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MEDICAL MANAGEMENT SYSTEM

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1. Executive Summary

1.1 *Project Overview*

Our project consists of a Web-based application for a Management System for Hospitals with its main points being leaving appointments online, keeping medical records for each patient in a digital form instead of on paper, how they are now, keeping records of hospitalizations and emergencies and also showing timetables for medical personnel.

The implementation of the idea will work closely with polyclinics by having access at their databases for patients they forward to our system. Polyclinic's receptionists, which will have their own account in our system, will be the ones to leave appointments for their patients depending on the hospital doctor's timetable and also share the medical records of the patient with that doctor.

Each doctor will have his/her own account where he/she can add patients, leave appointments (this is done by polyclinic's receptionists mainly/mostly), cancel them, write prescriptions, check the medical records of a patient and alter them if needed. In addition the specialist doctor can send requests to the hospital receptionist to reserve a bed to hospitalize a patient, if he sees it necessary after an appointment.

Also, in our system we will keep track of each doctor's timetable and display how the shifts are going to be. Besides doctors, higher ups in administrate will have their own accounts, where they can make changes in timetables, shifts and in personnel such as adding/removing doctors.

Hospital receptionists will also have accounts but mostly of an observing nature, they won't be able to make any changes but only check timetables, inform patients on them but also add new entries for people who come for an emergency and choose beds for patients who will be hospitalized.

Nurses will have their own accounts, where they submit reports on the progress of the hospitalized patients.

In addition, the project will consist of a separate part for the emergency section of the hospital to hold records of when the patient comes, his basic personal information, what was his problem and which doctor attended to his needs. This information as we said will be added by the hospital receptionists.

The project is intended towards public hospitals.

1.2 *Purpose and Scope of this Specification*

The purpose of our project is to facilitate the way the hospitals in our country work. The idea came while thinking about the numerous problems the health department faces such as people waiting in long lines and medical records getting lost and not being kept in order. Our Management System aims to remove such long lines by people leaving appointments at a specific time when the doctor is available and holding all records of patient activity in the hospital in digitalized form. Such activity includes not only appointments but also emergency entries, hospitalizations, shifts. Thus records will be less likely to get lost or get mixed up.

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In scope:

- Modification of the way patient records are being kept in a hospital
- Modification of the way appointments at the doctor's office are reserved
- Modification of the way hospitalized patients' progress are kept
- Modification of the way the shifts are displayed
- Modification of the way emergency entries are kept

Out of scope:

- Modifications of the administrative part of the Hospital

2. Product/Service Description

2.1 Product Context

This project is about a Medical Management System available for hospitals. It is not an independent system because it has a accessible database with polyclinics, so it is depended on the polyclinic.

2.2 User Characteristics

In this project there are five types of users:

- Administrator
- Polyclinic Receptionist
- Specialist Doctor
- Hospital Receptionist
- Nurses

a. Administrator

The administrator of our software will be created initially by the programmers. Afterwards, the account will be given to one of the top members of hospital hierarchy whom can be The Dean of the hospital or hospital Administrators. He/she will be in charge of scheduling of timetables. Also, another task of admin is adding or removing staff members such as : doctors ,receptionists and nurses.

b. Polyclinic Receptionist

In this project the polyclinic receptionist is not a member of the hospital. He/she is only needed to set appointments to the specialist doctor and along with it exports also the patients' medical history.

c. Specialist Doctor

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The specialist doctor is the one that receives the appointments from polyclinic receptionist. After checking the patient he/she can: fill a digital prescription, set the patient for further testing ,immediately send the patient to the emergency and also hospitalizing the patient. In addition, for every change in patients' medical history the specialist doctor will make the necessary updates and then send it back to the polyclinic receptionist.

In cases where the patient comes to emergency without being sent from polyclinic receptionist, the specialist doctor in charge will create a new entry in that hospital, by completing the medical parts of his/her charts.

Finally, specialist doctor has the option to cancel any of his/hers appointment.

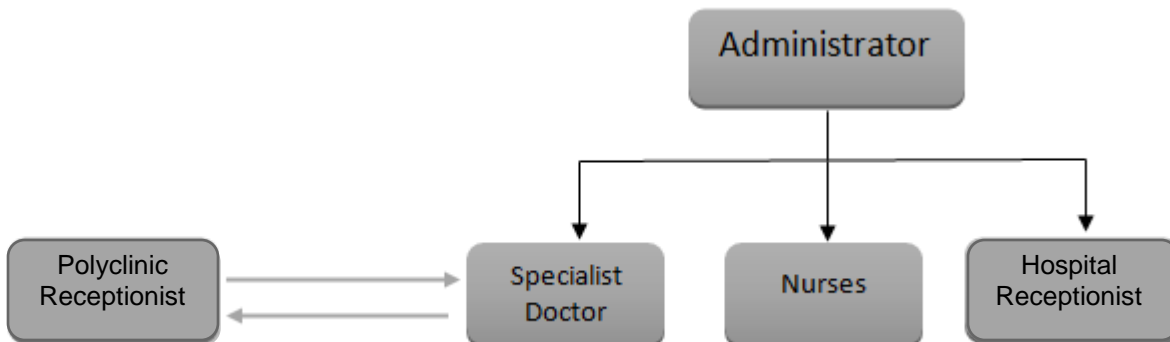
d. Hospital Receptionist

Hospital receptionists' job is to access the doctors' timetables and to create a new entry in emergency room by fulfilling on the patient credentials.

e. Nurses

The nurses are divided in different wards. They are in specialist doctors' supervision and can also fulfill the patient records for some conditional cases. Their responsibilities are set by the specialist doctor in charge and can only complete the given tasks such as: taking tests from a patient, making sure the medicine is given at the right time and amount etc.

Here is a diagram on how these users are connected with each-other:



2.3 Assumptions

- It is assumed that everything is done according the law.
- It is assumed that the doctors insert properly the patients' diagnoses and prescription.
- It is assumed that the timetables of hospitals' staff are set properly.
- It is assumed that doctors are coordinated in schedules for emergency.
- It is assumed that a patient knows the time of the appointment.

2.4 Constraints

- A management system should be implemented at polyclinics too

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- Access to polyclinics' databases is a must (will be done using XML)
- Patients should have medical records at the corresponding polyclinic
- Patients should go to polyclinic first and then forwarded to us if necessary
- Only the doctor and nurse attending to a patient can have access to that patient's records
- Only higher ups in the hospital can make changes such as add/remove staff, change timetables and shift schedules
- Receptionists can only see timetables but cannot make any changes
- Each doctor should have a PC in his/her office
- Internet connection should be stable and available at all times

3. Requirements

3.1 Functional Requirements

The requirement numbering has a scheme - FR_## (FR for Functional Requirement).

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
FR_01	The web application has different views for each type of user, each one of them having different functionalities accordingly.	<ul style="list-style-type: none">- A view for polyclinic receptionists- A view for specialist doctors- A view for hospital receptionists- A view for nurses- A view for the administrator			
FR_02	All the accounts for each type of user are secured with a password.	The password is stored in the database by firstly hashing it, so that only the user knows it.			
FR_03	Each user will be uniquely identifiable by his/her own id.	It guarantees that each user is uniquely identifiable (no two users have the same id, thus no ambiguity).			
FR_04	Admin can add, remove or edit doctors, receptionists and nurses, as well set the timetable for each one of them.	Admin is the only user responsible for updating or editing users such as: doctor, receptionist and nurse.			

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Req#	Requirement	Comments	Priori ty	Date Rvwd	SME Reviewed / Approved
FR_05	Admin has restricted access to all patients' records.	Admin has no right to have sensitive information about any of the patients.			
FR_06	All the patients' profiles that are added by the doctor or the receptionist have to obey the validation rules determined by the system itself.	Every attribute that is inserted into the database must strictly stick to the rules previously set.			
FR_07	Only the polyclinic receptionist is able to set appointments for patients.	The polyclinic receptionist is the only user that has the right to set appointments.			
FR_08	Each specialist doctor has the right to cancel his/her appointment.	If the doctor can't reach the time set for an appointment for different reasons, he is able to cancel it.			
FR_09	Once the specialist doctor cancels a patient's appointment, the patient is notified about this fact by email.	An email is sent automatically when the appointment has been cancelled.			
FR_10	The polyclinic receptionist must export the anamnesis of the patient whom he/she is making an appointment for.	This is a must, because otherwise there won't be any information about the patient in the system.			
FR_11	After updating the anamnesis of a patient, the specialist doctor has to export the generated format of the anamnesis back to the polyclinic receptionist.	For every change in the anamnesis of a patient, the specialist doctor has to inform the polyclinic receptionist.			
FR_12	Hospital receptionists can only add personal information when creating a new entry for a patient that comes to the emergency ward.	Receptionist fills in the formalities for each new patient that comes in the emergency.			

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Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
FR_13	The specialist doctor at the emergency ward adds a new patient after examining him/her.	The specialist doctor has the right to add a new patient, when in emergency ward.			
FR_14	Hospital receptionist has restricted access to all patients' records.	Receptionist has no right to have sensitive information about any of the patients.			
FR_15	The system generates automatically reports for statistical purposes.	Reports, such as for number of patients in a special ward in a month, types of most faced medical diagnosis, etc. are generated in PDF format.			
FR_16	Admin is the only one who can access the automatically generated reports for statistical purposes.	All others users don't have any access to the reports.			
FR_17	Admin can search doctors, nurses and receptionists without any limitation, but not patients.	Getting information for doctors, nurses and receptionists, but not for patients (ethical issues).			
FR_18	Admin can search the timetables for the doctors that stay in the emergency ward.	Search for the doctors who have the shift at the emergency ward.			
FR_19	When doctors are logged in, they can search only their patients.	Ethical reasons because of the confidentiality of the information for all other patients that this doctor has no relation to.			
FR_20	The hospital receptionist can search the timetables and get information for the availability of a specialist doctor and also for the doctors at the emergency ward as well.	Search the doctor's appointments and the doctors who are at the emergency ward.			

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Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
FR_21	The specialist doctor has a dedicated page where they can view the hospitalized patients.	This page will contain the ID, name, surname, room and also information on the patient's records and his/her progress written by the nurse.			
FR_22	The hospital receptionist assigns the room and bed to the patient waiting to be hospitalized.	When the specialist doctor makes a room request the receptionist views the rooms' availability for that specific ward and assigns one to that patient.			
FR_23	The hospital receptionist can search for a hospitalized patient in order to find his/her room during the visiting hours.	Using name/surname/ID of a patient the receptionist can easily find in which room the patient is.			
FR_24	The nurse can search for a patient that is assigned to her (that is in her ward).	Using name/surname/ID of a patient the nurse can easily find that patient.			
FR_25	The specialist doctor sends a request for hospitalization whenever he/she considers it necessary for the patient's case.	The specialist doctor makes the request for hospitalization and the nurse proceeds later with assigning the room.			
FR_26	Nurses have restricted access to the patients' records that are not in their ward.	Nurses have no right to obtain sensitive information about any of the patients that don't belong to their ward.			

3.2 Non-Functional Requirements

3.2.1 Product Requirements

3.2.1.1 Usability Requirements

- The software is very user-friendly which makes it very easy to work with.

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- On the first log in each user will have small tips on how the system works and what it provides.
- Admin will be the only person that can register staff members. The system has the right instructions to make this step easier.
- After registration, admin has no more clearance to access any of doctors or receptionists credentials.
- After changing the given password, nurses, receptionists and doctors are the only ones with access to their accounts.
- The system is conceptualized to be easy to learn and to use.

