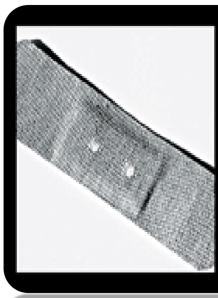

THE CLINIC

A WEB DATABASE APPLICATION DEVELOPED BY GROUP 16

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CS2102 DATABASE SYSTEMS

DATE OF SUBMISSION
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Table of Contents

APPLICATION DESCRIPTION

The Clinic System is an application for use of and maintaining records within a clinic of general practitioners. Overall, the system maintains visitors information, medical history within the clinic and allows doctors or visitors to refer to their own history.

The system is built based on a database of doctors, patients, drugs, visits and prescriptions. Please refer to the entity relationship (ER) diagram on page 4 to see the relationship between these tables or visit the actual website and explore the functions ”live”, the address and log in details can be found below.

There are three main user roles: admin, doctor and patient.

Admins can create a ”new visit” entry for an incoming patient, which is to be edited by the doctor. He can add a new patient and edit the patient’s entries. He may also access the visits and prescriptions database and print the instructions for the patients. Additionally, he can access and edit the drugs database (this role may be given to a pharmacist). He can also edit and add doctors to the doctors database (so this role can also be given to the receptionist of a clinic).

Doctors can edit an incoming patient’s visit and give him prescriptions using the drug database. He may view the patient’s previous visits as a reference for the current treatment. It is also possible for the doctor to search in his patient register by id, see a list of patients who visited on a particular day and access drug statistics (e.g view most prescribed drug, which drugs were pescribed on a particular date).

Patients can access their visits to view their prescriptions (e.g in case they lost the instructions on how to use the drugs). Patients can also view which doctors they have seen and which they have not seen, search drug by manufacturer and edit their personal info.

Website: http://clinicsystem.azurewebsites.net/
Log-in as admin with Log-in id ”admin” and password ”admin” and create your own user details, which will enable you to log in through either doctors or visitors log in page (depending on what you picked to administrate as) with id as user-id and contact number as password. To test the sample database we have created, you can use the following login details:

Doctor:

Log-in : S223748R
Password: 67832412

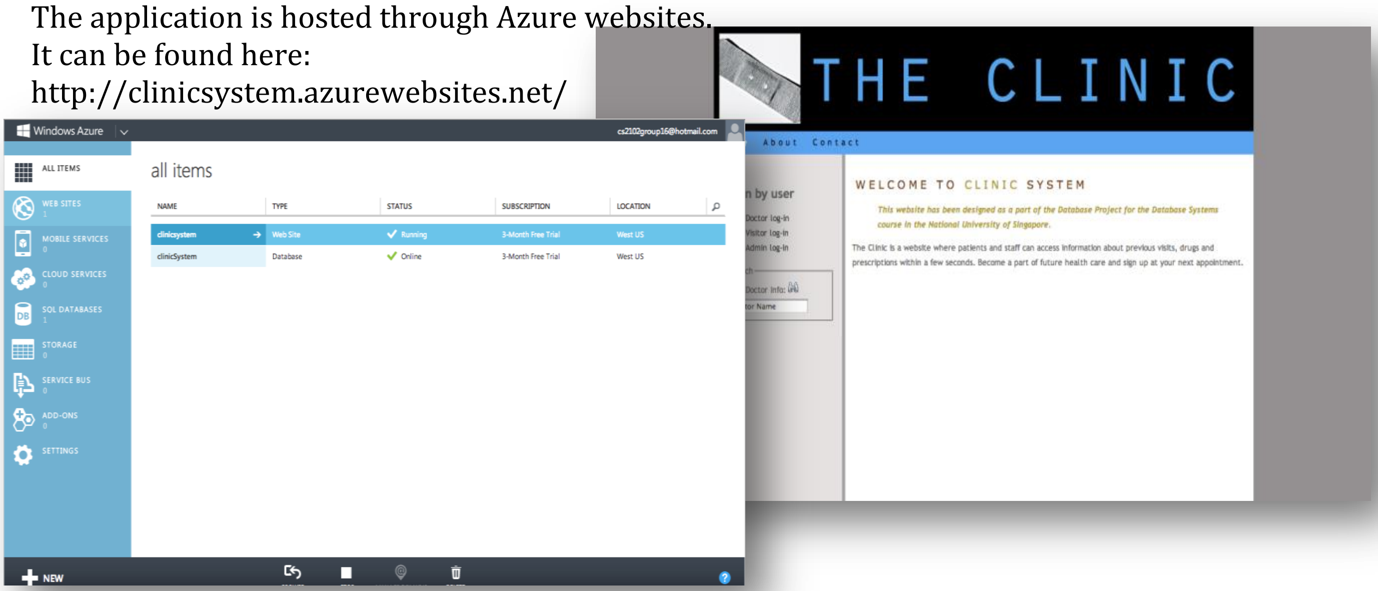
Patient:

Log-in : G0562934N
Password : 83443234

TECHNICAL SPECIFICATION

Web server page

The application is hosted through Azure websites.
It can be found here:
http://clinicsystem.azurewebsites.net/



NAME	TYPE	STATUS	SUBSCRIPTION	LOCATION
clinicsystem	Web Site	✓ Running	3-Month Free Trial	West US
clinicSystem	Database	✓ Online	3-Month Free Trial	West US

THE CLINIC

WELCOME TO CLINIC SYSTEM

This website has been designed as a part of the Database Project for the Database Systems course in the National University of Singapore.

The Clinic is a website where patients and staff can access information about previous visits, drugs and prescriptions within a few seconds. Become a part of future health care and sign up at your next appointment.

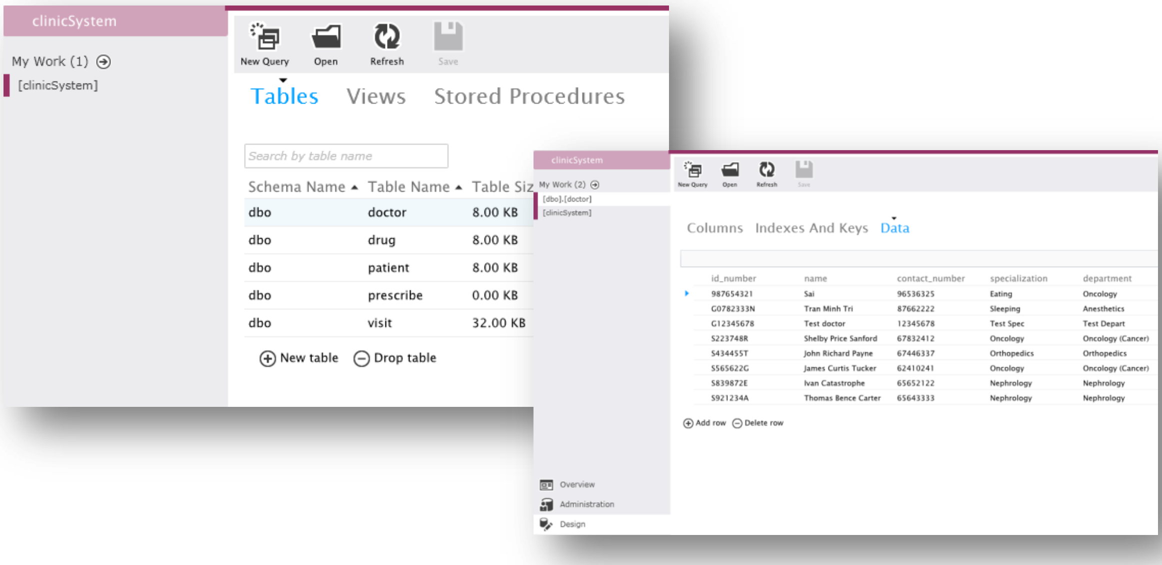
Server page language

Webmatrix is a free web developer tool suggested by Microsoft when using SQL Azure for database managment, server page language used is PHP.

