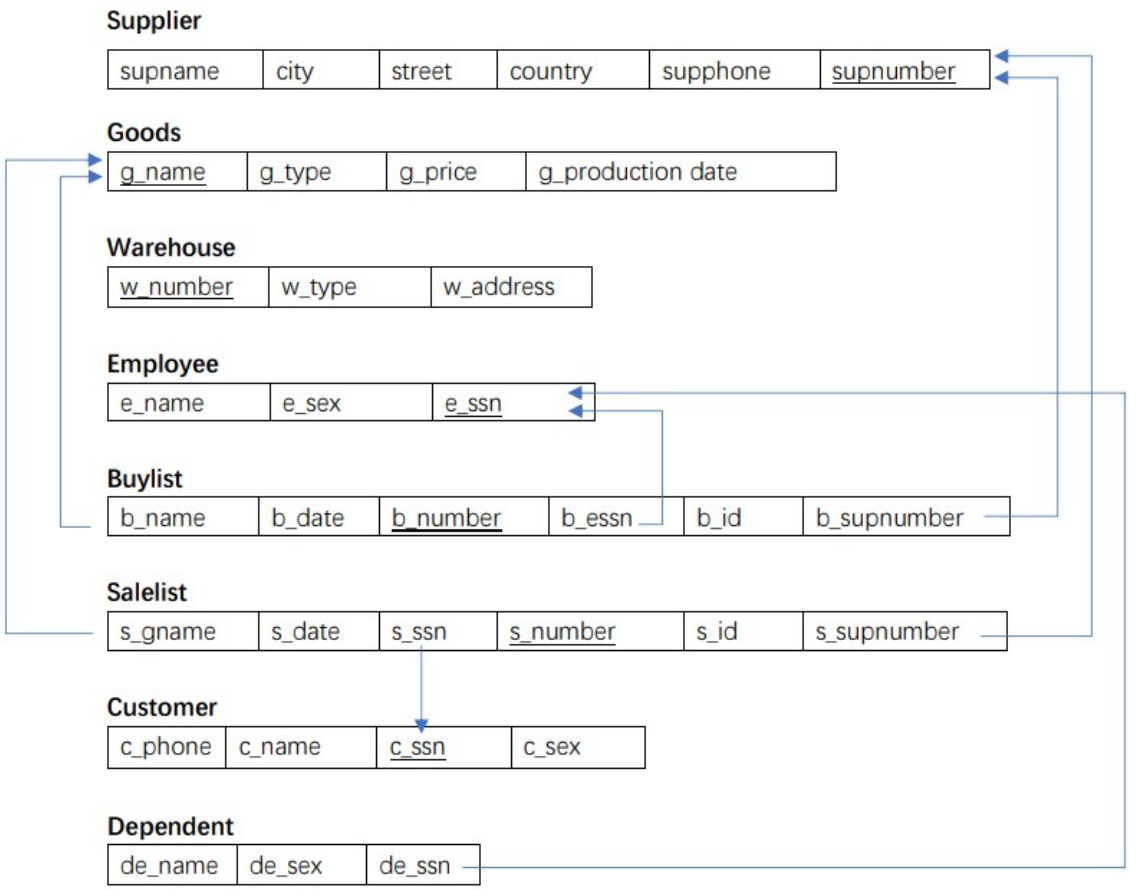
**ER Diagram (final version):**

This ER Diagram is the final version of ERD for our project.



