DMD Project Phase 2
A database design for a
“Hospital Management System”

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Requirement ID	Uniquely identifies requirement
Title	Gives the requirement a symbolic name
Type	Functional or non-functional
Description	The definition of the requirement
Priority	Defines the order in which requirements should be implemented. Priorities are designated (highest to lowest) from 1 to 3. Requirements of priority 1 are mandatory; 2 represents features nice to have, and 3 represents optional features.
Risk	Specifies the risk of not implementing the requirement. It shows how critical the requirement is to the system as a whole. The following risk levels are defined over the impact of not being implemented correctly. ● Critical (C) It will break the main functionality of the system. The system cannot be used if this requirement is not implemented. ● High (H) It will impact the main functionality of the system. Some function of the system could be inaccessible, but the system can be generally used. ● Medium (M) It will impact some system features, but not the main functionality. The system can still be used with some limitation. ● Low (L) The system can be used without limitation, but with some workarounds.

Functional requirements

(Sorted firstly by priority and then by risk)

Requirement ID	0006
Title	Appointments
Type	Functional
Description	Registered patients and medics can make and cancel appointments using the system (the web portal)
Priority	1
Risk	C

Requirement ID	0012
Title	Receptionist and registration
Type	Functional
Description	Receptionist can register patient
Priority	1
Risk	C

Requirement ID	0013
Title	Web-portal information for receptionist
Type	Functional
Description	Receptionist can view appointments, hospital records, notifications, messages
Priority	1
Risk	C

Requirement ID	0014
Title	Receptionist and appointments
Type	Functional
Description	Receptionist can make and cancel appointments
Priority	1
Risk	C

Requirement ID	0009
Title	Medics and medical records
Type	Functional
Description	Medics can make medical records.
Priority	1
Risk	C

Requirement ID	0018
Title	Information about accounts
Type	Functional
Description	The system must keep personal information of all registered patients. New accounts must be automatically added to the database.
Priority	1
Risk	C

Requirement ID	0020
Title	Automated medical records
Type	Functional
Description	All patient’s medical records must be tracked by the system. New records must be automatically appended to the record list after doctor’s appointments.
Priority	1
Risk	C

Requirement ID	0021
Title	Management and distribution of information
Type	Functional
Description	The system must contain information about all appointments, notifications, messages and display them to appropriate users.
Priority	1
Risk	C

Requirement ID	0023
Title	Access management
Type	Function
Description	The system must provide different permissions and access levels (admin, patient, doctor, receptionist, storekeeper). In particular, receptionist can manage appointments, hospital records and message.
Priority	1
Risk	C

Requirement ID	0001
Title	Registration
Type	Functional
Description	Any unregistered patient can register in the system. The process of registration includes filling personal information.
Priority	1
Risk	H

Requirement ID	0008
Title	Doctor and medicines
Type	Functional
Description	Doctor can prescribe medicines.
Priority	1
Risk	H

Requirement ID	0016
Title	Medicine providing
Type	Functional
Description	Storekeeper can provide medicine that have been requested
Priority	1
Risk	H

Requirement ID	0002
Title	Medic and invoice requesting
Type	Functional
Description	Medic can request medication bill (invoice)
Priority	1
Risk	H

Requirement ID	0025
Title	Create/Edit/Delete invoices
Type	Functional
Description	Accountant can create, edit and delete invoices that have been requested
Priority	1
Risk	H

Requirement ID	0033
Title	Delivering invoices to patients
Type	Functional
Description	Accountant can send invoices to patients for further payment
Priority	1
Risk	H

Requirement ID	0034
Title	Payment
Type	Functional
Description	Registered patient must pay invoices that have been created by accountant
Priority	1
Risk	H

Requirement ID	0015
Title	Invoices keeping
Type	Functional
Description	System must contain all invoices
Priority	1
Risk	H

Requirement ID	0003
Title	Timetable of doctors
Type	Functional
Description	Anybody can see the timetable of doctors on the hospital web portal.
Priority	1
Risk	M

Requirement ID	0017
Title	Medicine adding
Type	Functional
Description	Storekeeper can add medicine to the inventory
Priority	1
Risk	M

Requirement ID	0019
Title	Actual information
Type	Functional
Description	The system must display the actual timetables of doctors, contact information.
Priority	1
Risk	M

Requirement ID	0024
Title	Medicine inventory management
Type	Functional
Description	The system must track the medicine inventory, remove medications after requests, add medication (requested by a storekeeper) and inform a storekeeper in case of lack of particular medications.
Priority	1
Risk	M