Microsoft WebMatrix

Database managment system

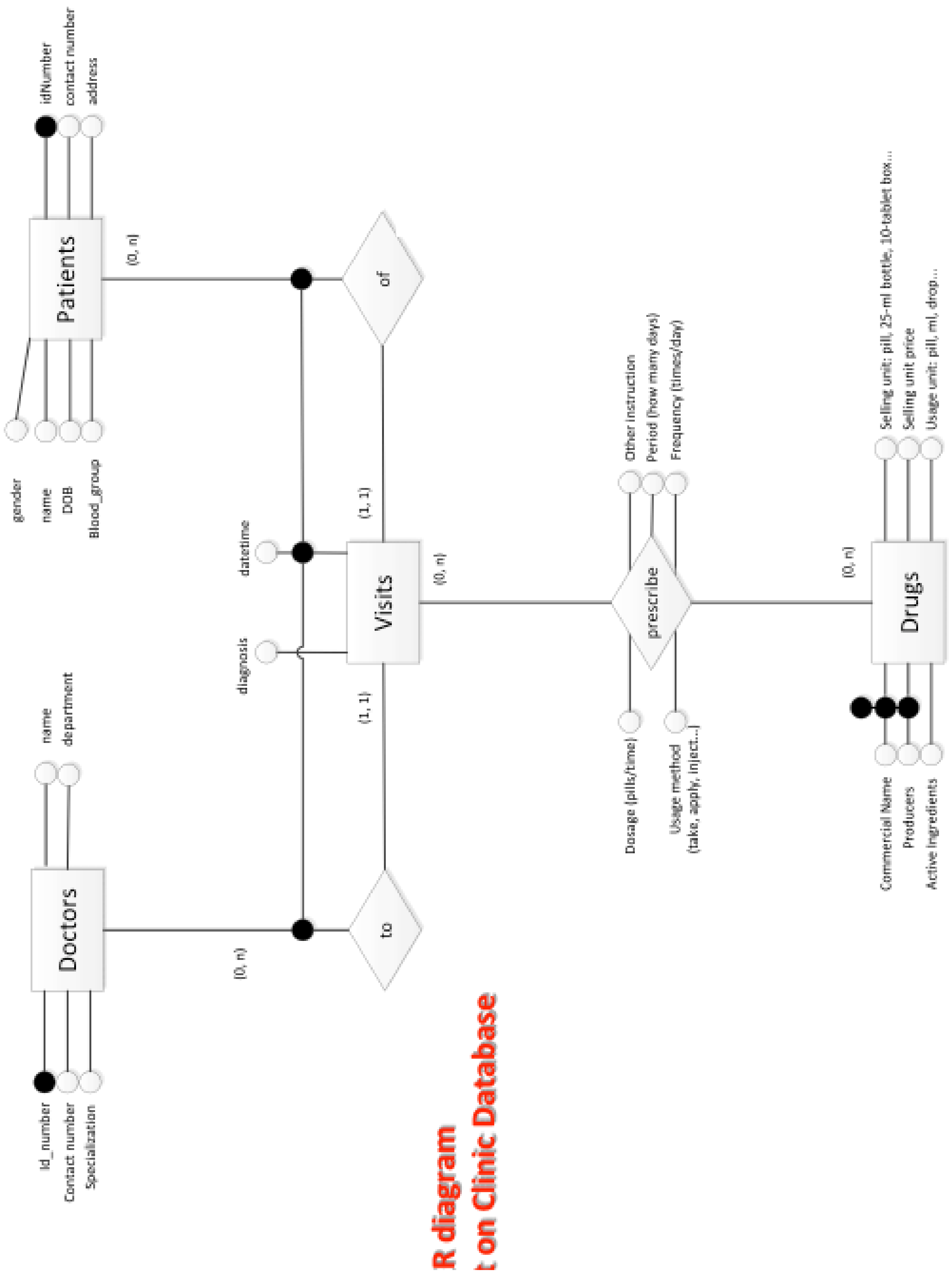
The application was developed with Microsoft SQL Azure.



Schema Name	Table Name	Table Siz
dbo	doctor	8.00 KB
dbo	drug	8.00 KB
dbo	patient	8.00 KB
dbo	prescribe	0.00 KB
dbo	visit	32.00 KB

id_number	name	contact_number	specialization	department
987654321	Sai	96536325	Eating	Oncology
G0782333N	Tran Minh Tri	87662222	Sleeping	Anesthetics
G12345678	Test doctor	12345678	Test Spec	Test Depart
S223748R	Shelby Price Sanford	67832412	Oncology	Oncology (Cancer)
S434455T	John Richard Payne	67446337	Orthopedics	Orthopedics
S565622G	James Curtis Tucker	62410241	Oncology	Oncology (Cancer)
S839872E	Ivan Catastrophe	65652122	Nephrology	Nephrology
S921234A	Thomas Bence Carter	65643333	Nephrology	Nephrology