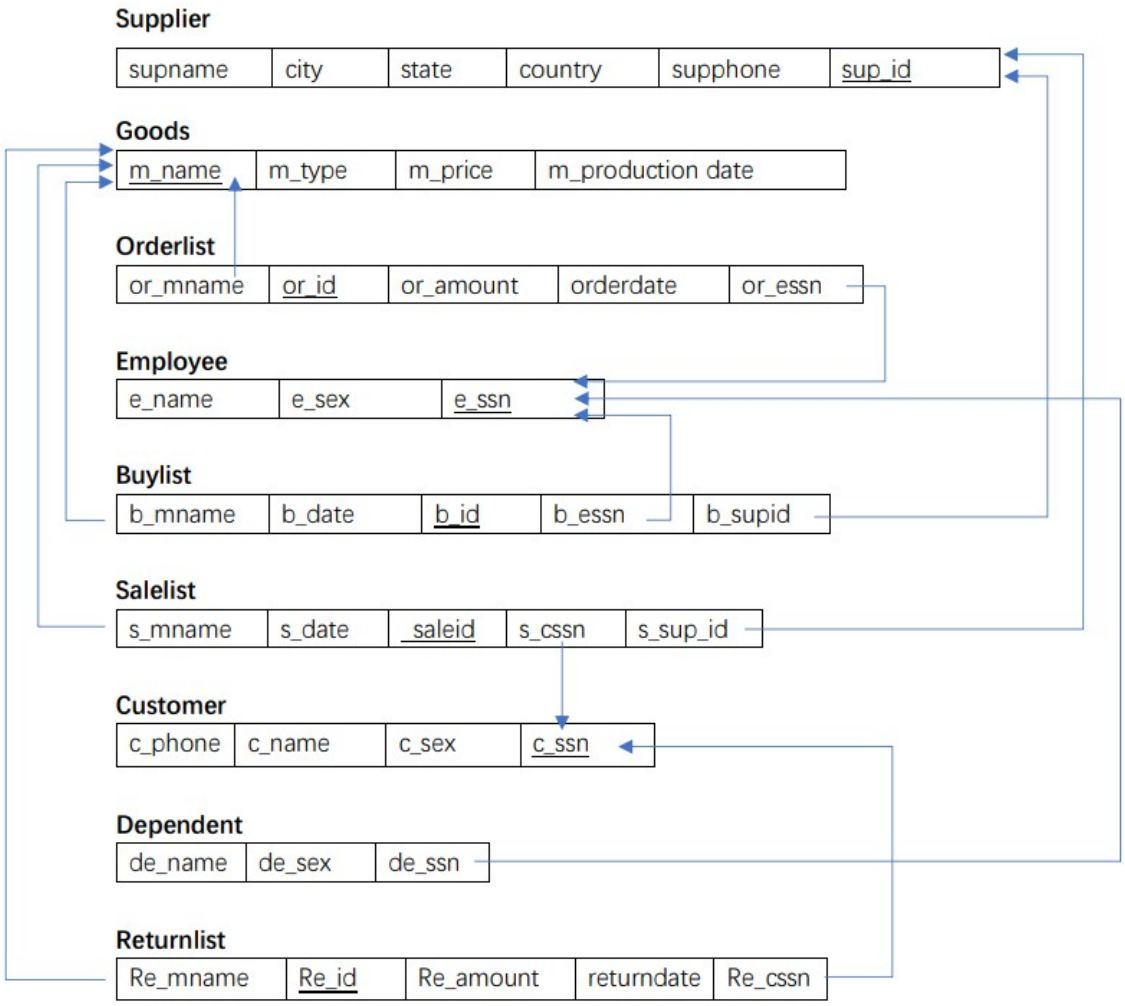

# 3 Initial Database Schema

**Schema:**



# 4 Final Database Schema

**Schema:**




## Code listing:

```
DROP TABLE admin CASCADE CONSTRAINTS;
CREATE TABLE admin(
  s_id           int,
  s_name        varchar2(20) ,
  s_password    varchar2(20)
);
insert into admin values(1,'admin','admin');
DROP TABLE Supplier CASCADE CONSTRAINTS;
CREATE TABLE Supplier (
Supid varchar2(25),
Supname  varchar2(40),
Supadress varchar2(40),
Supphone  varchar2(30),
primary key (Supid)
);
DROP TABLE Medicine CASCADE CONSTRAINTS;
CREATE TABLE Medicine (
mname   varchar2(50),
mtype  varchar2(40) ,
```

```
mprice  number,
mproductiondate  date,
primary key (mname)
);
DROP TABLE employee CASCADE CONSTRAINTS;
CREATE TABLE employee (
essn varchar2(40),
ename varchar2(40),
esex varchar2(40),
primary key (essn)
);
DROP TABLE buylist CASCADE CONSTRAINTS;
CREATE TABLE buylist (
buyid varchar2(40),
b_supid varchar2(40),
b_mname     varchar2(40),
b_essn varchar2(40),
buydate   date,
primary key (buyid)
);
DROP TABLE salelist CASCADE CONSTRAINTS;
CREATE TABLE salelist (
saleid varchar2(40),
s_supid  varchar2(40),
s_mname      varchar2(40),
s_cssn  varchar2(40),
saledate   date,
primary key (saleid)
);
DROP TABLE customer CASCADE CONSTRAINTS;
CREATE TABLE customer (
cssn varchar2(40),
cname  varchar2(40),
csex varchar2(40),
cphone  varchar2(40),
primary key (cssn)
);
DROP TABLE dependent CASCADE CONSTRAINTS;
CREATE TABLE dependent (
dessn varchar2(40),
dename  varchar2(40),
desex varchar2(40),
primary key (dessn)
);
DROP TABLE orderlist CASCADE CONSTRAINTS;
CREATE TABLE orderlist (
orid varchar2(60),
or_essn varchar2(60),
or_mname     varchar2(60),
oramount varchar2(40),
orderdate   date,
primary key (orid)
);
DROP TABLE returnlist CASCADE CONSTRAINTS;
CREATE TABLE returnlist (
returnid varchar2(60),
re_essn varchar2(60),
re_mname     varchar2(60),
reamount varchar2(40),
returndate   date,
primary key (returnid)
);
```