3.2.1.2 User Interface Requirements

The user interface of the web-based application will be executable to browsers like Chrome and Mozilla. Before entering the system each of our users: admin, nurse, receptionists or doctors will face each a login interface where he/she must provide the medical ID and password. After this step each user, will be sent to his/hers own appropriate view.

- Admin will have a view of a table of all medical specialties in the hospital with corresponding doctors and two buttons to Add/Remove doctors.
- Receptionist will have an interface where he/she can view the doctors' timetable.
- Doctors will have a view of his/hers timetable, the hospitalized patients and an interface where he/she can complete a prescription for each patient.
- Nurse will have a view of all hospitalized patients and a module of all tasks (medications / tests) given by the specialist doctor for each patient.

3.2.1.3 Efficiency Requirements

3.2.1.3.1 Performance Requirements

- The software will be based on web and has to be run from a web server.
- The software shall support all the workers in the hospital who must have access in the system at any time.
- The software will take initial load time depending on internet connection strength which also depends on the media from which the product is run.
- The performance will depend upon hardware components of each user.
- Registration of data for each entity shall be processed in a few milliseconds

3.2.1.3.1.1 Capacity

This project will require constantly export and import of patients data between different databases. This process will most probably increase the time of execution and maybe will make a queue of requests and responds from the database.

3.2.1.3.1.2 Availability

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- The software will be active and utilized 24 hours on every day of the week.
- Since the project is built up on a specific hospital, the geographic coverage area of the software will be only inside the hospital.
- The system is made to decrease the lines of wait in hospitals so each patient must have scheduled an appointment in correct procedures. The unscheduled patients can only be accepted in emergency ward.
- The system is not available on patients.
- The system will be reliable because the failures would cause unwanted queues.

3.2.1.3.1.3 Latency

The project is based on internet connection so the most common problem that would cause delays will be the internet latency.

3.2.1.4 Manageability/Maintainability Requirements

3.2.1.4.1 Monitoring

The best will be done by our team to have a reliable and robust system, but there can be unexpected cases when the application malfunctions (due to bugs, attacks, etc). To make sure that these cases will not happen we will be in continuous discussion with our supervisor and tester.

3.2.1.4.2 Maintenance

MySQL is used for maintaining the database and the Apache server takes care of the site. In case of a failure, a re-initialization of the program is recommended. If it is not the case, that means that the server may be down, so the user needs to wait for the system administrator to start the server.

For emergent cases of breakdown, we will provide the software with the backup of the web application and the database. The application shall be easy to extend. The code shall be written in a way that it favors implementation of new functions and additions of new lines of code. Also, modularity in the organization provides for a better maintenance.

3.2.1.4.3 Operations

Some normal and special operations required by each user are:

- Admin
 - Register of doctors and receptionists and log in
 - Add/Remove doctors
 - Add/Remove receptionists
 - Update his/her own profile
 - Set timetable for all staff
 - Access automatically-generated reports
- Hospital Receptionist
 - Log in

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- Update his/her own profile
- Add new entry in emergency
- Views the timetables

- Polyclinic Receptionist
 - Log in
 - Export current patient anamnesis to the specialist doctor
 - Import his patient anamnesis from the specialist doctor
 - Update his/her own profile
 - Set appointments

- Specialist doctor
 - Log in
 - Import anamnesis of a patient from polyclinic receptionist
 - Export anamnesis of that patient to the polyclinic receptionist
 - Update the patient anamnesis
 - Complete the register of that day
 - Update his/her own profile
 - Add patient in case of emergency
 - Search a patient
 - Cancel an appointment

- Nurse
 - Log in
 - Change him/her credentials
 - Search a patient
 - Add data to a patient condition
 - Complete the required medication for each patient

3.2.1.5 Dependability Requirements

- “Ministry of Health and Social Protection” should implement a completely functional management system in polyclinics first, before implementing our system in hospitals.
- We need continuous access to polyclinics’ databases. We can’t treat a patient without importing his medical records first from polyclinics. This is done by the corresponding polyclinic’s receptionist forwarding it to us when leaving an appointment for a patient at our hospital.

3.2.2 Organizational Requirements

3.2.2.1 Environmental Requirements

By the administrative point of view, every document such as: patient’s personal info, prescriptions, anamnesis, etc. must be imported and obtained by the polyclinic receptionist from the polyclinic’s system into our system, because otherwise it can’t be proceeded with other phases of medication by the doctors of other specialties. Of course the polyclinic’s

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system must take into consideration that all other legal and ethical issues concerning confidentiality for patient's sensitive information aren't exploited.

3.2.2.2 Data Management Requirements

- The data that this application will deal with varies from personal information of the patient, to specific and detailed medical records.
- Rules are set to access and maintain this data. Depending in the user's level of accessibility, the range of access will vary from basic data, like appointments timetable, to full and specific medical data.
- To maximize data management performance, data entities and their relationships will be well defined.
- Since this application will deal with large set of data, the frequency of data usage will be of high levels, so this system will guarantee firm stability.

3.2.3 External Requirements

3.2.3.1 Security Requirements

Knowing that this application will deal with sensitive data, is of primary obligation to assure the safety and inviolability of the datasets.

- Login authentication is the first step that protects the system from unauthorized access. Every user will have his/her own username and password, stored in a secure database. Depending in the user's category, the access in system's data, modalities and functions are restricted. This means that a user cannot use this system outside of his/her work scope.
- The data that will be stored in this system are of most sensitive, including individual and medical records for each and every patient. Under the privacy policy, the dataset will be encrypted, safe from unauthorized usage and stored for unlimited period of time.

The methods that will be used to insert and store data in the database, will assure stability, check data integrity and prevent injections from inside or outside of the system.

4. Software Design/Diagrams

4.1 User Scenarios (General)

Nr.	User Story Name	Description
1.	Admin logs in	Using ID and password to access the system, admin logs in.
2.	Views Doctors, Nurses, Receptionists and Emergency Staff	Admin can view doctors and nurses according to specific wards, hospital receptionists and their shift and emergency staff as well.
3.	Edits each type of user	Admin can edit and update personal information about doctors, nurses and receptionists.
4.	Removes/Deletes each type of user	Admin can remove each type of user from the system/database.
5.	Adds new user	Admin is the only user that can add a new user (doctor, nurse, receptionists).
6.	Sets the timetable	Admin is the only user that sets the timetable for doctors, nurses and receptionists.
7.	Views monthly reports	Admin is the only user that can view monthly reports.
8.	Searches doctors, nurses and receptionists	Admin can search by ID, name, surname or ward each doctor or nurse and by ID, name or surname the receptionists.
9.	Admin signs out	Admin signs out from the system
10.	Specialist doctor signs in	Specialist doctor provides ID and password and signs in.
11.	Specialist doctor adds new appointment	Specialist doctor leaves an appointment for the patient at a specific time
12.	Specialist doctor finishes appointment	Specialist doctor fills a form on how the visit went and this is added to the patient's medical records
13.	Specialist doctor cancels appointment	Specialist doctor has an emergency and cancels the appointment

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14.	Specialist doctor checks patient records	Specialist doctor sees all the patients records including all his visits, analysis, prescriptions etc.
15.	Specialist doctor checks patient progress	Specialist doctor sees all the patients' progress since he was hospitalized based on what the nurse has written
16.	Specialist doctor sends request for hospitalization	Specialist doctor sends request for bed to the hospital receptionist
17.	Specialist doctor edits patient information and medical records	Specialist doctor changes the medical records of a patient based on the visit or analyses the patient did at the hospital
18.	Specialist doctor deletes a patient	Specialist doctor deleted a patient from the database
19.	Specialist doctor searches for a patient	Specialist doctor searched by ID, name or surname a patient
20.	Specialist doctor edits his own profile	Specialist doctor edits his basic information on his profile page
21.	Specialist doctor adds new patient	Specialist doctor adds new patient in case of emergency
22.	Specialist doctor signs out	Specialist doctor signs out of the system
23.	Polyclinic receptionist signs in	Polyclinic receptionist inserts credentials to access the system
24.	Polyclinic receptionist creates appointments	Polyclinic receptionist inserts patient's general and medical data and sets date and time for the appointment.
25.	Polyclinic receptionist imports/exports Data	Polyclinic receptionist imports or exports data from hospital's database and clinic's database.
26.	Polyclinic receptionist signs out	Polyclinic receptionist signs out of the system
27.	Hospital receptionist logs in	Hospital receptionist provides ID and password and logs in.
28.	Hospital receptionist adds new patient	Hospital receptionist adds new patient at emergency section.
29.	Hospital receptionist saves the new patient	Hospital receptionist fills a form on the new patients' credentials and saves it to the database.

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30.	Hospital receptionist searches for doctors	Hospital receptionist has access to doctors shifts and appointments
31.	Hospital receptionist searches nurses	Hospital receptionist has access to nurses' shifts.
32.	Hospital receptionist receives requests for empty beds	Hospital receptionist received request from specialist doctor for an empty bed.
33.	Hospital receptionist searches for empty bed	Hospital receptionist searches for empty beds according to the wards.
34.	Hospital receptionist sends notification for empty bed found	Hospital receptionist sends the respond to the specialist doctor for the empty beds found or not.
35.	Hospital receptionist searches for current hospitalized patients	Hospital receptionist has access only on current hospitalized patients' credentials and position at the hospital
36.	Hospital receptionist edits his/her own profile.	Hospital receptionist has ability to see and edit the personal information.
37.	Hospital receptionist signs out.	Hospital receptionist signs out of the system
38.	Nurse logs in	Nurse provides ID and password and logs in.
39.	Nurse views all his/her patients	Nurse has permission to view all the patients and their status in his/her ward.
40.	Nurse searches the patients records	Nurse searches a patient by Id and has access on his/her records.
41.	Nurse completes the patients' medication	Nurse has access to complete the given patients' medication
42.	Nurse completes the patients' tests	Nurse has access to complete the given patients' tests
43.	Nurse completes the patients' injections	Nurse has access to complete the given patients' injections
44.	Nurse makes periodic checkups	Nurse has to make several checkups in his/her patients
45.	Nurse is notified for new patients	Nurse receives new notification every time a patient is hospitalized in his/her ward
46.	Nurse is notified for changes in current patient	Nurse receives notification if changes are applied to patient's state and room.
47.	Nurse edits his/her own profile.	Nurse has ability to see and edit the personal information.
48.	Nurse logs out.	Nurse logs out at the end of the shift.