ENTITY RELATIONSHIP DIAGRAM



RELATIONAL SCHEMA [DDL]

```
CREATE TABLE doctor (
id_number CHAR(9) PRIMARY KEY,
name VARCHAR(64) NOT NULL,
contact_number CHAR(8) NOT NULL,
specialization VARCHAR(64) NOT NULL,
department VARCHAR(64));

CREATE TABLE patient (
id_number CHAR(9) PRIMARY KEY,
name VARCHAR(64) NOT NULL,
gender VARCHAR(6) NOT NULL CHECK(gender = 'male' OR gender='female'),
contact_number CHAR(8) NOT NULL,
address VARCHAR(128) NOT NULL,
date_of_birth DATETIME NOT NULL,
blood_group VARCHAR(2) CHECK(blood_group = 'A' OR blood_group = 'B' OR
blood_group = 'O' OR blood_group = 'AB' OR blood_group = NULL));

CREATE TABLE visit (
doctor CHAR(9) REFERENCES doctor(id_number) ON UPDATE CASCADE,
patient CHAR(9) REFERENCES patient(id_number) ON UPDATE CASCADE,
datetime DATETIME DEFAULT GetDate(),
diagnosis TEXT,
PRIMARY KEY (doctor, patient, datetime));

CREATE TABLE drug (
commercial_name VARCHAR(64) NOT NULL,
manufacturer VARCHAR(64) NOT NULL,
active_ingredient VARCHAR(256),
selling_unit VARCHAR(32) ,
selling_unit_price DECIMAL(18,2) NOT NULL,
usage_unit VARCHAR(32) NOT NULL,
PRIMARY KEY (commercial_name, manufacturer));

CREATE TABLE prescribe (
doctor CHAR(9),
patient CHAR(9),
datetime DATETIME,
drug VARCHAR(64),
manufacturer VARCHAR(64),
FOREIGN KEY (doctor, patient, datetime) REFERENCES visit(doctor, patient, datetime)
ON UPDATE CASCADE ON DELETE CASCADE,
FOREIGN KEY (drug, manufacturer) REFERENCES drug(commercial_name,
manufacturer) ON UPDATE CASCADE ON DELETE CASCADE,
PRIMARY KEY (doctor, patient, datetime, drug, manufacturer),
period INT NOT NULL,
frequency INT NOT NULL,
dosage INT NOT NULL,
usage_method VARCHAR(32) NOT NULL,
other_instruction TEXT);
```

VIEWS

View for Doctors

The doctor is only concered with specfic information (and not all) of the patient, along with his diagnosis information, visit time and the drugs that were refered to him. Hence from a design point of view, it would be better to have a seperate VIEW for the doctor which would only contain the required infomation.

```
CREATE VIEW vw_Doctor_Drug AS
SELECT ps.drug, ps.manufacturer, d.active_ingredient, ps.doctor, ps.patient,
                                                                ps.datetime
FROM prescribe ps, drug d
WHERE ps.drug = d.commercial_name AND ps.manufacturer = d.manufacturer

CREATE VIEW vw_Doctor_Patient
AS
SELECT p.name, p.gender, v.datetime, v.diagnosis, v.doctor, v.patient
FROM visit v, patient p
WHERE p.id_number = v.patient
```

View for Patients

A logged-in patient needs to access information repeated from the visit as well as the prescribe folder, in order to retrieve all the information he/she needs to refer to a past visit. A VIEW in this scenario allows for cleaner and shorter SQL code for queries.

```
CREATE VIEW vw_Patient AS
SELECT v.patient, v.datetime, d.name, v.diagnosis, p.drug, p.manufacturer,
p.period, p.frequency, p.dosage, p.usage_method, p.other_instruction
FROM visit v, prescribe p, doctor d
WHERE v.patient=p.patient AND v.doctor=p.doctor AND v.doctor=d.id_number
AND v.datetime=p.datetime
```

View for Visitors

Any visitor to the page can search for a doctor by typing doctor’s name in the search box at the side-navigation. The result page will return query from the following view, which has been created beforehand.

```
CREATE VIEW doctor_basic AS
SELECT name, specialization, department
FROM doctor
```

PROCEDURES

We have provided the doctor with the functionality to view the patients he has seen on a particular date. We have also provided him with a quick link to view the patients he has seen today. As this would involve similar SQL code with some logic, we have used a Procedure to implement this.

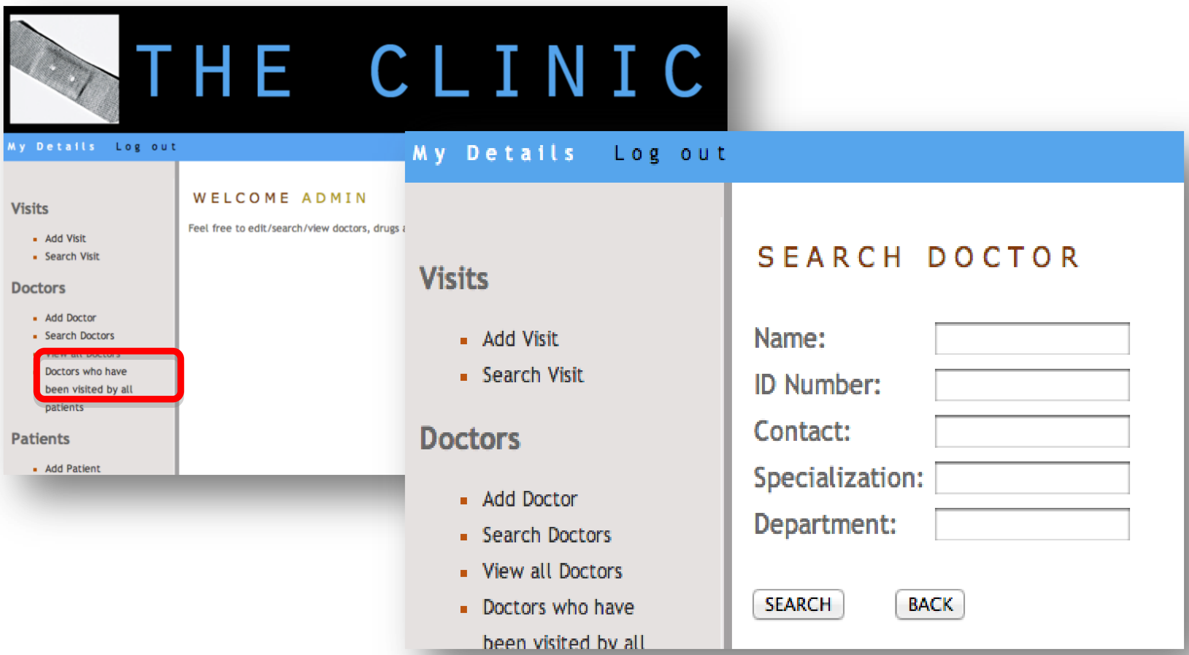
Similarily, the doctor can search for a patient id to view his prescriptions or add a new prescription. For both cases we have to check if the patient exists in the system and if he does, we need to return information depending on whether it is a add prescription or view prescription. Hence, we have used a stored procedure for this.

```
CREATE PROCEDURE CheckPatientId
@doctor_id CHAR (9), @patient_id CHAR (9), @forDiagnosis BIT=1
AS

/*This procedure check if the patient has a visit/had a visit with the doctor. If
yes, then it return the details depneding on the forDiagnosis parameter*/

DECLARE @name int;
SET @name = (SELECT COUNT(*)
        FROM vw_Doctor_Patient
        WHERE patient=@patient_id AND doctor=@doctor_id);

If(@name >0) /*A visit of this patient is registered with this doctor. Hence return
the details.*/
BEGIN

If (@forDiagnosis = 1) /*If doctor needs to attend to the visit*/
BEGIN
SELECT p.name, p.date_of_birth, p.blood_group, v.datetime, p.id_number
FROM patient p, visit v
WHERE p.id_number=@patient_id AND v.patient = p.id_number AND
v.doctor=@doctor_id AND v.diagnosis iS NULL AND v.datetime >=CONVERT
(date, GETDATE())
END

Else /*Doctor needs to access his prescriptions so return the registered
prescreption which are in the vw_Doctor_Drug View */
BEGIN
SELECT  dp.name, dp.diagnosis, dd.drug, dd.manufacturer, dd.datetime
FROM vw_Doctor_Drug dd, vw_Doctor_Patient dp
WHERE dd.patient=@patient_id AND dd.doctor=@doctor_id AND
dp.patient=@patient_id AND dp.doctor=@doctor_id AND dd.datetime =
dp.datetime
END
END
```

```
CREATE PROCEDURE Patients_Seen
@doctor_id CHAR (9), @StartDate DATETIME=NULL, @EndDate
DATETIME=NULL OUTPUT
AS

if(@StartDate IS NULL)
BEGIN
SET @StartDate = GETDATE();
END

SET @EndDate = DATEADD(day,1,@startDate);

BEGIN
SELECT *
FROM vw_Doctor_Patient
WHERE doctor = @doctor_id AND datetime BETWEEN CONVERT (date,
@StartDate) AND CONVERT (date, @EndDate)
END
```