Requirement ID	0005
Title	Web portal information for patients
Type	Functional
Description	Registered patients and medics can view appointments, hospital records, notifications, messages in the web portal. A patient can view only his own hospital records. Medic can view hospital records of the patient.
Priority	2
Risk	M

Requirement ID	0004
Title	Contact the reception
Type	Functional
Description	Patients can contact the reception
Priority	2
Risk	L

Requirement ID	0011
Title	Doctors intercommunication
Type	Functional
Description	Doctors can make an appointment for patients to another doctor
Priority	2
Risk	L

Requirement ID	0010
Title	Medicine requests
Type	Functional
Description	Medics can request medicines from the inventory
Priority	3
Risk	C

Requirement ID	0007
Title	Chat in the web portal
Type	Functional
Description	Registered patient and medics can chat via the web portal.
Priority	3
Risk	L

Requirement ID	0022
Title	Chat
Type	Functional
Description	The system must support communication between users in form of the chat.
Priority	3
Risk	L

Requirement ID	0032
Title	Blood donation
Type	Functional
Description	The registered patient can donate some blood.
Priority	3
Risk	L

Non-functional requirements

(Sorted by priority)

Requirement ID	0026
Title	Availability
Type	Non-functional
Description	The system must work 24/7.
Priority	1
Risk	C

Requirement ID	0030
Title	Security
Type	Non-functional
Description	The system must be well-secured
Priority	1
Risk	C

Requirement ID	0031
Title	Scalability
Type	Non-functional
Description	The system must be easily extended for any type of hospitals
Priority	1
Risk	C

Requirement ID	0027
Title	Backups
Type	Non-functional
Description	The system must periodically backup all data.
Priority	2
Risk	L

Requirement ID	0028
Title	Fault tolerance
Type	Non-functional
Description	The server must automatically restart in case of shut down.
Priority	2
Risk	L

Requirement ID	0029
Title	User-friendly interface
Type	Non-functional
Description	The web portal must have intuitive and user-friendly interface.
Priority	2
Risk	L

ER diagram choices explanation

An ACCOUNTANT, a STOREKEEPER, a MEDIC, and a RECEPTIONIST are EMPLOYEEs. They are weak entities with the foreign key - emp_id. An EMPLOYEE entity has attribute emp_type which specifies what type the employee is.

A doctor and a nurse have much in common so we created a weak entity called a MEDIC - a generalization of a DOCTOR and a NURSE.

A MEDIC has attribute medic_type which specifies what type the medic is - a doctor or a nurse.

All the relations in this hierarchy are 1 to 1 relations with total participation from the specified entity side. We did it because every type of EMPLOYEE must have the foreign key - emp_id.

On the Phase 1 use case diagram we had PATIENT, REGISTERED PATIENT, UNREGISTERED PATIENT. In ER diagram we decided to have only REGISTERED PATIENT, because we decided not to store information about visitors.

We decided that our APPOINTMENTs are needed to be managed only by one RECEPTIONIST. Also we decided that APPOINTMENT can not exists without a MEDIC and a REGISTERED PATIENT. Many MEDICs and only one REGISTERED PATIENT can participate in an APPOINTMENT.

One EMPLOYEE can send one message in time either to another EMPLOYEE or REGISTERED PATIENT. We decided to do so, because it is easier to implement. REGISTERED PATIENTs cannot communicate with each other in the system, because this information does not relate to hospital system.