4.2 User Scenarios (Detailed)

Scenario 1_10_23_27_38 → User signs in

- User enters ID
- User enters password
- If ID and password match, user is signed in
- Else user must re-enter them

Scenario 2 → Admin views Doctors, Nurses, Receptionists and Emergency Staff

- Provided that the admin is signed in
- Views information about which nurse and doctor is assigned to which ward
- Views information about the hospital receptionists and their shifts
- Views information about the staff that is part of the emergency ward
- Admin signs out

Scenario 3 → Admin edits each type of user

- Provided that the admin is signed in
- Clicks on the button “Edit”
- Edits and changes profile information of the users
- Clicks “Save” button
- If data is entered according to validation rules then changes are saved
- Else changes have to be performed correctly from the beginning
- Admin signs out

Scenario 4 → Admin deletes each type of user

- Provided that the admin is signed in
- Clicks on “Remove” or “Delete” button located beside each type of user
- Is asked whether being sure about the deletion of that user
- If clicks “Yes” that user is deleted from the database
- Else (if “No” is clicked) no changes are performed (user isn’t removed)
- Admin signs out

Scenario 5.1 → Admin adds new user (Receptionists)

- Provided that the admin is signed in
- Clicks on “Add new user” button
- Clicks on the combo box “Staff”
- Selects the “Polyclinic Receptionist” or “Hospital Receptionist” option
- A form that contains: ID, Name, Surname, Password, Email, Phone Number is shown.
- Admin enters the data
- If data is entered accordingly and correctly then when “Add” button is clicked the user is created in the system and added to the database as well
- Else data must be re-entered once again from the beginning
- If “Cancel” button is clicked then the fields that were entered are reset automatically and nothing is saved
- Admin signs out

Scenario 5.2 → Admin adds new user (Specialist Doctor)

- Provided that the admin is signed in
- Clicks on “Add new user” button
- Clicks on the combo box “Staff”
- Selects the “Specialist Doctor” option
- A form that contains: ID, Name, Surname, Password, Specialty, Email, Phone Number and Office Number is shown.
- Admin enters the data
- If data is entered accordingly and correctly then when “Add” button is clicked the user is created in the system and added to the database as well
- Else data must be re-entered once again from the beginning
- If “Cancel” button is clicked then the fields that were entered are reset automatically and nothing is saved
- Admin signs out

Scenario 5.3 → Admin adds new user (Nurse)

- Provided that the admin is signed in
- Clicks on “Add new user” button
- Clicks on the combo box “Staff”
- Selects the “Nurse” option
- A form that contains: ID, Name, Surname, Password, Ward, Email, Phone Number is shown.
- Admin enters the data

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- If data is entered accordingly and correctly then when “Add” button is clicked the user is created in the system and added to the database as well
- Else data must be re-entered once again from the beginning
- If “Cancel” button is clicked then the fields that were entered are reset automatically and nothing is saved
- Admin signs out

Scenario 6.1 → Admin sets the timetable (Nurse or Receptionist)

- Provided that the admin is signed in
- Clicks on the “Set the timetable” button
- Selects the “Nurse” or “Receptionist” option
- Then on the combo box “Nurse” or “Receptionist” selects one of the names available
- A two-column table is shown: the first column contains the days of the week, while the second one contains combo boxes where the shift number must be selected
- After selecting the shift for all the days of that week then the “Save” button is clicked and the data is saved to the database
- Else if “Cancel” button is clicked then the options that were selected are reset automatically and nothing is saved
- Admin signs out

Scenario 6.2 → Admin sets the timetable (Specialist Doctor)

- Provided that the admin is signed in
- Clicks on the “Set the timetable” button
- Selects the “Specialist Doctor” option
- Then on the combo box “Specialist Doctor” selects one of the names available
- A two-column table is shown: the first column contains the days of the week, while the second one contains two check boxes describing the working hours: one dedicated to Visits and the other dedicated to the Duty Call when in the Emergency Ward
- When selecting Visits two options are shown to be checked: either the first shift (08:00-14:00) or the second shift (14:00-20:00)
- After selecting Duty Call or Visits or both of them then the “Save” button is clicked and the data is saved to the database
- Else if “Cancel” button is clicked then the options that were selected are reset automatically and nothing is saved
- Admin signs out

Scenario 7 → Admin views monthly reports

- Provided that the admin is signed in
- Clicks on “View Monthly Reports” button
- A table shows the number of hospitalizations, visits and emergency cases of specific wards for that month
- Clicks on “Download as PDF” button
- A PDF file containing the same information as in the table is downloaded
- Admin signs out

Scenario 8 → Admin searches Doctors, Nurses and Receptionists

- Provided that the admin is signed in
- Enters ID, name, surname or ward at the search field
- Clicks on “Search” button
- Information related to that ID, name, surname, or ward is shown, provided that the entered word exists anywhere in the database except for the patient’s data
- Else “No information found” message is shown
- Admin signs out

Scenario 11 → Specialist doctor adds new appointment

- User clicks on the button “New” in the page Home
- User completes the form that is shown after clicking
- User clicks “Add”
- If form fields are not completed correctly, user must recomplete it
- If form fields are completed correctly, new appointment is created

Scenario 12 → Specialist doctor finishes appointment

- User has appointment with patient
- User clicks on the button “Finished” allocated in the right side of the appointment entry in the table shown in the page Home
- User fills the form with the needed information
- User clicks “Save”
- If form fields are not completed correctly, user must recomplete it
- If form fields are completed correctly, the information for this visit is saved

Scenario 13 → Specialist doctor cancels appointment

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- User clicks the button “Cancel” allocated in the right side of the appointment entry in the table shown in the page Home
- User asked if he/she is sure about the cancelation
- User clicks “Yes”
- Appointment is canceled

Scenario 14 → Specialist doctor checks patient records

- User goes to “Patient” page in the menu allocated on the top of every page
- User clicks the button “Records” allocated in the right side of the patient entry in the table with patient data

Scenario 15 → Specialist doctor checks patient progress

- User goes to “Hospitalized” page in the menu allocated on the top of every page
- User clicks the button “Progress” allocated in the right side of the patient entry in the table with patient data

Scenario 16 → Specialist doctor sends request for hospitalization

- User has appointment with patient
- User finishes appointment with patient
- User clicks on the “Finish” button allocated in the right side of the appointment entry in the table shown in the page Home
- User completes the form that will appear after clicking “Finish”
- User checks “Yes” at “Request for hospitalization” at the end of the form
- User clicks “Save”

Scenario 17 → Specialist doctor edits patient information and medical records

- User clicks on the “Patients” button in the menu allocated on the top of every page
- User is redirected to a page containing a list of all patients
- User clicks on the button “Edit” allocated in the right side of the patient entry in the table shown in the page Patients
- User adds or edits the patient’s medical records
- User clicks “Save”

Scenario 18 → Specialist doctor deletes a patient

- User clicks on the “Patients” button in the menu allocated on the top of every page
- User is redirected to a page containing a list of all patients
- User clicks on the button “Delete” allocated in the right side of the patient entry in the table shown in the page Patients

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- User asked if he/she is sure about the deletion
- User clicks “Yes”
- User is deleted

Scenario 19 → Specialist doctor searches for a patient

- User writes what he is searching for in the search input field allocated in every page
- User is shown a list of all entries that contain his search keyword
- If there is nothing found, user is shown a message telling him that

Scenario 20 → Specialist doctor edits his own profile

- User clicks on the “Profile” button in the menu allocated on the top of every page
- User is redirected to a page containing its profile
- User clicks “Edit”
- User changes his data
- User clicks “Save”
- If data in the forms is not edited correctly(not in accordance to the form conditions), user must recomplete it
- If data in the forms is edited correctly, user profile is updated

Scenario 21 → Specialist doctor adds new patient

- User clicks on the button “New” in the page Patients
- User completes the form that is shown after clicking
- User clicks “Add”
- If form fields are not completed correctly, user must recomplete it
- If form fields are completed correctly, new appointment is created

Scenario 24 → Polyclinic Receptionist creates Appointment

- User presses “Create Appointment” button
- Inserts general data of the patient
- Uploads digital medical prescription
- Saves the records by pressing “Save” button
- If some data is missing, the system will notify the user to re-enter missing data
- If save is successful, it redirects to “Select Ward” page
- User selects a ward from a list given by the combobox “Select Ward”
- After the selection is made, a timetable with available and non-available time schedule will appear
- User selects a free slot time schedule, as the patient indicates
- The label “Select date” will be updated with the selected date and time

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- The user presses “Confirm Appointment” to confirm the appointment
- If successful, a pop up message will appear that notifies and redirects the user to homepage

Scenario 25 → Polyclinic Receptionist imports/exports Data

- Press the button “Import/Export Data” to redirect there
- User insert patient’s ID to search for patient data
- If unsuccessful, a message will appear: “No data found”
- If data found, a message will appear: “Patient found” and a table with patient’s data will appear
- By pressing “Import” or “Export” button, the user will upload or download the medical record of the patient

Scenario 28 → Hospital Receptionist adds new patient

- User clicks on the button “New” in the Emergency section
- User completes the form that is shown after clicking

Scenario 29 → Hospital Receptionist saves patient

- User clicks “Save”
- If form fields are not completed correctly, user must recomplete it
- If form fields are completed correctly, new patient is created

Scenario 30→ Hospital Receptionist searches doctor

- User can enter the id, name or surname of the doctor.
- The timetable with specific doctors’ appointments will be shown.

Scenario 31 → Hospital Receptionist searches nurse

- User can enter the id, name or surname of the nurse.
- The timetable with specific nurses’ shifts will be shown.

Scenario 32 → Hospital Receptionist receives request for hospitalization

- User receives the request for hospitalization from a specialist doctor.
- User clicks on that request and the view of the hospital beds is showed.

Scenario 33 → Hospital Receptionist searches for available rooms and beds

- User clicks on the request for hospitalization.
- User is redirected to the view of hospital rooms.
- User searches for an available room and bed in that specific ward where the request came from.
- User finds an available bed or not.

Scenario 34 → Hospital Receptionist sends notification for available bed

- User searches for an available bed.
- User clicks 'Send ' after selecting a room, if a bed is available in that room.
- User clicks 'Send No' if there are no beds available.

Scenario 35 → Hospital Receptionist searches patients

- User enters the name, surname or id of a patient.
- User views the basic information of that patient and the room where he/she is.

Scenario 36 → Hospital Receptionist edits his own profile information

- User clicks on the "Profile" button in the menu allocated on the left of every page
- User is redirected to a page containing its profile
- User clicks "Edit"
- User changes his data
- User clicks "Save"
- If data in the forms is not edited correctly (not in accordance to the form conditions), user must recomplete it
- If data in the forms is edited correctly, user profile is updated

Scenario 39→ Nurse views all patients

- User selects 'View all patients'.
- User views a timetable with all the patients and given rooms.

Scenario 40→ Nurse searches patient

- User searches a patient on the search bar by his/her id.
- If a patient is found, a form with all his records is delivered to user.
- If a patient is not found, user is sent to the homepage.

Scenario 41→ Nurse completes medication

- User searches or selects a patient's records in the 'View all section'.
- User selects 'Insert data' to the end of the records form.
- User completes the checkbox left empty by the doctor giving the specific medication.

Scenario 42→ Nurse completes tests

- User searches or selects a patient's records in the 'View all section'.
- User selects 'Insert data' to the end of the records form.
- User completes the checkbox left empty by the doctor giving the specific tests.

Scenario 43→ Nurse completes injections

- User searches or selects a patient's records in the 'View all section'.
- User selects 'Insert data' to the end of the records form.
- User completes the checkbox left empty by the doctor giving the specific injections.

Scenario 44→ Nurse completes checkups

- User searches or selects a patient's records in the 'View all section'.
- User selects 'Insert data' to the end of the records form.

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- User inserts a check in the checkbox every time he/she makes a control on the patient status as many times as doctor has recommended it.

Scenario 45→ Nurse is notified for new patients

- User receives a notification every time a new patient is added at his/her care.
- The view of all patients is changes after receiving this notification.

Scenario 46→ Nurse is notified of changes in current patients

- User receives a notification every time a change in status is made in one of his/her patients.
- User receives a notification every time a change in room/bad is made to one of his/her patients.