**Properties of good database design:**

- All attributes are preserved ✓
- All dependencies are preserved ✓
- All relations are in 3 rd normal form (or higher). ✓
- All joins are lossless ✓

All attributes in our database is derived from the "real world" pharmacy. From the schema diagram above, we know that all dependencies are preserved and all relations are in 3rd normal form(or higher). For the lossless join issue, no spurious tuples will result if join any 2 base relations in our database.

```
Example:
salelist_customer(c_ssn,c_sex,c_name,c_phone,s_cssn,saleid,s_date,s_sup_id,s_mname)
f ={ c_ssn -> c_phone,c_name,c_sex,s_cssn
     s_cssn ->s_sup_id, saleid, s_date, s_mname}
```

# 5 Database Instance

- supplier table:

| SUPID | SUPNAME | SUPADRESS | SUPPHONE |
|---|---|---|---|
| 1001 | Pfizer Inc | Manhattan,New York,US | 138854 |
| 1002 | Roche Holding AG | Basel,null,Swiss | 138858 |
| 1003 | Novartis International AG | Basel,null,Swiss | 138828 |
| 1004 | Merck Inc | Kenilworth,New Jersey,US | 1386163 |
| 1005 | GlaxoSmithKline plc | London,England,UK | 1315062 |
| 1006 | Johnson & Johnson | New Brunswick,New Jersey,US | 13814888 |
| 1007 | AbbVie | Lake Bluff,Ilinois,US | 1315201 |
| 1008 | Sanofi | Paris,null,France | 1302515 |
| 1009 | Hibitai Hemorrhoid Suppository co | Changsha,Hunan,CN | 1352332 |
| 1010 | Mayinglong Hemorrhoid Suppository co | Shenzhen,guangdong,TX | 112301 |
| 1011 | Ketoconazole Ointment Company | Xinong,guanxi,TX | 152352 |
| 1012 | Conde medica | Chaoyang District, Beijing,CN | 138854 |
| 1013 | Shuanghuanglian Company | Haidian District, Beijing,CN | 138858 |
| 1014 | Angelica Company | Zhongguan District,Beijing,CN | 138828 |
| 1015 | Ginseng company | Chengdu, Sichuan,ZH | 1386163 |
| 1016 | Cold ling Company | Guilin, Guangxi,CN | 1315062 |
| 1017 | Cephalosporins company | Chengdu,Sichuan,CN | 13814888 |
| 1018 | Ducklin & Company | Mianyang,Sichuan,ZH | 1315201 |
| 1019 | Ibuprofen Oral Liquid Company | Wuhan,hubei,CN | 1302515 |
| 1020 | Medwish co | Changsha,Hunan,ZH | 1222231 |