SQL USED FOR ADMIN

The admin page allows for management of the following tables: doctor, patient, drug and visit, with the basic task namely add, delete, edit (except for visit) and search. The SQL DML code for these are similar. Presented below is a sample from the doctor table.



Function: Search for a doctor in the doctors table

```
SELECT * FROM doctor
        WHERE id_number LIKE '%G%'
        AND name LIKE '%Minh%'
        AND contact_number LIKE '%2%'
        AND specialization LIKE '%s%'
        AND department LIKE '%a%'
```

Function: Add a doctor into the doctors table

```
INSERT INTO doctor
VALUES ( 'G0893333H', 'name', '99881234', 'Orthopedic' , 'Catholic')
```

Function: Edit a doctor in the doctors table

```
UPDATE doctor
SET name = 'Barbra Streisand', contact_number ='56749023', specialization
='Cancer' , department ='Neurology' WHERE id_number = 'B0772333Y';
```

Function: Delete a doctor from the doctors table

```
DELETE FROM doctor WHERE id_number = 'P8456889H';
```

There are also some non-standard functions which make use of more advanced SQL queries.

Function: Displays list of the number of patients visiting a particular doctor on the date of the day

```
SELECT v.doctor AS doctor_name, COUNT(DISTINCT v.patient) AS count
FROM visit v
WHERE CONVERT(VARCHAR(25),v.datetime,112) =
                                        CONVERT(VARCHAR(25),getdate(),112)
GROUP BY v.doctor
```

Function: Display patients who visited all doctors

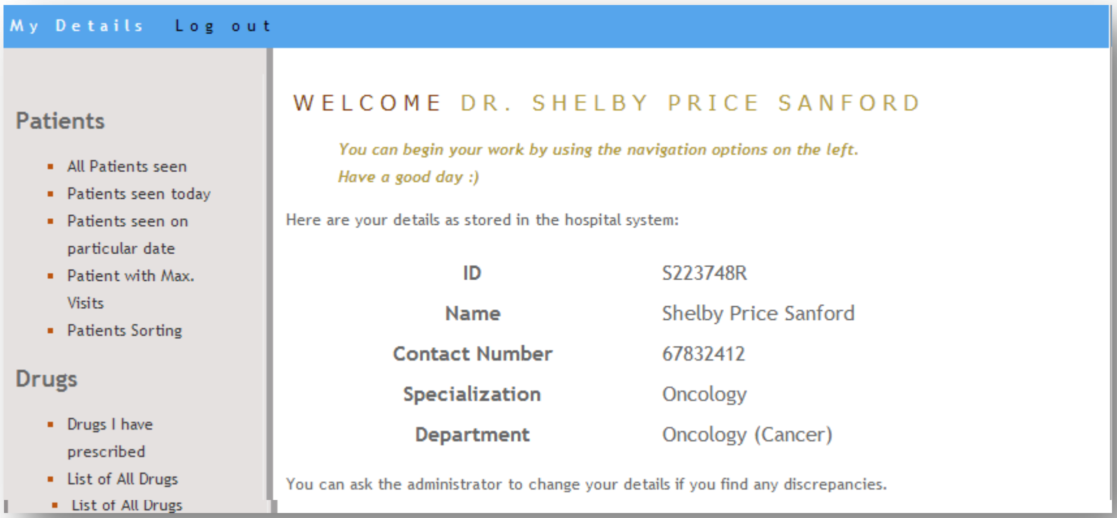
```
SELECT p.name, p.id_number
FROM patient p
WHERE NOT EXISTS
                          (SELECT *
                           FROM doctor d
                           WHERE NOT EXISTS
                                                       (SELECT *
                                                        FROM visit v
                                                        WHERE v.doctor = d.id_number
                                                        AND v.patient = p.id_number))";
```

Function: Display patient with maximum number of visits with a particular doctor

```
SELECT patient, name, gender, COUNT(*)
FROM vw_Doctor_Patient
WHERE doctor = doc_id
GROUP BY patient, name, gender
HAVING COUNT(*) >= ALL(
                                  SELECT COUNT(*)
                                  FROM vw_Doctor_Patient v2
                                  WHERE v2.doctor = doc_id
                                  GROUP BY patient)";
```

SQL USED FOR DOCTOR

Note: Certain paramters were passed to the the SQL queries. They are represented with ”?”



WELCOME DR. SHELBY PRICE SANFORD

You can begin your work by using the navigation options on the left.
Have a good day :)

Here are your details as stored in the hospital system:

ID	S223748R
Name	Shelby Price Sanford
Contact Number	67832412
Specialization	Oncology
Department	Oncology (Cancer)

You can ask the administrator to change your details if you find any discrepancies.

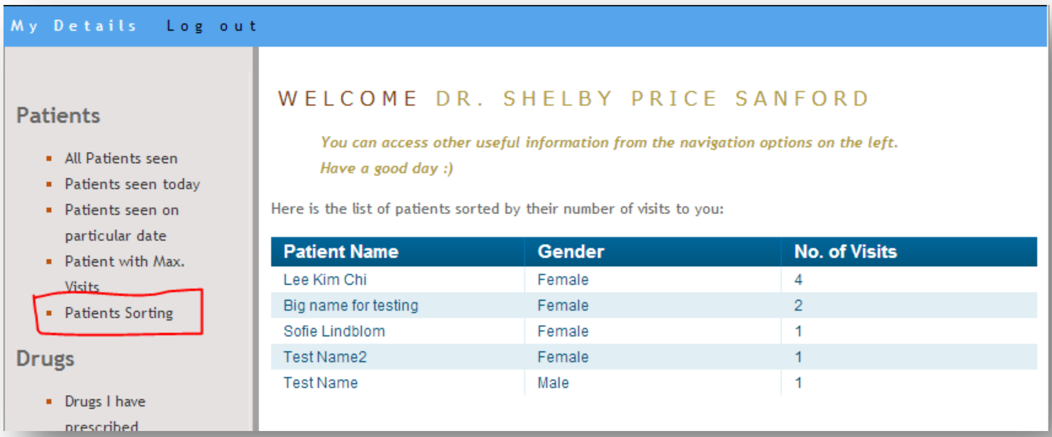
Function: Patients seen on a Particular date

```
EXEC Patients_Seen @doctor_id =?, @StartDate=?
```