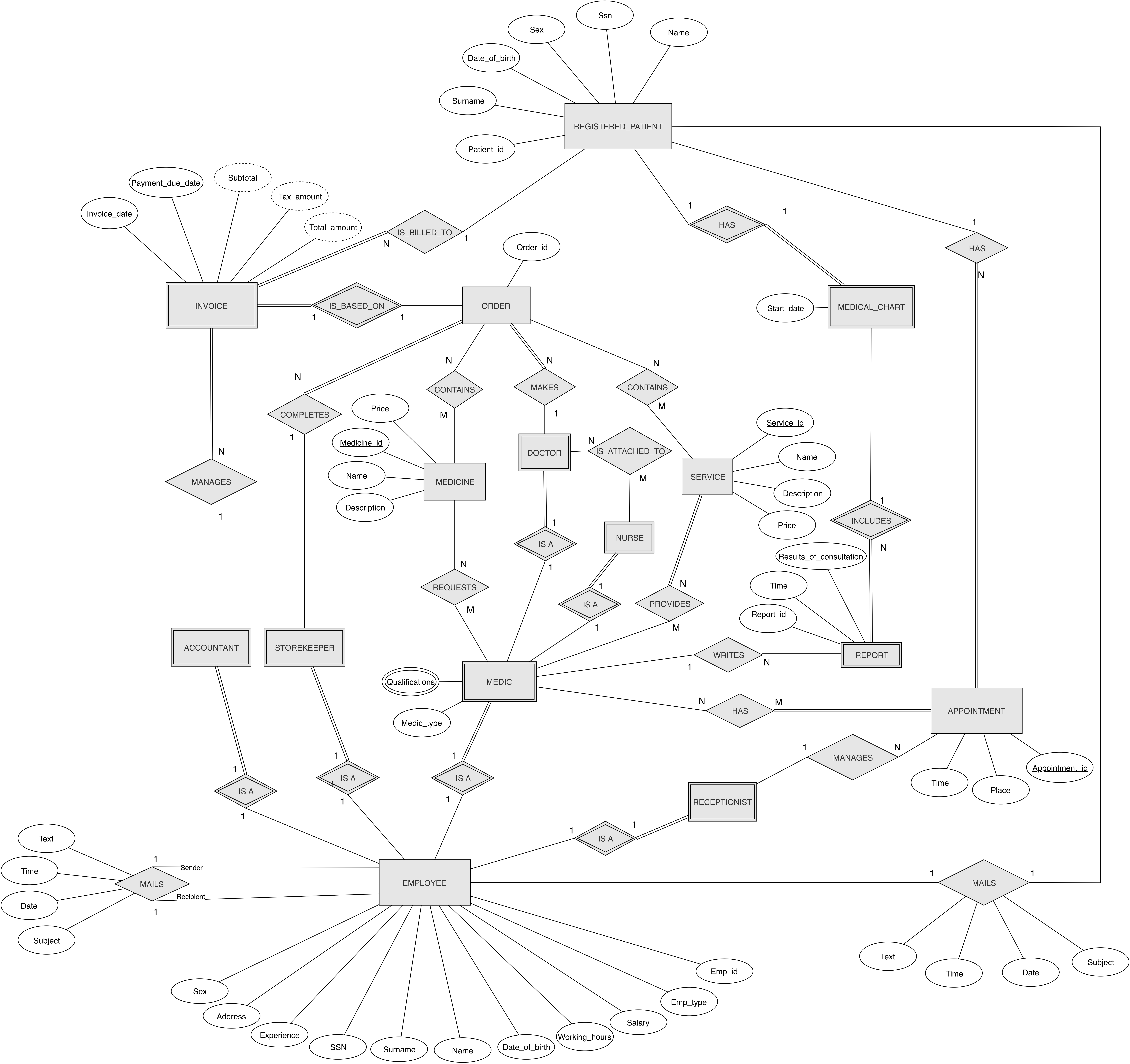
We decided that an INVOICE must be an Entity, because it is the important part of paying system. To manage this entity we created new entity - ACCOUNTANT.

The ORDER entity was created with a purpose to manage communication between DOCTOR and STOREKEEPER to prescribe medicines. Also ORDER contains the list of services provided by MEDIC.

Each REGISTERED PATIENT has the only MEDICAL CHART consisting of REPORTs. So, a MEDICAL CHART can be considered as a weak entity with the foreign key patient_id.

REPORT is the outcome of the appointment, which is written by a MEDIC and included into MEDICAL CHART.

Due to the unknown constraints we decided several NURSEs to be attached to one DOCTOR and one NURSE can help several DOCTORS.