Scenario 47→ Nurse edits his own profile information

- User clicks on the “Profile” button in the menu allocated on the left of every page
- User is redirected to a page containing its profile
- User clicks “Edit”
- User changes his data
- User clicks “Save”
- If data in the forms is not edited correctly (not in accordance to the form conditions), user must recomplete it
- If data in the forms is edited correctly, user profile is updated

Scenario 9_22_26_37_48 → User signs out

- Provided the user is signed in
- User clicks the button “Sign out” allocated at the top-right corner of every page
- User is signed out of the system

4.3 Use Cases

Use Case 1_10_23_27_38

Name	Sign in
Summary	User enters the system by providing genuine credentials
Actor	Admin, Polyclinic Receptonist, Specialist Doctor, Nurse, Hospital Receptionist
Description	User provides ID and password
Precondition	User must have an existing account
Alternatives	The same user can sign in only once at a time
Post condition	User enters the system

Use Case 2

Name	View Staff
Summary	Admin views Doctors, Nurses, Receptionists and Emergency Staff
Actor	Admin
Description	Admin can view each doctor, nurse according to wards and also hospital receptionists with their respective shifts as well as the staff attending to the emergency ward
Precondition	Admin is signed in
Alternatives	Information on patients cannot be provided to the admin
Post condition	Staff information is displayed

Use Case 3

Name	Edit users
Summary	Admin edits each type of user

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Actor	Admin
Description	Admin edits and changes profile information of the users and if data is entered according to validation rules then changes are saved
Precondition	Admin is signed in
Alternatives	
Post condition	Changes that have been made are updated in the database

Use Case 4

Name	Delete users
Summary	Admin deletes each type of user
Actor	Admin
Description	Admin clicks on “Delete” button located beside each type of user and after that is asked whether being sure about the deletion of that user; when clicking “Yes” that user is deleted from the database, else user isn’t removed
Precondition	Admin is signed in and that specific user exists
Alternatives	
Post condition	Deleted user doesn’t exist anymore

Use Case 5

Name	Add new user
Summary	Admin adds new user
Actor	Admin
Description	Admin after clicking on “Add new user” button selects a type of user and accordingly fills in the form of that specific user. If data is

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	entered correctly then when “Add” button is clicked the user is created in the system and added to the database as well
Precondition	Admin is signed in and that user doesn’t exist
Alternatives	No two users with the same ID should exist
Post condition	New user is created

Use Case 6

Name	Set the timetable
Summary	Admin sets the timetable
Actor	Admin
Description	Admin selects a user: if nurse or receptionist admin assigns a shift number for each day of the week, if a specialist doctor admin selects visits and the shift and/or the duty call (emergency) option and saves the changes
Precondition	Admin is signed in
Alternatives	
Post condition	The timetable is set

Use Case 7

Name	View monthly reports
Summary	Admin views monthly reports
Actor	Admin
Description	Admin after clicking on “View Monthly Reports” button can view a table with the number of hospitalizations, visits and emergency cases of specific wards for that month. When clicking on “Download as PDF” button, a PDF file containing the same information as in the table is downloaded

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Precondition	Admin is signed in
Alternatives	
Post condition	Information on different auto-generated reports is displayed

Use Case 8

Name	Search Staff
Summary	Admin searches Doctors, Nurses and Receptionists
Actor	Admin
Description	Admin enters ID/name/surname/ward at the search field. When clicking on “Search” button information related to that ID, name, surname, or ward is shown, provided that the entered word exists anywhere in the database except for the patient’s data
Precondition	Admin is signed in
Alternatives	
Post condition	Information on the searched term/words is displayed

Use Case 11

Name	Add new appointment
Summary	Specialist Doctor adds new appointments for patients
Actor	Specialist Doctor
Description	Specialist Doctor fills a form with patient data and leaves appointment at a specific time
Precondition	Specialist Doctor must be allowed to create new appointments
Alternatives	Patient can leave appointment through the polyclinic receptionist

Post condition	Patient records are brought back to this doctor
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Use Case 12

Name	Finish appointment
Summary	Specialist Doctor must keep record of finished appointment
Actor	Specialist Doctor
Description	Specialist Doctor fills a form with information on how the visit went
Precondition	An appointment must be made
Alternatives	
Post condition	Appointment information must be added to previous patient records

Use Case 13

Name	Cancel appointment
Summary	Specialist Doctor cancels appointment with patient
Actor	Specialist Doctor
Description	Specialist Doctor cancels the appointment with patient and patient is notified by text or email
Precondition	Specialist Doctor must have an existing appointment with the patient
Alternatives	
Post condition	Appointment is rescheduled

Use Case 14

Name	Check patient record
Summary	Specialist Doctor can look at patient records
Actor	Specialist Doctor
Description	Specialist Doctor can see all the patients

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	records including all his visits, analysis, prescriptions etc.
Precondition	Patient must have records saved in the database
Alternatives	Specialist Doctor must have access to the patient's records, patient must be under the care of this doctor
Post condition	

Use Case 15

Name	Check patient progress
Summary	Specialist Doctor can look at the progress of a hospitalized patient
Actor	Specialist Doctor
Description	Specialist Doctor can see all the patients' progress since he was hospitalized based on what the nurse has written
Precondition	Patient must be hospitalized at the hospital
Alternatives	Specialist Doctor must have access to the patient's records, patient must be under the care of this doctor
Post condition	

Use Case 16

Name	Send request for hospitalization
Summary	Specialist Doctor can send request to reserve a bed
Actor	Specialist Doctor
Description	Specialist Doctor can send request for hospitalization to the receptionist which informs the doctor back which room he/she reserved
Precondition	Specialist Doctor chooses to hospitalize patient after an appointment with him
Alternatives	

Post condition	Patient is in the system as hospitalized patient
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Use Case 17

Name	Edit medical records
Summary	Specialist Doctor can change patient's medical records
Actor	Specialist Doctor
Description	Specialist Doctor can change the medical records of a patient based on the visit or analyses the patient did at the hospital
Precondition	Patient must have existing medical records at the hospital
Alternatives	The Specialist Doctor must have access to that patient's records in order to have the power to change them
Post condition	Medical Records are changed

Use Case 18

Name	Delete patient
Summary	Specialist Doctor can delete a patient
Actor	Specialist Doctor
Description	Specialist Doctor has the power to delete a patient entry from the database
Precondition	Patient must be part of the database
Alternatives	Specialist Doctor must have access to this patients' data in order to delete him
Post condition	Patient is deleted

Use Case 19

Name	Search patient
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Summary	Specialist Doctor searched for the data of a patient
Actor	Specialist Doctor
Description	Specialist Doctor can search for a patient only through his ID, name and surname
Precondition	Patient must be part of our system
Alternatives	Patient must be in the care of this doctor in order to appear in the search results
Post condition	The searched patient is shown if exists

Use Case 20

Name	Edit own profile
Summary	Specialist Doctor can edit his own profile
Actor	Specialist Doctor
Description	Specialist Doctor has the power to make changes to his profile information and also change password
Precondition	Specialist Doctor must have an account and profile in our system
Alternatives	The admin changes user profile
Post condition	Profile is changed

Use Case 21

Name	Add new patient
Summary	Specialist Doctor adds new patients
Actor	Specialist Doctor
Description	In case of emergencies, when the patient doesn't have any appointment and is not registered in our system, the user can add new patient
Precondition	Patient must come to the hospital for an emergency
Alternatives	The receptionist can add new patients too

Post condition

Patient is now part of our system

Use Case 24

Name	Create Appointment
Summary	Polyclinic Receptionist inserts patient's general and medical data and sets date and time for the appointment.
Actor	Polyclinic Receptionist
Description	Polyclinic Receptionist inserts patient's general data, uploads medical prescriptions. Save those data and after selects Hospital Ward and sets date and time for the appointment.
Precondition	Polyclinic Receptionist must be logged in
Alternatives	
Post condition	Appointment is set and patient's data are stored in the system.

Use Case 25

Name	Import/Export Data
Summary	Polyclinic Receptionist imports or exports data from hospital's database and polyclinic's database.
Actor	Polyclinic Receptionist
Description	Polyclinic Receptionist searches for patient's data in the system. After the data are found, Polyclinic Receptionist imports or export updated medical records of the patient from the polyclinic's database or the hospital's database.

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Precondition	Polyclinic Receptionist must be logged in. Patient data must exist within the system.
Alternatives	
Post condition	Medical records of the patient are updated and exchanged between hospital and polyclinic.

Use Case 28

Name	Add new patient
Summary	Hospital Receptionist adds new patient in emergency ward
Actor	Hospital Receptionist
Description	Hospital Receptionist fills a form with patient data
Precondition	Hospital Receptionist must be allowed to create new patients
Alternatives	Patient can be added by specialist doctor.
Post condition	Hospital Receptionist adds a patient to the database

Use Case 29

Name	Save patient
Summary	Hospital Receptionist must save the patient in order to add him to the hospitals database
Actor	Hospital Receptionist
Description	Hospital Receptionist completes the fields of patient's credentials.
Precondition	All necessary fields must be completed.
Alternatives	The other fields can be left blank.
Post condition	New patient profile must be sent to specialist doctor in order to fill the other medical fields.

Use Case 30

Name	Search doctor
Summary	Hospital Receptionist searches for information about a doctor.
Actor	Hospital Receptionist
Description	Hospital Receptionist searches a doctor and the view of his profile and his appointments is shown.
Precondition	Hospital Receptionist must search by inserting the ID of that doctor
Alternatives	Hospital Receptionist can search even by inserting name and surname of the doctor.
Post condition	The doctors' information is shown

Use Case 31

Name	Search nurse
Summary	Hospital Receptionist searches for information about a nurse.
Actor	Hospital Receptionist
Description	Hospital Receptionist searches a nurse and the view of his profile and his/her shift is shown.
Precondition	Hospital Receptionist must search by inserting the ID of that nurse
Alternatives	Hospital Receptionist can search even by inserting name and surname of the nurse.
Post condition	The nurses' information is shown

Use Case 32

Name	Receive request for empty bed
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Medical Management System

Summary	Hospital Receptionist can receive and must reply to the request for empty bed
Actor	Hospital Receptionist
Description	Hospital Receptionist can receive from every doctor the request for an empty bed.
Precondition	Hospital Receptionist must be logged in
Alternatives	
Post condition	Hospital Receptionist receives the request.

Use Case 33

Name	Search for empty beds
Summary	Hospital Receptionist can send search to reserve a bed
Actor	Hospital Receptionist
Description	Hospital Receptionist can see the view containing all beds information for a given ward
Precondition	Hospital Receptionist must receive a request from the specialist doctor.
Alternatives	
Post condition	An empty room is found or not.

Use Case 34

Name	Send notification
Summary	Hospital Receptionist must send back the notification for founding or not a bed.
Actor	Hospital Receptionist
Description	Hospital Receptionist sends back the information if an empty bed is found or not to the specialist doctor from whom the request came.
Precondition	Hospital Receptionist must have received a request for empty bed
Alternatives	

Post condition	The notification is sent to the specialist doctor.
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Use Case 35

Name	Search a patient
Summary	Hospital Receptionist can search a current hospitalized patient.
Actor	Hospital Receptionist
Description	Hospital Receptionist searches for a patient in the hospital and the profile and room information is shown.
Precondition	Hospital Receptionist must enter id or name and surname of the patient to search
Alternatives	
Post condition	A patient is found.