Function: Patients with max. Visits

```
SELECT patient, name, gender, COUNT(*)
        FROM vw_Doctor_Patient
        WHERE doctor =?
        GROUP BY patient, name, gender
        HAVING COUNT(*) >= ALL(
                  SELECT COUNT(*)
                  FROM vw_Doctor_Patient v2
                  WHERE v2.doctor = ?
                  GROUP BY patient)
```

Function: Sort patients by their number of visits



WELCOME DR. SHELBY PRICE SANFORD

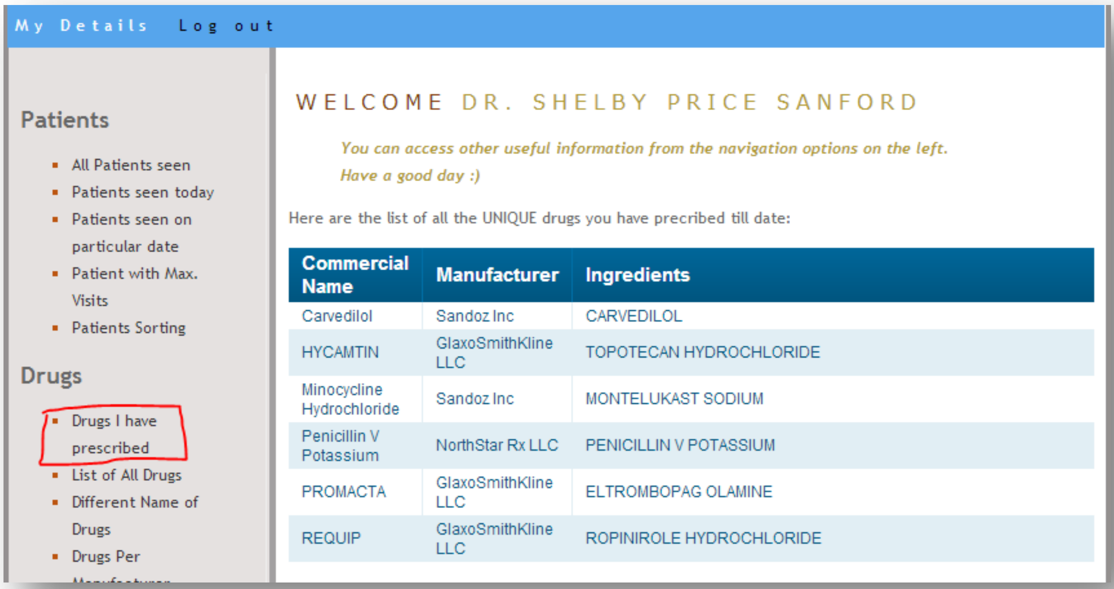
You can access other useful information from the navigation options on the left.
Have a good day :)

Here is the list of patients sorted by their number of visits to you:

Patient Name	Gender	No. of Visits
Lee Kim Chi	Female	4
Big name for testing	Female	2
Sofie Lindblom	Female	1
Test Name2	Female	1
Test Name	Male	1

```
SELECT patient, name, gender, COUNT(*)
            FROM vw_Doctor_Patient
            WHERE doctor =?
            GROUP BY patient, name, gender
            ORDER BY Count(*) DESC
```

Function: Drugs the doctor has prescribed.



WELCOME DR. SHELBY PRICE SANFORD

You can access other useful information from the navigation options on the left.
Have a good day :)

Here are the list of all the UNIQUE drugs you have precribed till date:

Commercial Name	Manufacturer	Ingredients
Carvedilol	Sandoz Inc	CARVEDILOL
HYCAMTIN	GlaxoSmithKline LLC	TOPOTECAN HYDROCHLORIDE
Minocycline Hydrochloride	Sandoz Inc	MONTELUKAST SODIUM
Penicillin V Potassium	NorthStar Rx LLC	PENICILLIN V POTASSIUM
PROMACTA	GlaxoSmithKline LLC	ELTROMBOPAG OLAMINE
REQUIP	GlaxoSmithKline LLC	ROPINIROLE HYDROCHLORIDE

```
SELECT DISTINCT drug, manufacturer, active_ingredient
                                    FROM vw_Doctor_Drug
                                    WHERE doctor = ?
```

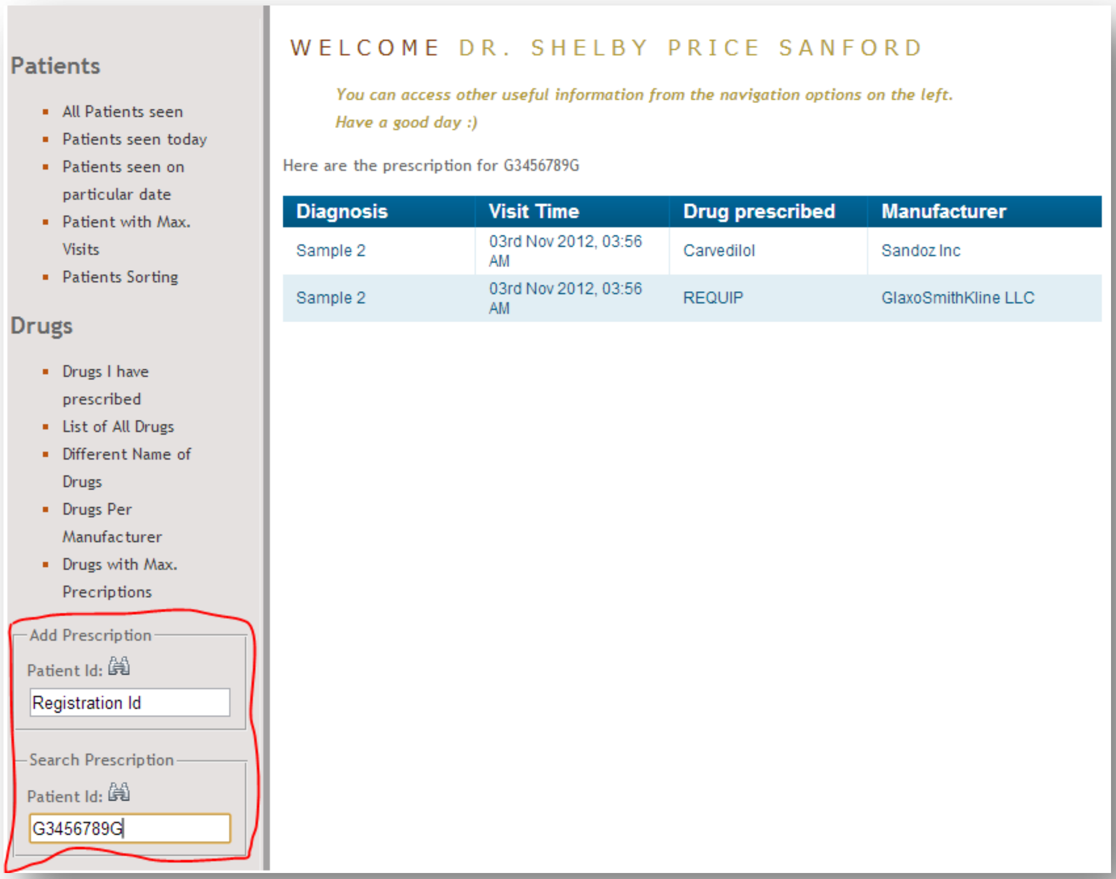
Function: Drugs Per Manufacturer

```
SELECT COUNT(d.commercial_name), d.manufacturer
                                   FROM drug d
          GROUP BY d.manufacturer
```