20 rows returned in 0.00 seconds Download

- medicine table:

| MNAME | MTYPE | MPRICE | MPRODUCTIONDATE |
|---|---|---|---|
| Conde | prescription medicine | 500 | 11/17/2020 |
| Shuanghuanglian | nonprescription medicine | 600 | 11/11/2020 |
| Angelica | nonprescription medicine | 700 | 11/15/2020 |
| Ginseng | nonprescription medicine | 800 | 11/16/2020 |
| Cold ling | nonprescription medicine | 540 | 11/12/2020 |
| Cephalosporins | nonprescription medicine | 200 | 11/06/2020 |
| Ducklin | prescription medicine | 400 | 11/12/2020 |
| Ibuprofen Oral Liquid | prescription medicine | 500 | 11/17/2020 |
| Hibitai Hemorrhoid Suppository | prescription medicine | 300 | 11/17/2020 |
| Mayinglong Hemorrhoid Suppository | prescription medicine | 100 | 11/03/2020 |
| Ketoconazole Ointment | prescription medicine | 99 | 11/05/2020 |

11 rows returned in 0.00 seconds Download

- orderlist table:

| ORID | OR_ESSN | OR_MNAME | ORAMOUNT | ORDERDATE |
|---|---|---|---|---|
| 8001 | 2001 | Conde | 5000 | 11/19/2020 |
| 8002 | 2002 | Shuanghuanglian | 60000 | 11/12/2020 |
| 8003 | 2003 | Angelica | 7000 | 11/11/2020 |
| 8004 | 2004 | Ginseng | 8600 | 11/11/2020 |
| 8005 | 2005 | Cold ling | 9400 | 11/12/2020 |
| 8006 | 2006 | Cephalosporins | 2200 | 11/05/2020 |
| 8007 | 2007 | Ducklin | 2007 | 11/06/2020 |
| 8008 | 2008 | Ibuprofen Oral Liquid | 7700 | 11/08/2020 |
| 8009 | 2009 | Hibitai Hemorrhoid Suppository | 5400 | 11/24/2020 |
| 8010 | 2010 | Mayinglong Hemorrhoid Suppository | 5200 | 11/16/2020 |
| 8011 | 2011 | Ketoconazole Ointment | 3000 | 11/12/2020 |

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- returnlist table:

| RETURNID | RE_ESSN | RE_MNAME | REAMOUNT | RETURNDATE |
|---|---|---|---|---|
| 9001 | 2001 | Conde | 3000 | 11/19/2020 |
| 9002 | 2002 | Shuanghuanglian | 600 | 11/12/2020 |
| 9003 | 2003 | Angelica | 700 | 11/11/2020 |
| 9004 | 2004 | Ginseng | 850 | 11/11/2020 |
| 9005 | 2005 | Cold ling | 950 | 11/12/2020 |
| 9006 | 2006 | Cephalosporins | 20 | 11/05/2020 |
| 9007 | 2007 | Ducklin | 30 | 11/06/2020 |
| 9008 | 2008 | Ibuprofen Oral Liquid | 30 | 11/08/2020 |
| 9009 | 2009 | Hibitai Hemorrhoid Suppository | 540 | 11/24/2020 |
| 9010 | 2010 | Mayinglong Hemorrhoid Suppository | 520 | 11/16/2020 |
| 9011 | 2011 | Ketoconazole Ointment | 30 | 11/12/2020 |

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- salelist table:

| SALEID | S_SUPID | S_MNAME | S_CSSN | SALEDATE |
|---|---|---|---|---|
| 6001 | 1001 | Conde | 4001 | 11/11/2020 |
| 6002 | 1002 | Shuanghuanglian | 4002 | 11/12/2020 |
| 6003 | 1003 | Angelica | 4003 | 11/05/2020 |
| 6004 | 1004 | Ginseng | 4004 | 11/06/2020 |
| 6005 | 1005 | Cold ling | 4005 | 11/07/2020 |
| 6006 | 1006 | Cephalosporins | 4006 | 11/05/2020 |
| 6007 | 1007 | Ducklin | 4007 | 11/12/2020 |
| 6008 | 1008 | Ibuprofen Oral Liquid | 4008 | 11/09/2020 |
| 6009 | 1009 | Hibitai Hemorrhoid Suppository | 4009 | 11/11/2020 |
| 6010 | 1010 | Mayinglong Hemorrhoid Suppository | 4010 | 11/12/2020 |
| 6011 | 1011 | Ketoconazole Ointment | 4011 | 11/06/2020 |
| 6012 | 1012 | Shuanghuanglian | 4002 | 11/12/2020 |
| 6013 | 1013 | Angelica | 4003 | 11/05/2020 |
| 6014 | 1014 | Ginseng | 4004 | 11/06/2020 |
| 6015 | 1015 | Cold ling | 4005 | 11/07/2020 |
| 6016 | 1016 | Cephalosporins | 4006 | 11/05/2020 |
| 6017 | 1017 | Ducklin | 4007 | 11/12/2020 |
| 6018 | 1018 | Ibuprofen Oral Liquid | 4008 | 11/09/2020 |
| 6019 | 1019 | Hibitai Hemorrhoid Suppository | 4009 | 11/11/2020 |
| 6020 | 1020 | Mayinglong Hemorrhoid Suppository | 4010 | 11/12/2020 |