Use Case 36

Name	Edit own profile
Summary	Hospital Receptionist can edit his own profile
Actor	Hospital Receptionist
Description	Hospital Receptionist has the power to make changes to his profile information and also change password
Precondition	Hospital Receptionist must have an account and profile in our system
Alternatives	The admin changes user profile
Post condition	Profile is changed

Use Case 39

Name	View all patients
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Medical Management System

Summary	Nurse views a timetable of all patients
Actor	Nurse
Description	Nurse views the timetable of all patients records and rooms
Precondition	Nurse must be logged in
Alternatives	
Post condition	Patient's information is shown

Use Case 40

Name	Search patient
Summary	Nurse must search a patient in order to get his/her records.
Actor	Nurse
Description	Nurse is presented with the patients records and status
Precondition	Nurse must insert the patient ID
Alternatives	Nurse can insert the patients name/surname
Post condition	The searched patient is found or not

Use Case 41

Name	Complete medication
Summary	Nurse checks the checkbox for a specific medication to the patient
Actor	Nurse
Description	Nurse needs to complete the medication to the patient as recommended by the doctor.
Precondition	Nurse must find the patient on the search
Alternatives	
Post condition	The medication is completed

Use Case 42

Name	Complete tests
Summary	Nurse checks the checkbox for a specific test to the patient
Actor	Nurse
Description	Nurse needs to complete the test to the patient as recommended by the doctor.
Precondition	Nurse must find the patient on the search
Alternatives	
Post condition	The test is completed

Use Case 43

Name	Complete injections
Summary	Nurse checks the checkbox for a specific injection to the patient
Actor	Nurse
Description	Nurse needs to complete the injection to the patient as recommended by the doctor.
Precondition	Nurse must find the patient on the search
Alternatives	
Post condition	The injection is completed

Use Case 44

Name	Make periodic checkups
Summary	Nurse checks the checkbox every time the checkup is made
Actor	Nurse
Description	Nurse needs to check up on a patient decided by the doctors' recommendation.
Precondition	Nurse must find the patient on the search

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Alternatives	
Post condition	The periodic checkup is completed

Use Case 45

Name	New Patient
Summary	Nurse is notified every time a new patient is registered in her ward.
Actor	Nurse
Description	Nurse gets a notification on the change on the timetable of all patients
Precondition	Nurse must be logged in
Alternatives	
Post condition	The nurse is notified for the new patient under his/her care

Use Case 46

Name	Change in patient
Summary	Nurse is notified every time a patient's room is changed.
Actor	Nurse
Description	Nurse gets a notification on the change on the timetable of all patients
Precondition	Nurse must be logged in
Alternatives	
Post condition	The nurse is notified for the change in his/her patient.

Use Case 47

Name	Edit own profile
Summary	Nurse can edit his own profile

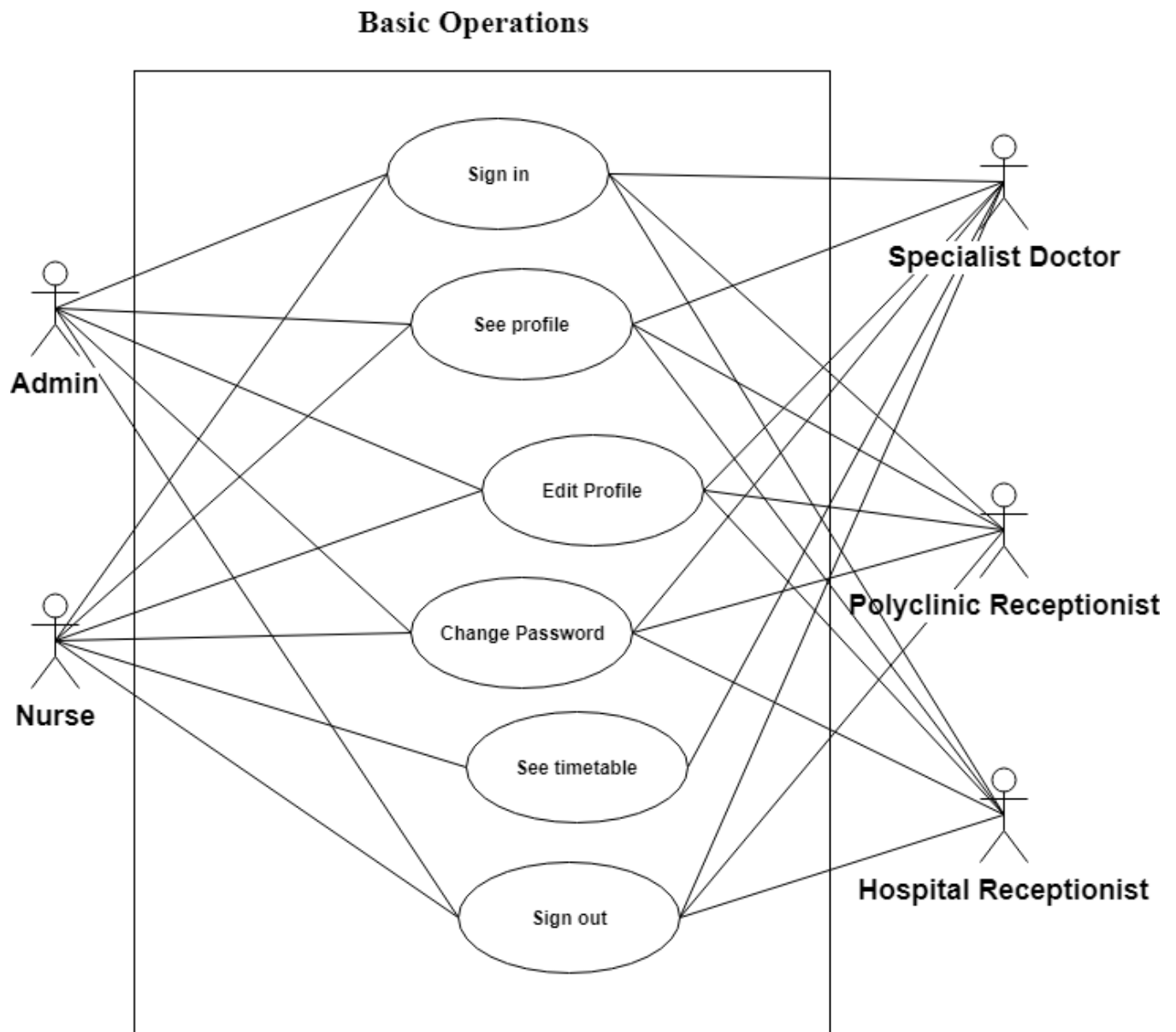
Medical Management System

Actor	Nurse
Description	Nurse has the power to make changes to his profile information and also change password
Precondition	Nurse must have an account and profile in our system
Alternatives	The admin changes user profile
Post condition	Profile is changed

Use Case 9_22_26_37_48

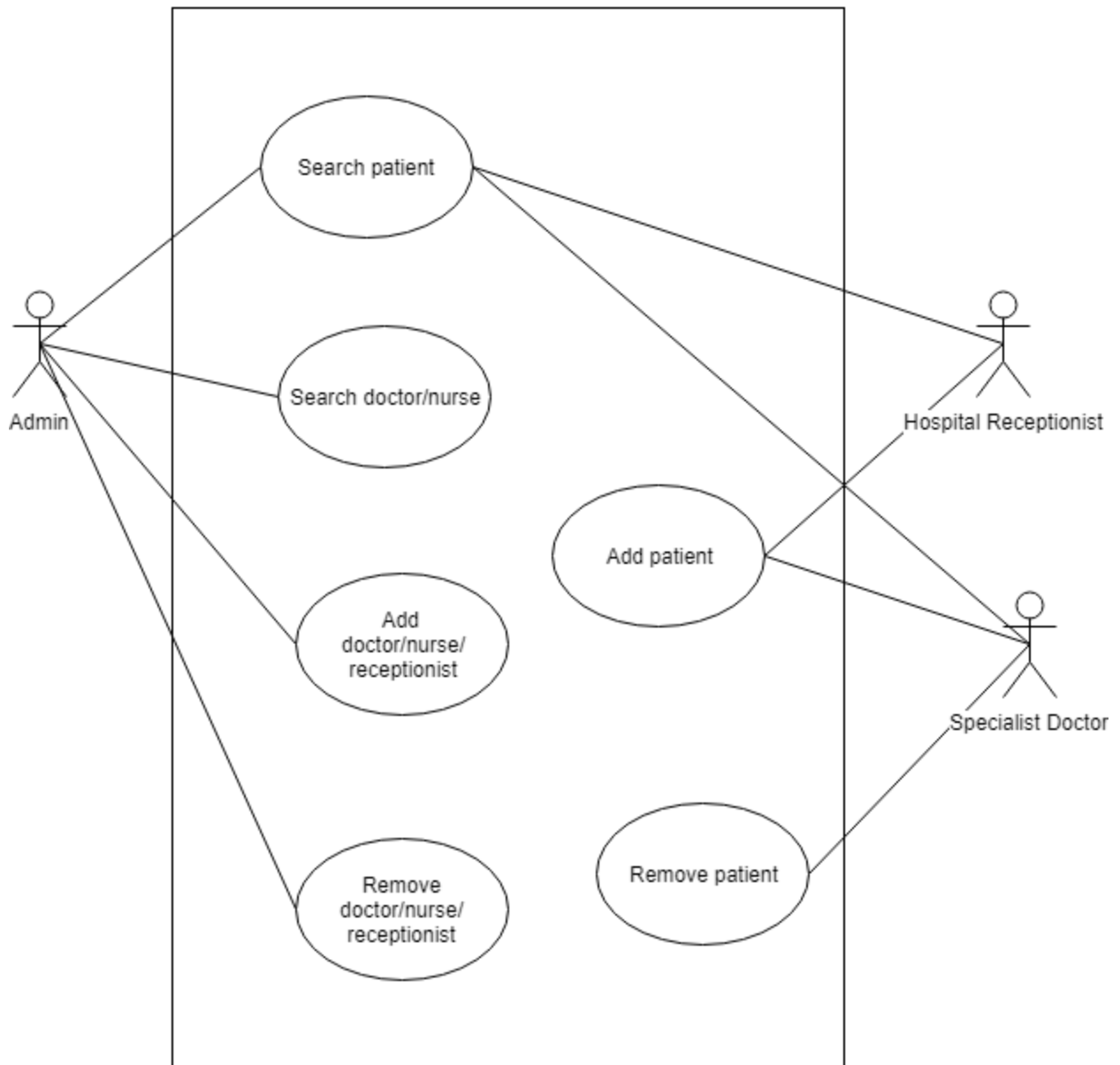
Name	Sign out
Summary	User clicks "Sign out" button and is signed out
Actor	Admin, Polyclinic Receptionist, Specialist Doctor, Nurse, Hospital Receptionist
Description	User clicks button "Sign out" at the top-right corner of current page
Precondition	User must have been signed in
Alternatives	When the user closes the browser it is automatically signed out
Post condition	User is signed out of the system