Function: Drugs With Max Prescriptions

```
SELECT drug, manufacturer, active_ingredient, COUNT(*)
                                    FROM vw_Doctor_Drug
            WHERE doctor = ?
            GROUP BY drug, manufacturer, active_ingredient
            HAVING COUNT(*) >= ALL(
                          SELECT COUNT(*)
                          FROM vw_Doctor_Drug
                          WHERE doctor = ?
                          GROUP BY drug)
```

Function: Add Prescirtion or View Prescreption - This uses procedure to check if the id exists and if it does, returns the required info (The Procedure has been defined above.)



Patients

- All Patients seen
- Patients seen today
- Patients seen on particular date
- Patient with Max. Visits
- Patients Sorting

Drugs

- Drugs I have prescribed
- List of All Drugs
- Different Name of Drugs
- Drugs Per Manufacturer
- Drugs with Max. Precriptions

Add Prescription
Patient Id:
Registration Id

Search Prescription
Patient Id:
G3456789G

WELCOME DR. SHELBY PRICE SANFORD

You can access other useful information from the navigation options on the left.
Have a good day :)

Here are the prescription for G3456789G

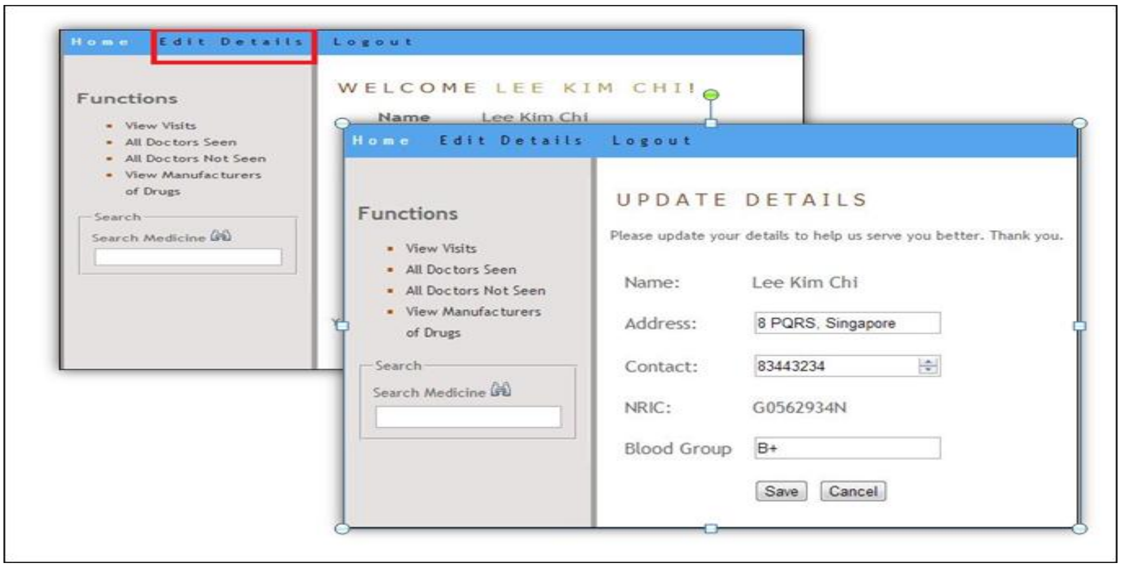
Diagnosis	Visit Time	Drug prescribed	Manufacturer
Sample 2	03rd Nov 2012, 03:56 AM	Carvedilol	Sandoz Inc
Sample 2	03rd Nov 2012, 03:56 AM	REQUIP	GlaxoSmithKline LLC

```
EXEC CheckPatientId @doctor_id =?, @patient_id=?, @forDiagnosis=?
```

Function: Insert a prescription for a patient who has visited the doctor.

```
INSERT INTO prescribe
                                    VALUES(?,?,?,?,?,?,?,?,?,?,?)
```

SQL USED FOR PATIENT



WELCOME LEE KIM CHI!

Name Lee Kim Chi

UPDATE DETAILS

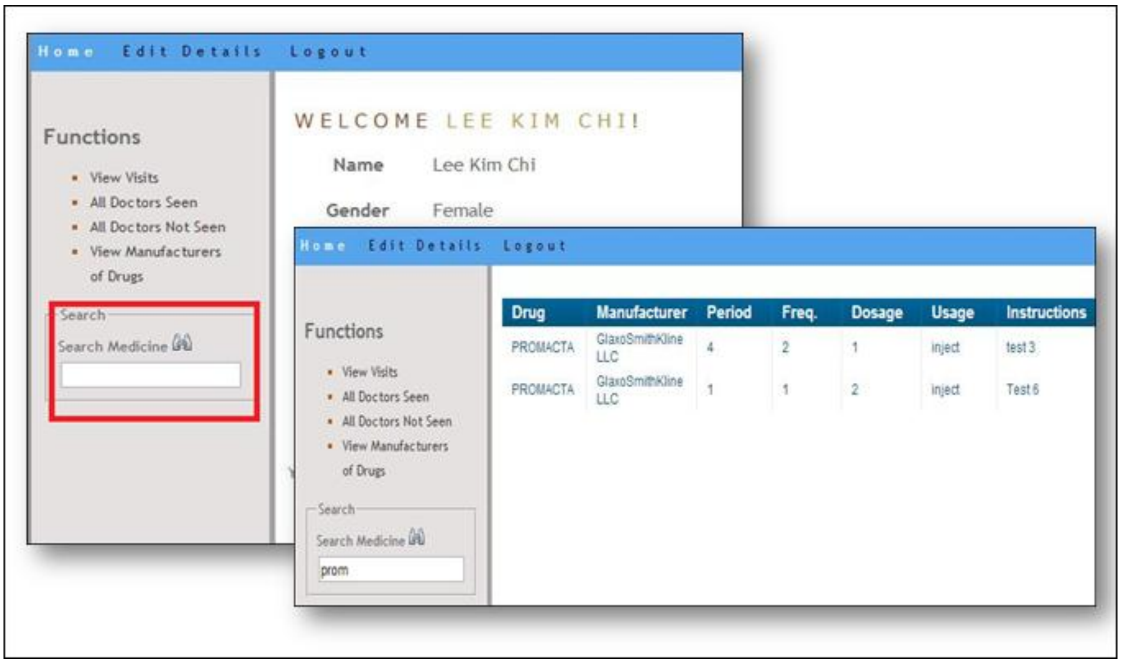
Please update your details to help us serve you better. Thank you.