20 rows returned in 0.00 seconds Download

- buylist table:

| BUYID | B_SUPID | B_MNAME | B_ESSN | BUYDATE |
|---|---|---|---|---|
| 5001 | 1007 | Ducklin | 2007 | 11/06/2020 |
| 5002 | 1008 | Ibuprofen Oral Liquid | 2008 | 11/08/2020 |
| 5003 | 1006 | Cephalosporins | 2006 | 11/05/2020 |
| 5004 | 1001 | Conde | 2001 | 11/19/2020 |
| 5005 | 1005 | Cold ling | 2005 | 11/12/2020 |
| 5006 | 1002 | Shuanghuanglian | 2002 | 11/12/2020 |
| 5007 | 1003 | Angelica | 2003 | 11/11/2020 |
| 5008 | 1004 | Ginseng | 2004 | 11/11/2020 |
| 5009 | 1009 | Hibitai Hemorrhoid Suppository | 2009 | 11/24/2020 |
| 5010 | 1010 | Mayinglong Hemorrhoid Suppository | 2010 | 11/16/2020 |
| 5011 | 1011 | Ketoconazole Ointment | 2011 | 11/12/2020 |
| 5012 | 1012 | Shuanghuanglian | 2002 | 11/12/2020 |
| 5013 | 1013 | Angelica | 2013 | 11/11/2020 |
| 5014 | 1014 | Ginseng | 2014 | 11/11/2020 |
| 5015 | 1015 | Cold ling | 2015 | 11/12/2020 |
| 5016 | 1016 | Cephalosporins | 2006 | 11/05/2020 |
| 5017 | 1017 | Ducklin | 2007 | 11/06/2020 |
| 5018 | 1018 | Ibuprofen Oral Liquid | 2008 | 11/08/2020 |
| 5019 | 1019 | Hibitai Hemorrhoid Suppository | 2009 | 11/24/2020 |
| 5020 | 1020 | Mayinglong Hemorrhoid Suppository | 2010 | 11/16/2020 |

20 rows returned in 0.00 seconds Download

- customer table:

| CSSN | CNAME | CSEX | CPHONE |
|---|---|---|---|
| 4001 | Zengxiaoxian | M | 136623206 |
| 4002 | Sam | F | 1352302566 |
| 4003 | Tom | F | 1361012516 |
| 4004 | Bob | M | 1361565266 |
| 4005 | Liliy | F | 1366516151 |
| 4006 | Bob | F | 1851620255 |
| 4007 | Cate | M | 1756156162 |
| 4008 | Song | F | 17615632515 |
| 4009 | Leslie | F | 115615152 |
| 4010 | Small | M | 1156154551 |

| CSSN | CNAME | CSEX | CPHONE |
|---|---|---|---|
| 4011 | Garen | M | 189856515 |
| 4012 | Liushang | F | 1352302566 |
| 4013 | Zhaoyun | F | 1361012516 |
| 4014 | Guanyu | M | 1361565266 |
| 4015 | Liliy | F | 1366516151 |
| 4016 | Bob | F | 1851620255 |
| 4017 | Caocao | M | 1756156162 |
| 4018 | Ahri | F | 17615632515 |
| 4019 | Frank | F | 115615152 |
| 4020 | Wangning | M | 1156154551 |