4.4 Use Case Diagrams

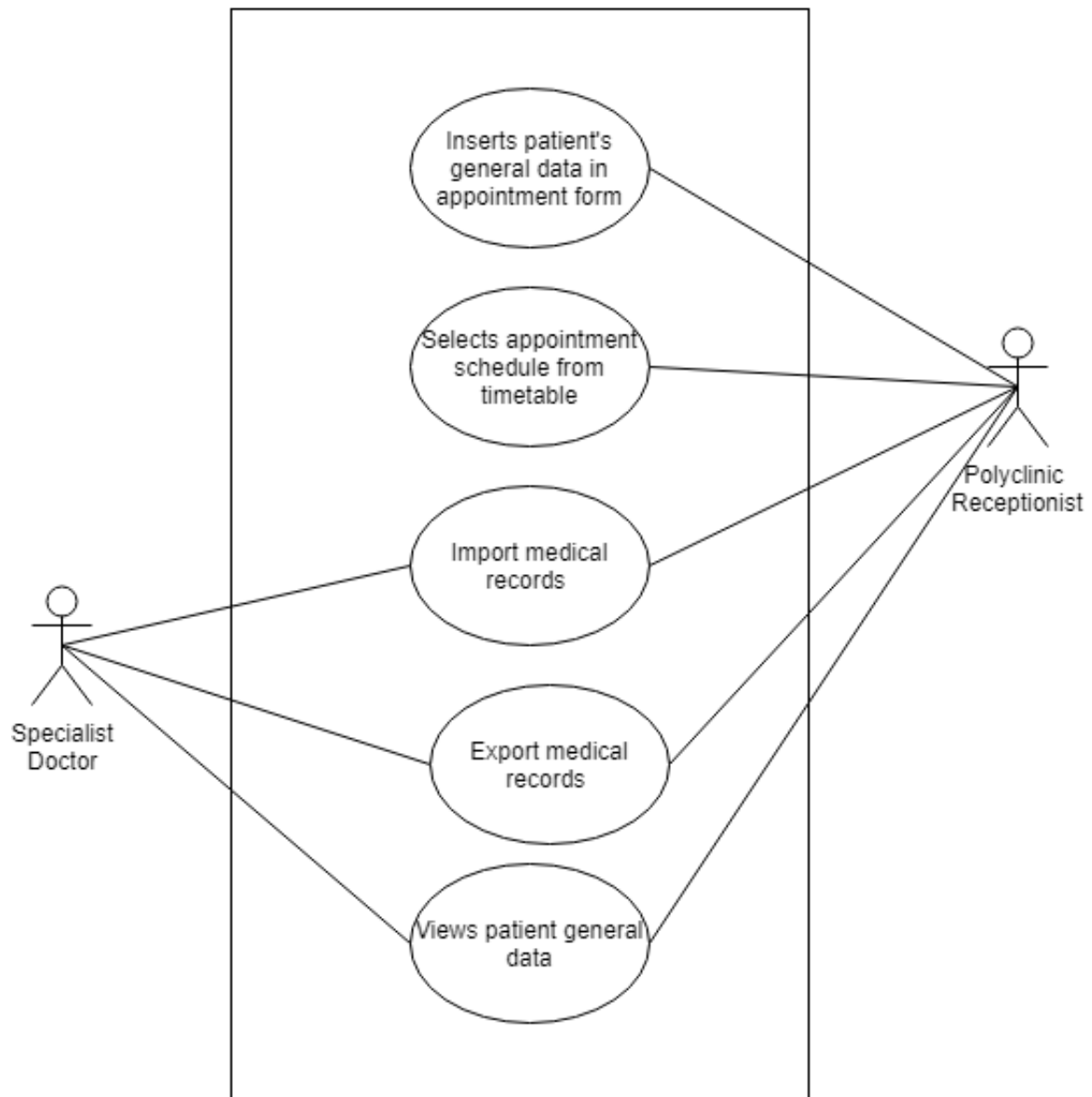


Medical Management System

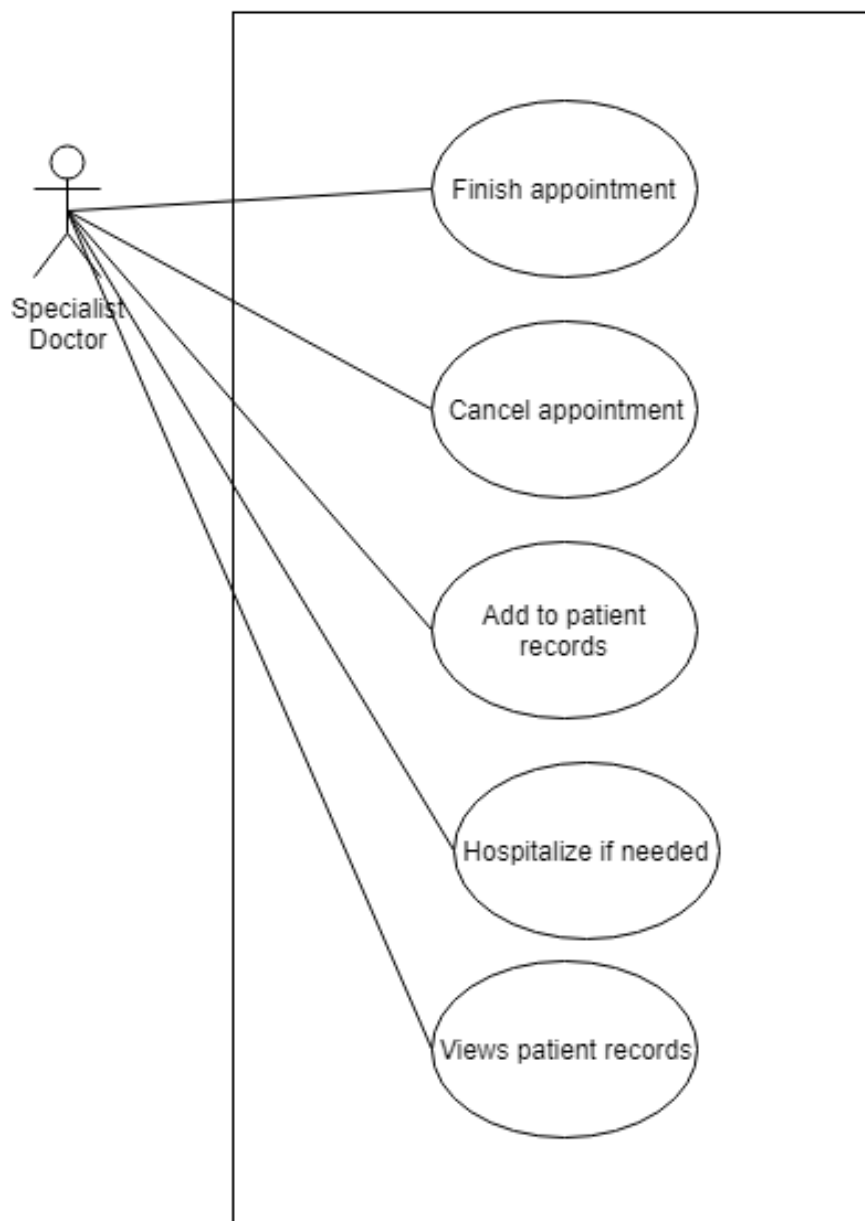
Add/Remove/Search Users



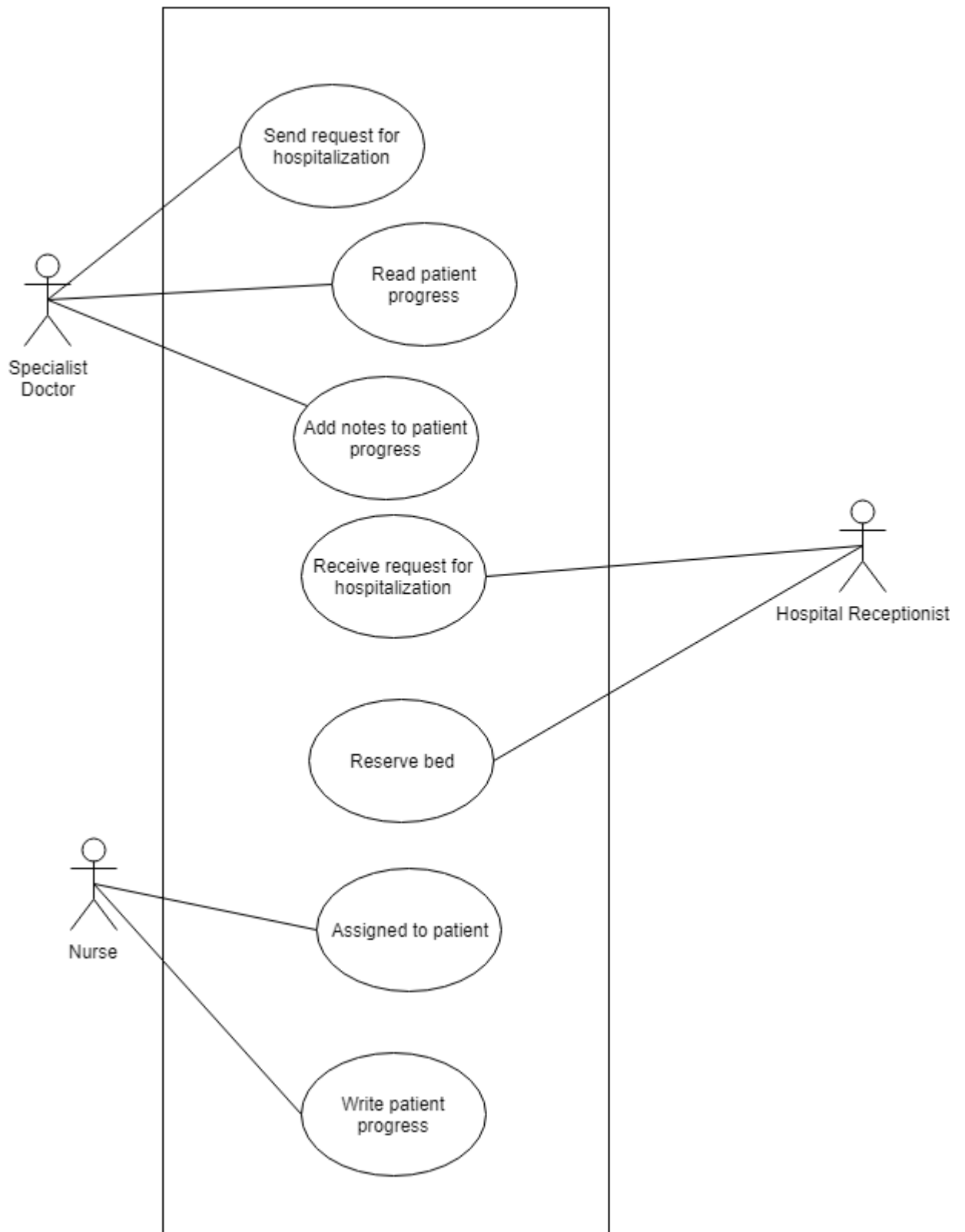
Set Appointment



Appointment