Name:	Lee Kim Chi
Address:	8 PQRS, Singapore
Contact:	83443234
NRIC:	G0562934N
Blood Group	B+

Function: To allow the patient to edit his/her information on the system

UPDATE patient
SET address=$address, contact_number=$contact, blood_group=$blood_group
WHERE id_Number=$patient_id

(where $address, $contact and $blood_group are obtained from the form where the user updates details, and $patient_id refers to the logged in user's ID)



WELCOME LEE KIM CHI!

Name Lee Kim Chi

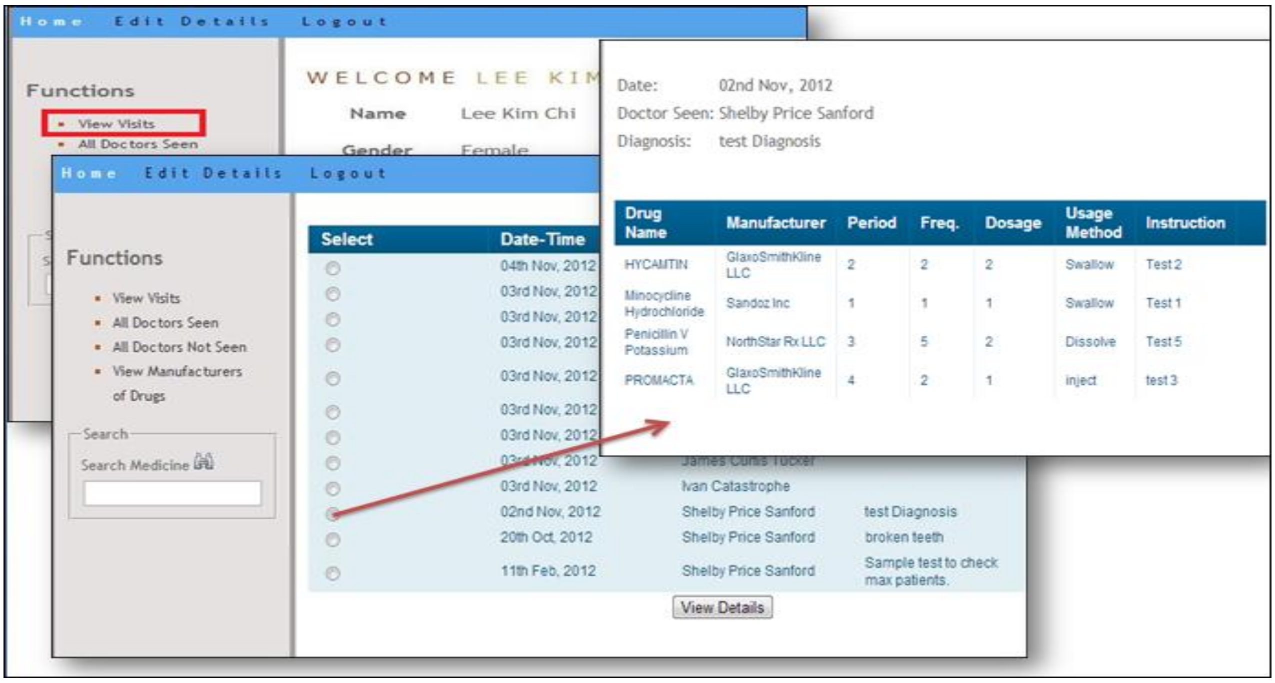
Gender Female

prom

Drug	Manufacturer	Period	Freq.	Dosage	Usage	Instructions
PROMACTA	GlaxoSmithKline LLC	4	2	1	inject	test 3
PROMACTA	GlaxoSmithKline LLC	1	1	2	inject	Test 6

Function: To allow logged in patient to search his/her records according to name of medicine

```
SELECT drug, manufacturer, period, frequency, dosage, usage_method,
                                                        other_instruction
FROM vw_patient
WHERE patient=$patient_if AND drug LIKE %$text-searchbox%";
```



Name Lee Kim Chi
Gender Female

Select	Date-Time		
○	04th Nov, 2012		
○	03rd Nov, 2012		
○	03rd Nov, 2012		
○	03rd Nov, 2012		
○	03rd Nov, 2012		
○	03rd Nov, 2012		
○	03rd Nov, 2012		
○	03rd Nov, 2012	James Curtis Tucker	
○	03rd Nov, 2012	Ivan Catastrophe	
●	02nd Nov, 2012	Shelby Price Sanford	test Diagnosis
○	20th Oct, 2012	Shelby Price Sanford	broken teeth
○	11th Feb, 2012	Shelby Price Sanford	Sample test to check max patients.

Date: 02nd Nov, 2012
Doctor Seen: Shelby Price Sanford
Diagnosis: test Diagnosis

Drug Name	Manufacturer	Period	Freq.	Dosage	Usage Method	Instruction
HYCAMTIN	GlaxoSmithKline LLC	2	2	2	Swallow	Test 2
Minocycline Hydrochloride	Sandoz Inc	1	1	1	Swallow	Test 1
Penicillin V Potassium	NorthStar Rx LLC	3	5	2	Dissolve	Test 5
PROMACTA	GlaxoSmithKline LLC	4	2	1	inject	test 3

Function: To allow the user to view past visits/ Selecting a visit displays all the information associated with the visit, like doctor name, prescriptions etc.