- employee and dependent table:

| ESSN | ENAME | ESEX |
|---|---|---|
| 2001 | John | M |
| 2002 | Alicia | F |
| 2003 | Justin | F |
| 2004 | Tom | M |
| 2005 | Andy | F |
| 2006 | Joy | F |
| 2007 | Bob | M |
| 2008 | Chenglong | M |
| 2009 | Wangsu | F |
| 2010 | Jack | M |
| 2011 | Lucian | M |
| 2012 | Lisi | F |
| 2013 | Wangwu | F |
| 2014 | Darious | M |
| 2015 | ZhaoLiu | F |
| 2016 | Joy | F |
| 2017 | Bob | M |
| 2018 | Chenglong | M |
| 2019 | Wangsu | F |
| 2020 | Jack | M |

20 rows returned in 0.00 secon

| DESSN | DENAME | DESEX |
|---|---|---|
| 2007 | Jack | M |
| 2010 | Jme | M |
| 2001 | Ray | F |
| 2002 | Jack | F |
| 2008 | Tim | M |
| 2005 | Drew | F |
| 2006 | Jame | M |
| 2009 | Dog | M |
| 2003 | Jake | F |
| 2004 | Dabby | F |
| 2011 | Lucian | M |
| 2012 | liwn | F |
| 2013 | Wangle | F |
| 2014 | Dame | F |
| 2015 | Zhaoxin | F |

15 rows returned in 0.00 seconds

# 6 Data Manipulation

**Description:**
This part contains 10 meaningful queries to show the data can be retrieved adequately and accurately:

**Sample queries and output:**

- List produce date of all the medicine:

```
SELECT mname, mproductiondate
FROM Medicine
```

| MNAME | MPRODUCTIONDATE |
|---|---|
| Conde | 11/17/2020 |
| Shuanghuanglian | 11/11/2020 |
| Angelica | 11/15/2020 |
| Ginseng | 11/16/2020 |
| Cold ling | 11/12/2020 |
| Cephalosporins | 11/06/2020 |
| Ducklin | 11/12/2020 |
| Ibuprofen Oral Liquid | 11/17/2020 |
| Hibitai Hemorrhoid Suppository | 11/17/2020 |
| Mayinglong Hemorrhoid Suppository | 11/03/2020 |
| Ketoconazole Ointment | 11/05/2020 |

11 rows returned in 0.00 seconds Download

- List the names of all employee's who have a dependent whose name is "Jack":

```
SELECT ename
FROM employee,dependent
WHERE essn=dessn AND dename='Jack';
```

| ENAME |
|---|
| Bob |
| Alicia |

- List the names of all Customer whose sex is Female:

```
SELECT cname, csex
FROM Customer
WHERE csex='M';
```

| CNAME | CSEX |
|---|---|
| Zengxiaoxian | M |
| Bob | M |
| Cate | M |
| Small | M |
| Garen | M |
| Guanyu | M |
| Caocao | M |
| Wangning | M |

- List all the names of employees who sold medicine has been returned:

```
SELECT ename
FROM employee, returnlist
WHERE RE_essn=essn;
```

| ENAME |
|---|
| John |
| Alicia |
| Justin |
| Tom |
| Andy |
| Joy |
| Bob |
| Chenglong |
| Wangsu |
| Jack |
| Lucian |

- List the all names of all the medicine name which type is 'prescription medicine' and the price of it between 50 and 400:

```
SELECT mname, mprice
FROM medicine
WHERE mtype='prescription medicine' AND mprice BETWEEN 50 and 400;
```

| MNAME | MPRICE |
|---|---|
| Ducklin | 400 |
| Hibitai Hemorrhoid Suppository | 300 |
| Mayinglong Hemorrhoid Suppository | 100 |
| Ketoconazole Ointment | 99 |

4 rows returned in 0.01 seconds Download

- List the name, address and phone number of supplier who supports nonprescription medicine:

```
SELECT s.supname, s.supphone, s.supadress
FROM medicine m, salelist a, supplier s
WHERE m.mname=a.s_mname AND a.s_supid=s.supid
    AND m.mtype='nonprescription medicine';
```

| SUPNAME | SUPPHONE | SUPADRESS |
|---|---|---|
| Roche Holding AG | 138858 | Basel,null,Swiss |
| Novartis International AG | 138828 | Basel,null,Swiss |
| Merck Inc | 1386163 | Kenilworth,New Jersey,US |
| GlaxoSmithKline plc | 1315062 | London,England,UK |
| Johnson & Johnson | 13814888 | New Brunswick,New Jersey,US |
| Conde medica | 138854 | Chaoyang District, Beijing,CN |
| Shuanghuanglian Company | 138858 | Haidian District, Beijing,CN |
| Angelica Company | 138828 | Zhongguan District,Beijing,CN |
| Ginseng company | 1386163 | Chengdu, Sichuan,ZH |
| Cold ling Company | 1315062 | Guilin, Guangxi,CN |