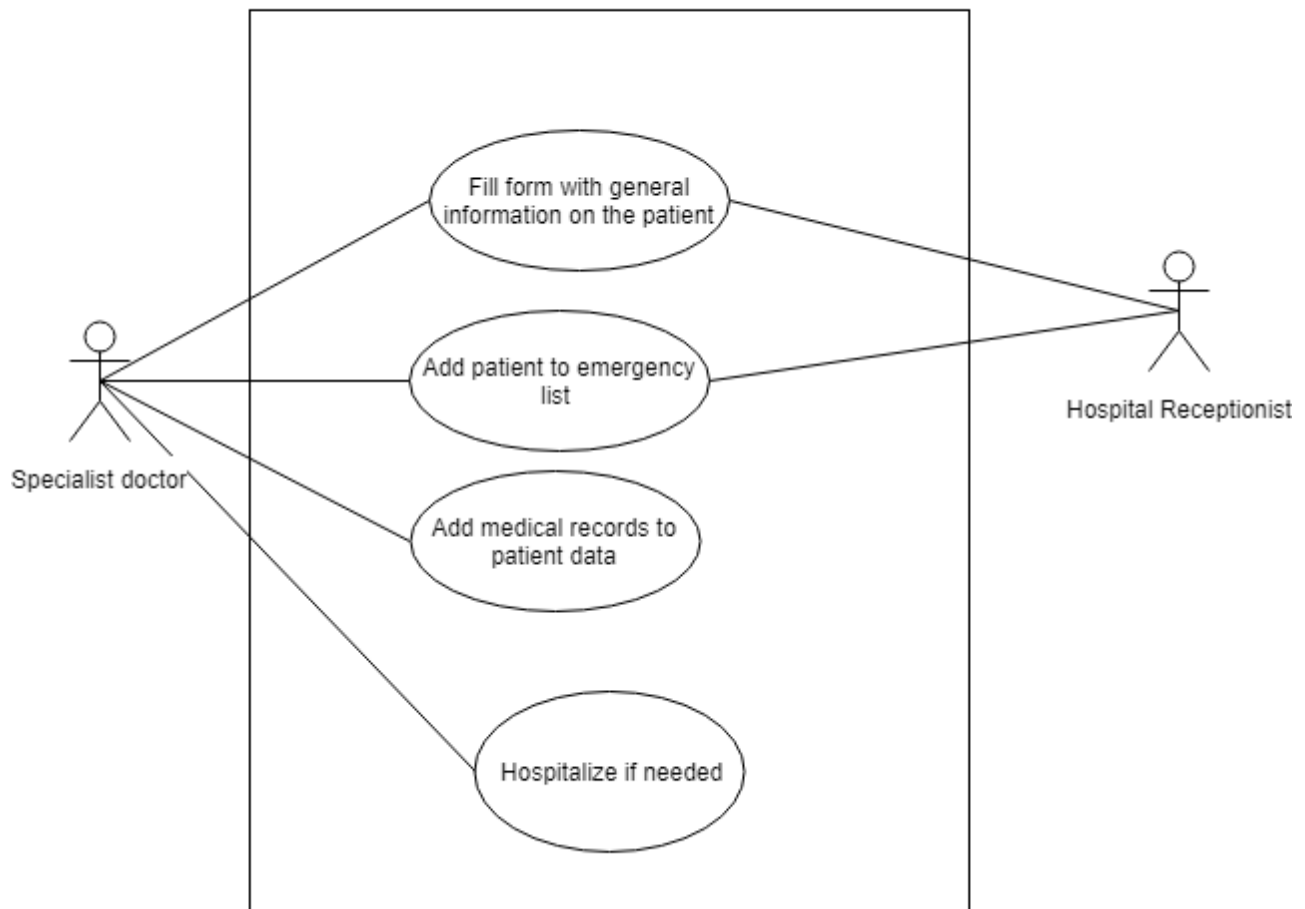


Hospitalization

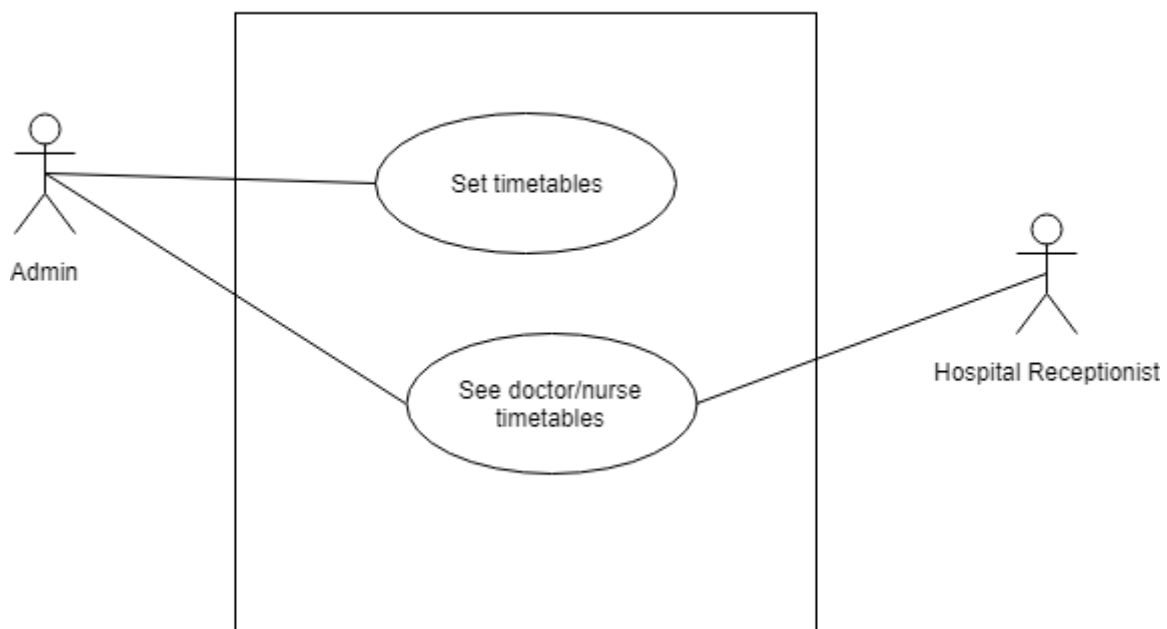


Medical Management System

Emergency cases

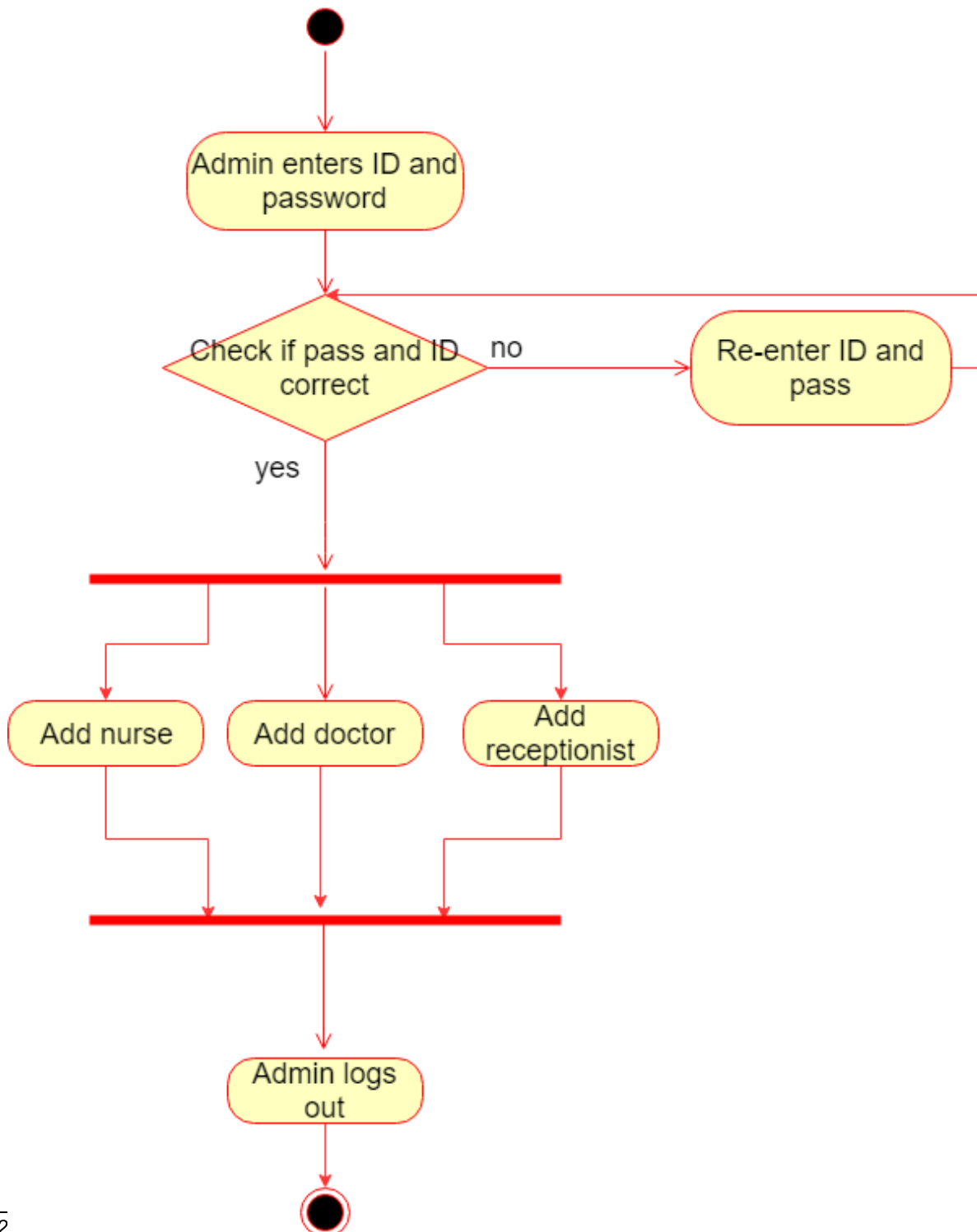


Timetables

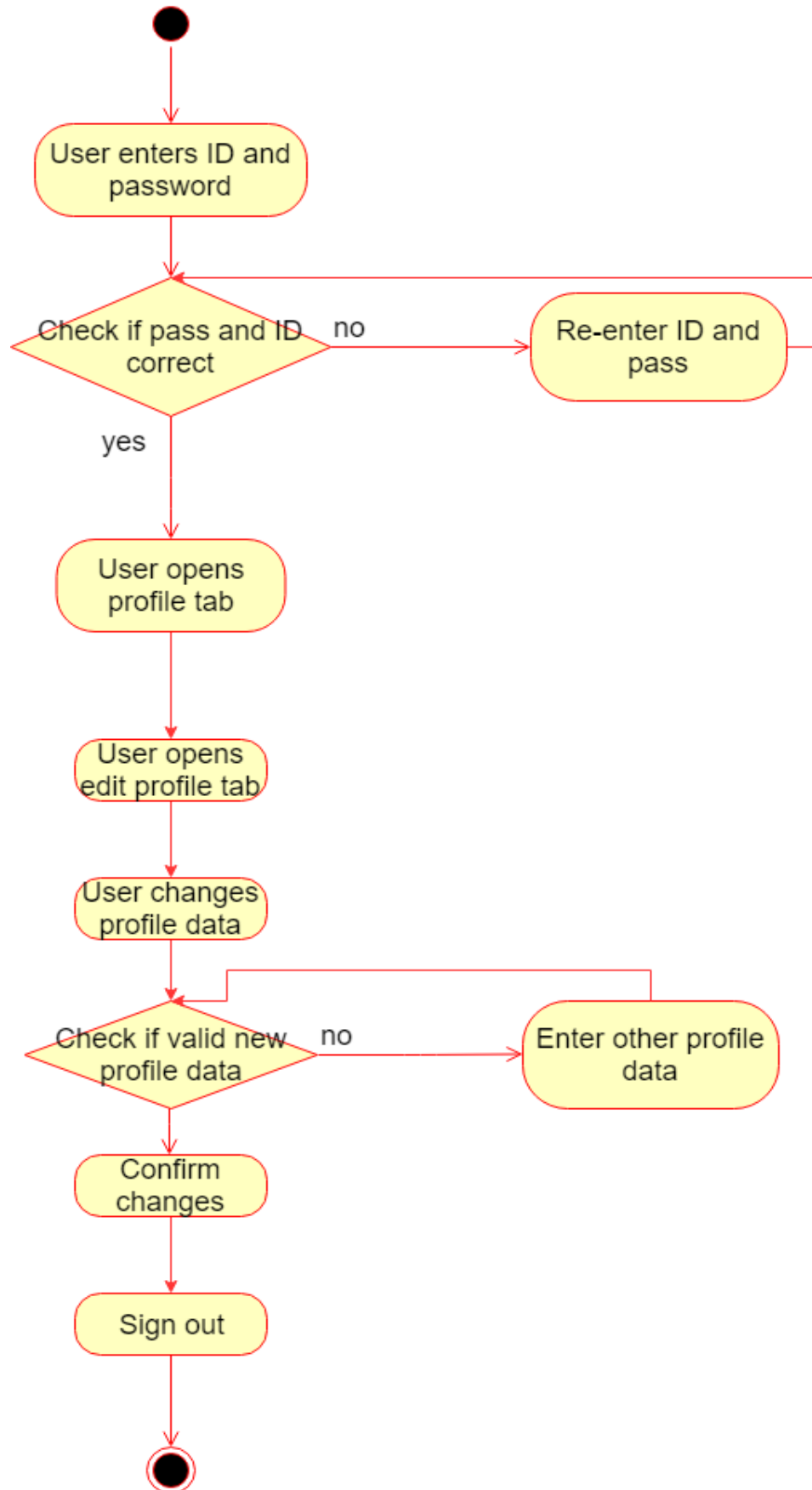