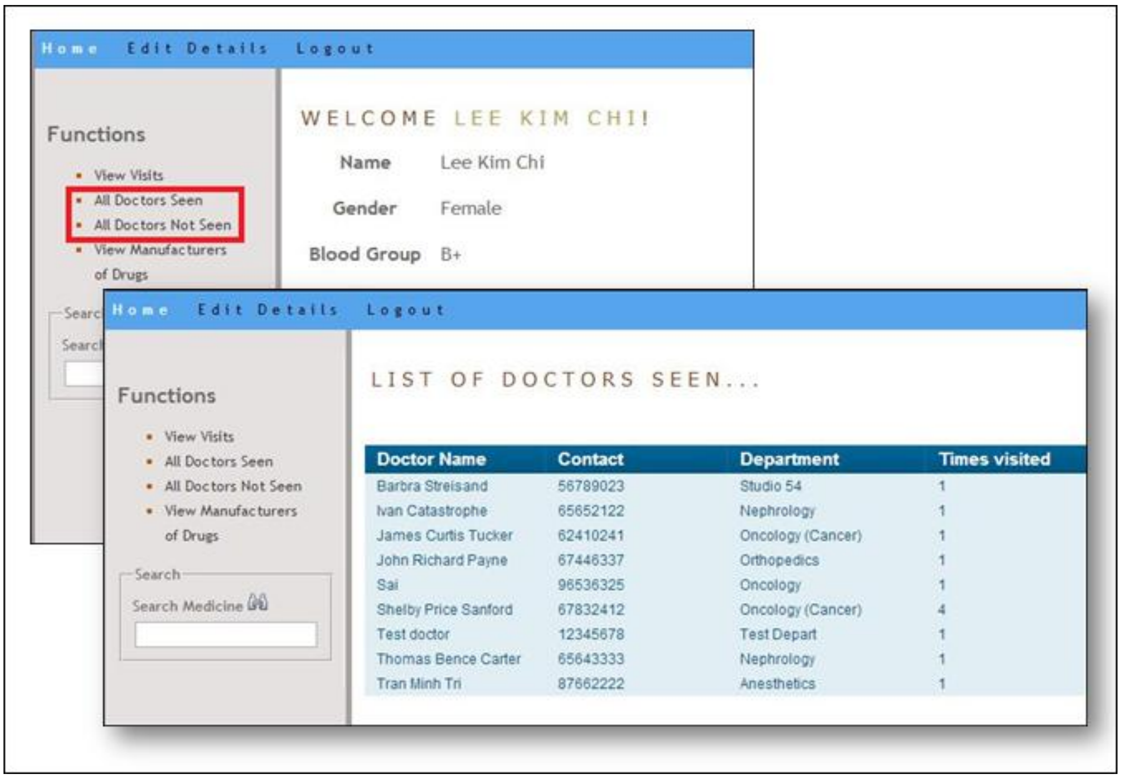
//To get all visits ordered by date

```
SELECT name, datetime, diagnosis
FROM vw_Patient
WHERE patient=$patient_id
ORDER BY datetime DESC
```

//To view details about selected visit

```
SELECT drug, manufacturer, period, frequency, dosage, usage_method,
other_instruction
FROM vw_Patient
WHERE patient=$patient_id AND datetime=CONVERT(datetime, $datetime)
```

(where $*datetime* is derived from the above query. This is based on the fact that a patient can have only one visit for a particular datetime)



WELCOME LEE KIM CHI!

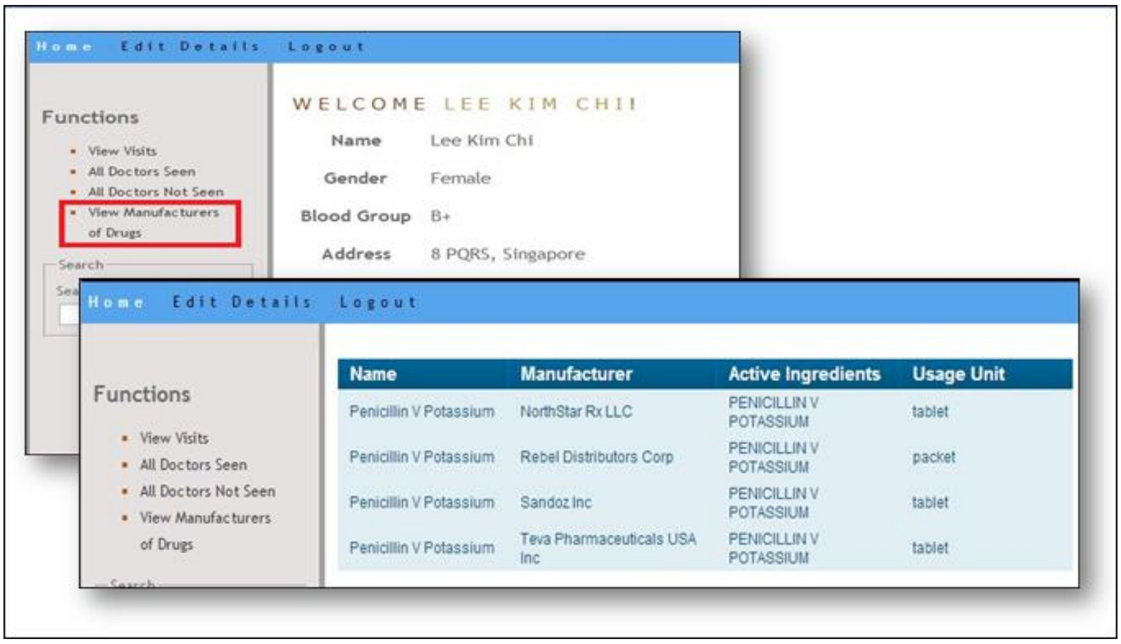
Name	Lee Kim Chi
Gender	Female
Blood Group	B+

LIST OF DOCTORS SEEN...

Doctor Name	Contact	Department	Times visited
Barbra Streisand	56789023	Studio 54	1
Ivan Catastrophe	65652122	Nephrology	1
James Curtis Tucker	62410241	Oncology (Cancer)	1
John Richard Payne	67446337	Orthopedics	1
Sai	96536325	Oncology	1
Shelby Price Sanford	67832412	Oncology (Cancer)	4
Test doctor	12345678	Test Depart	1
Thomas Bence Carter	65643333	Nephrology	1
Tran Minh Tri	87662222	Anesthetics	1

Function: To allow the patient to see information of doctors visited, along with contact details and number of times he/she has been visited by patient. The patient can also view the names, contacts and specializations of doctors in the clinic not visited for future appointments.

```
//Doctors visited
SELECT d.name, d.contact_number, d.department, COUNT(v.doctor)
FROM doctor d, visit v
WHERE v.patient=$patient_id AND v.doctor=d.id_number
GROUP BY d.name, d.contact_number, d.department

//Doctors not visited
SELECT DISTINCT d.name, d.contact_number, d.department,
                                        d.specialization
FROM doctor d, visit v
WHERE v.patient=$patient_id AND
          d.id_number NOT IN (SELECT doctor FROM visit)
```



WELCOME LEE KIM CHI!

Name	Lee Kim Chi
Gender	Female
Blood Group	B+
Address	8 PQRS, Singapore

Name	Manufacturer	Active Ingredients	Usage Unit
Penicillin V Potassium	NorthStar Rx LLC	PENICILLIN V POTASSIUM	tablet
Penicillin V Potassium	Rebel Distributors Corp	PENICILLIN V POTASSIUM	packet
Penicillin V Potassium	Sandoz Inc	PENICILLIN V POTASSIUM	tablet
Penicillin V Potassium	Teva Pharmaceuticals USA Inc	PENICILLIN V POTASSIUM	tablet

Function: View prescribed drugs to logged in patient, which are also available by other manufacturers

```
SELECT d.commercial_name, d.manufacturer, d.active_ingredient, d.usage_unit
FROM drug d
WHERE d.commercial_name IN
                (SELECT drug FROM vw_Patient WHERE patient=$patient_id)
                AND
        d.commercial_name=ANY
                        (SELECT dr.commercial_name
                        FROM drug dr
                        GROUP BY dr.commercial_name
                        HAVING COUNT(*)>0)
```

Site Compatibility

The site is compatible with the following browsers:

- Google Chrome 18 and above
- Internet Explorer 10
- Firefox 16 and above