10 rows returned in 0.01 seconds Download

- List all the name of employee who was sold the prescription medicine, and whose dependent is female:

```
SELECT e.ename
FROM employee e,dependent d,medicine m,buylist b
WHERE m.mname=b.b_mname AND b.b_essn=e.essn AND e.essn= d.dessn
 AND d.desex='M' AND m.mtype='prescription medicine';
```

| ENAME |
|---|
| Bob |
| Bob |
| Chenglong |
| Chenglong |
| Wangsu |
| Wangsu |
| Jack |
| Jack |
| Lucian |

- List the orderid, name, and phone number who bought the medicine 'Ducklin:

```
SELECT s.saleid, c.cname,c.cphone
FROM customer c, salelist s
WHERE c.cssn=s.s_cssn AND s.s_mname='Ducklin';
```

| SALEID | CNAME | CPHONE |
|---|---|---|
| 6007 | Cate | 1756156162 |
| 6017 | Cate | 1756156162 |

2 rows returned in 0.00 seconds

- List all name of order which amount of order less than 5000:

```
SELECT or_mname, oramount
FROM orderlist
WHERE oramount <= 5000;
```

| OR_MNAME | ORAMOUNT |
|---|---|
| Conde | 5000 |
| Cephalosporins | 2200 |
| Ducklin | 2007 |
| Ketoconazole Ointment | 3000 |

4 rows returned in 0.00 seconds Do

- List all the name of medicine name which has been returned amount beyond 600:

```
SELECT re_mname, reamount
FROM returnlist
WHERE reamount >= 600;
```

| RE_MNAME | REAMOUNT |
|---|---|
| Conde | 3000 |
| Shuanghuanglian | 600 |
| Angelica | 700 |
| Ginseng | 850 |
| Cold ling | 950 |

5 rows returned in 0.00 seconds

# 7 Web interface

**Unfortunately, as a beginner of Java Servlet, we only got a half-finished product since We don't have enough time to complete the web interface.**

# 8 Observations

## 8.1 How this project progressed:

**First of all, we choose this topic because one of our team member had worked for an online B2B(Business to Business) medical supplies trading platform. Inspired by that work experience and after team discussion about the difficulty level of implementation. We decide to build a medicine management database for a pharmacy.**

**Then we basically followed the steps in the project instruction file to create our database. However, as introduced in the conceptual model part, the first draft of our project is not solid and it causes a lot of problems. For example, we can't find any connections between the "warehouse" table to any other tables in the database schema derived from the draft.**

**In order to solve these problem, we had to go back to the conceptual model part and start over again, which consumes a big amount of time.**

## 8.2 Lesson learned from this project:

- We definitely should spent more time to create a solid conceptional model of the database.
- Problems in the conceptual level will cause many problems.
- We have a intuitive understanding of how the database can be used in our daily life.

## 8.3 About how to use particular database product we chose

**This part is our answer to the question: "How did you like using the particular database product you chose?"**

- The most creative idea we have is to combine the industry level medicine management systems with third party database so that people can apply many meaningful analysis and make contributes to the public health field.
  For example, combine medicine databases of large pharmacies in the US, people will be able to monitor the public health events in different regions by analyze the demand of certain medical supplies in certain region. However, this idea also have some drawbacks, for instance, it might not be legal and people should do a lot of work in order to protect customer's privacy.
- For the database product we created for this project, we tended to use it to keep track of the information needed for a pharmacy.
- For the industry level medicine management system like CVS pharmacy's website, we can conveniently found all of the information we need about the medicine, order records, return policy etc.

## 8.4 Further study opportunities:

- Complete the web interface for our database.
- Add more entities to our current database in order to give it more functions.
- Since pharmacies are operated in a very similar way as any other retail stores. (e.g. Kroger) I think it is possible for us to modify our current database to adapt it to the needs of retail stores.

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