Sex
Ssn
Name
Date_of_birth
Surname
REGISTERED_PATIENT
Patient_id
Payment_due_date
Subtotal
Tax_amount
Invoice_date
Total_amount
IS_BILLED_TO
N
1
1
HAS
1
1
HAS
N
Order_id
INVOICE
IS_BASED_ON
1
1
ORDER
MEDICAL_CHART
Start_date
N
N
N
N
CONTAINS
MAKES
CONTAINS
COMPLETES
M
1
M
1
Price
Service_id
Medicine_id
DOCTOR
N
IS_ATTACHED_TO
Name
N
Name
MEDICINE
M
SERVICE
MANAGES
Description
Description
1
1
INCLUDES
1
IS A
NURSE
Price
N
1
N
Results_of_consultation
REQUESTS
1
Time
IS A
N
PROVIDES
M
1
Report_id
M
ACCOUNTANT
STOREKEEPER
WRITES
1
N
REPORT
Qualifications
MEDIC
Medic_type
N
HAS
M
APPOINTMENT
1
1
1
1
MANAGES
N
IS A
IS A
IS A
1
1
1
1
Time
Place
Appointment_id
RECEPTIONIST
1
1
IS A
Text
Time
1
Sender
MAILS
EMPLOYEE
1
MAILS
1
Date
Recipient
1
Subject
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Sex
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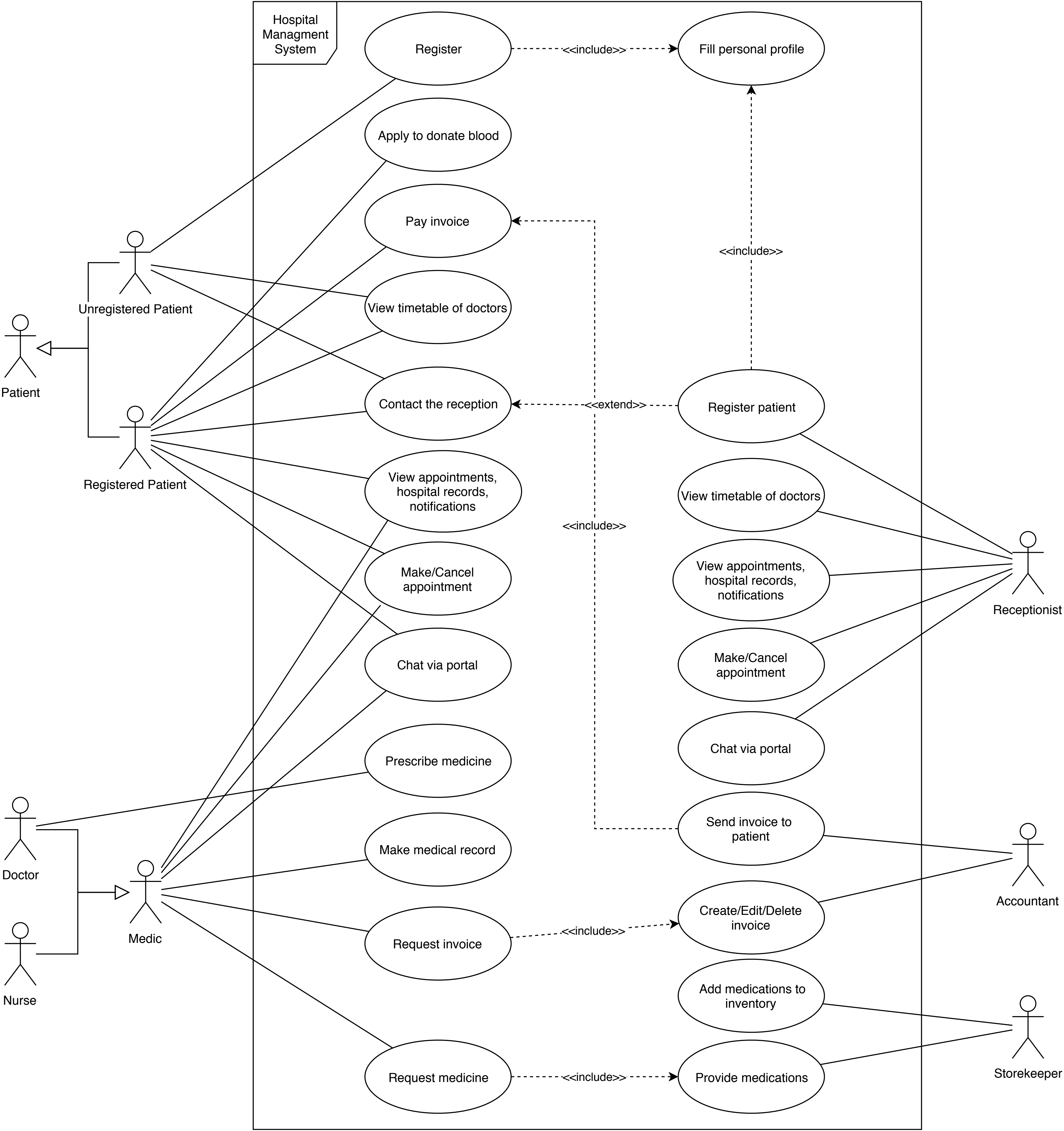
Salary
Experience
Working_hours
SSN
Surname
Name
Date_of_birth


Hospital Managment System
Register
<<include>>
Fill personal profile
Apply to donate blood
Pay invoice
<<include>>
View timetable of doctors
Unregistered Patient
Patient
Contact the reception
<<extend>>
Register patient
Registered Patient
View appointments, hospital records, notifications
View timetable of doctors
<<include>>
View appointments, hospital records, notifications
Receptionist
Make/Cancel appointment
Make/Cancel appointment
Chat via portal
Chat via portal
Prescribe medicine
Doctor
Send invoice to patient
Make medical record
Accountant
Medic
Create/Edit/Delete invoice
Request invoice
<<include>>
Nurse
Add medications to inventory
Storekeeper
Request medicine
<<include>>
Provide medications