4.5 Activity Diagrams

Add User

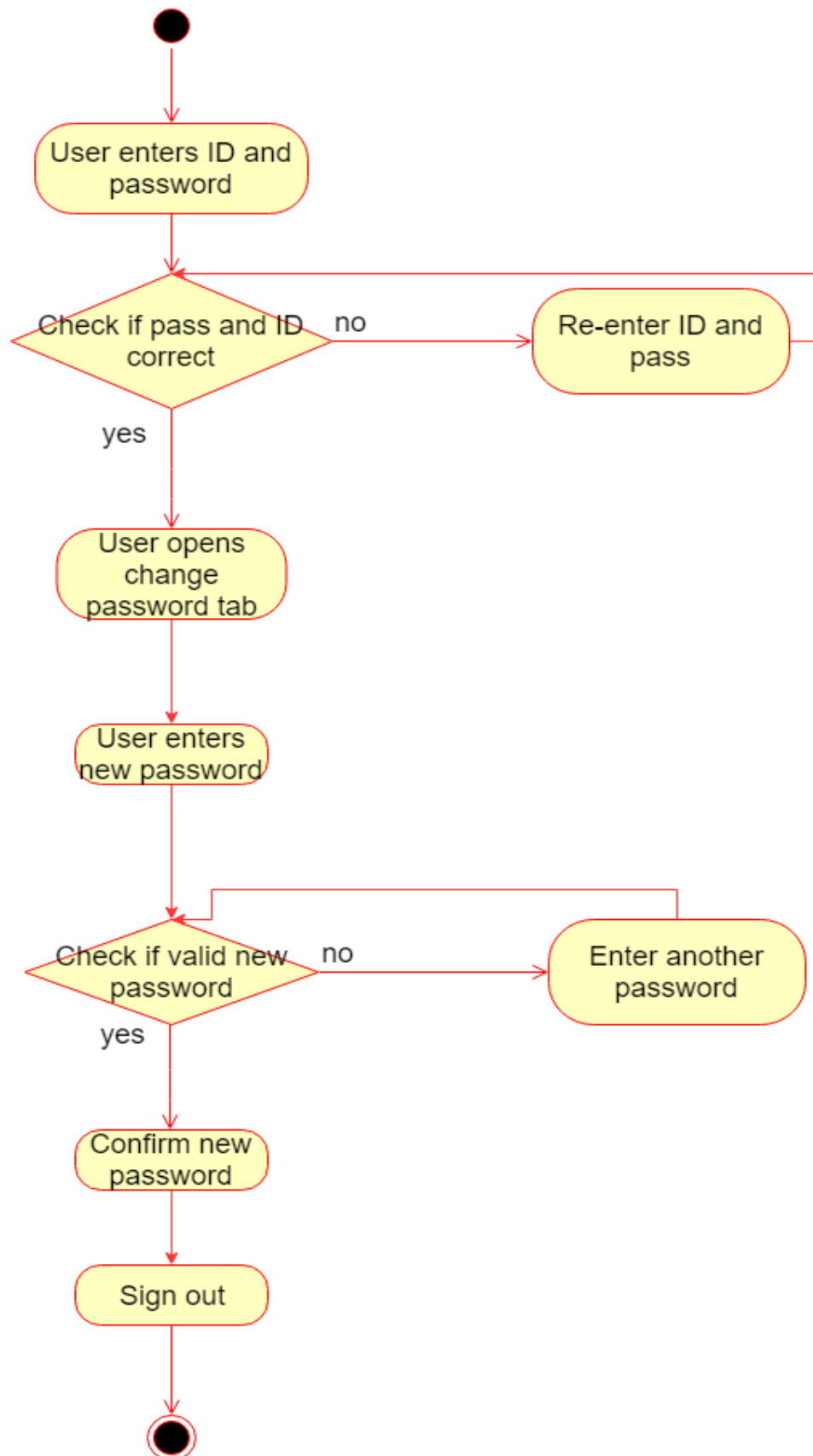


Edit Profile

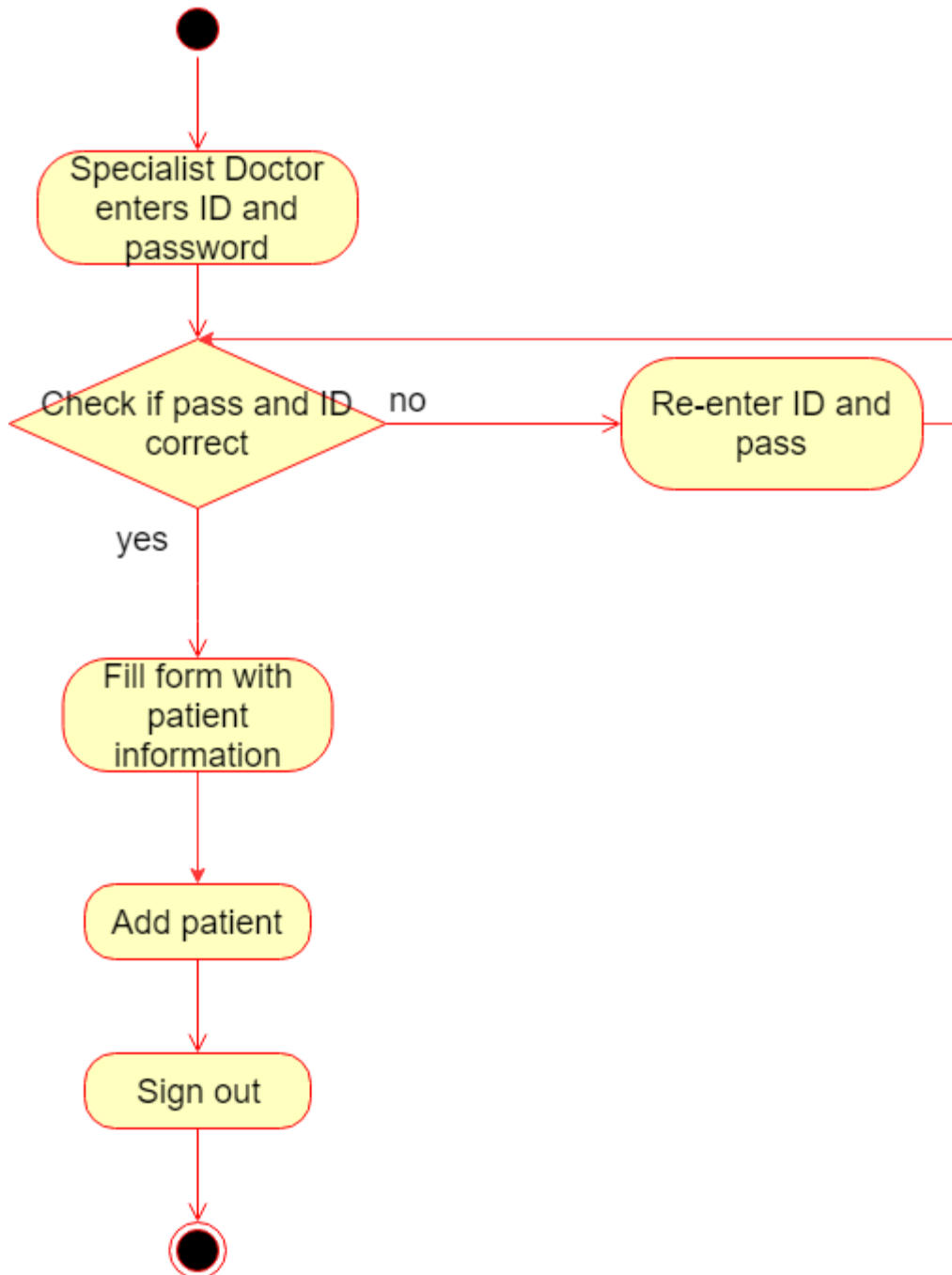


Medical Management System

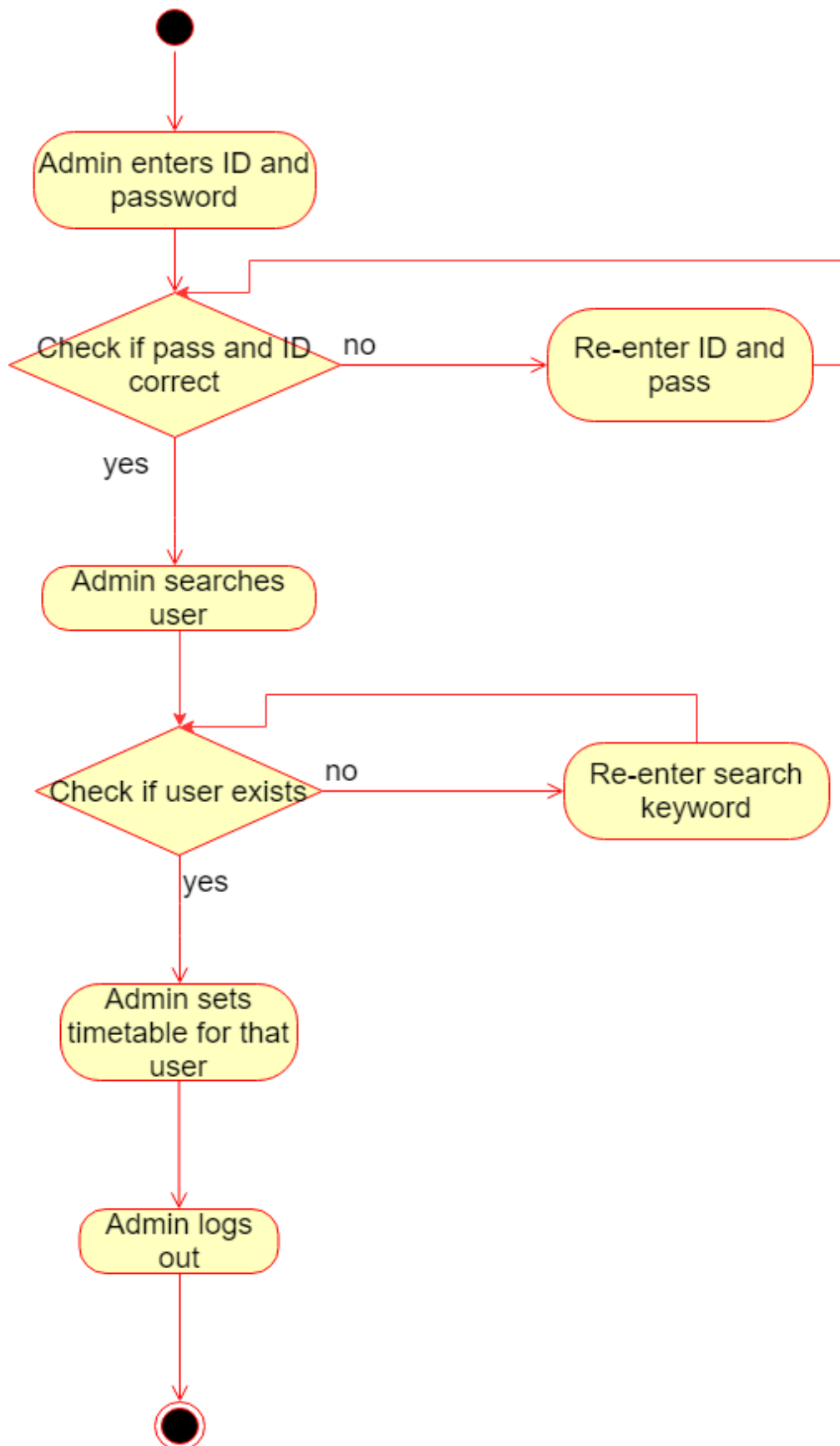
Change Password



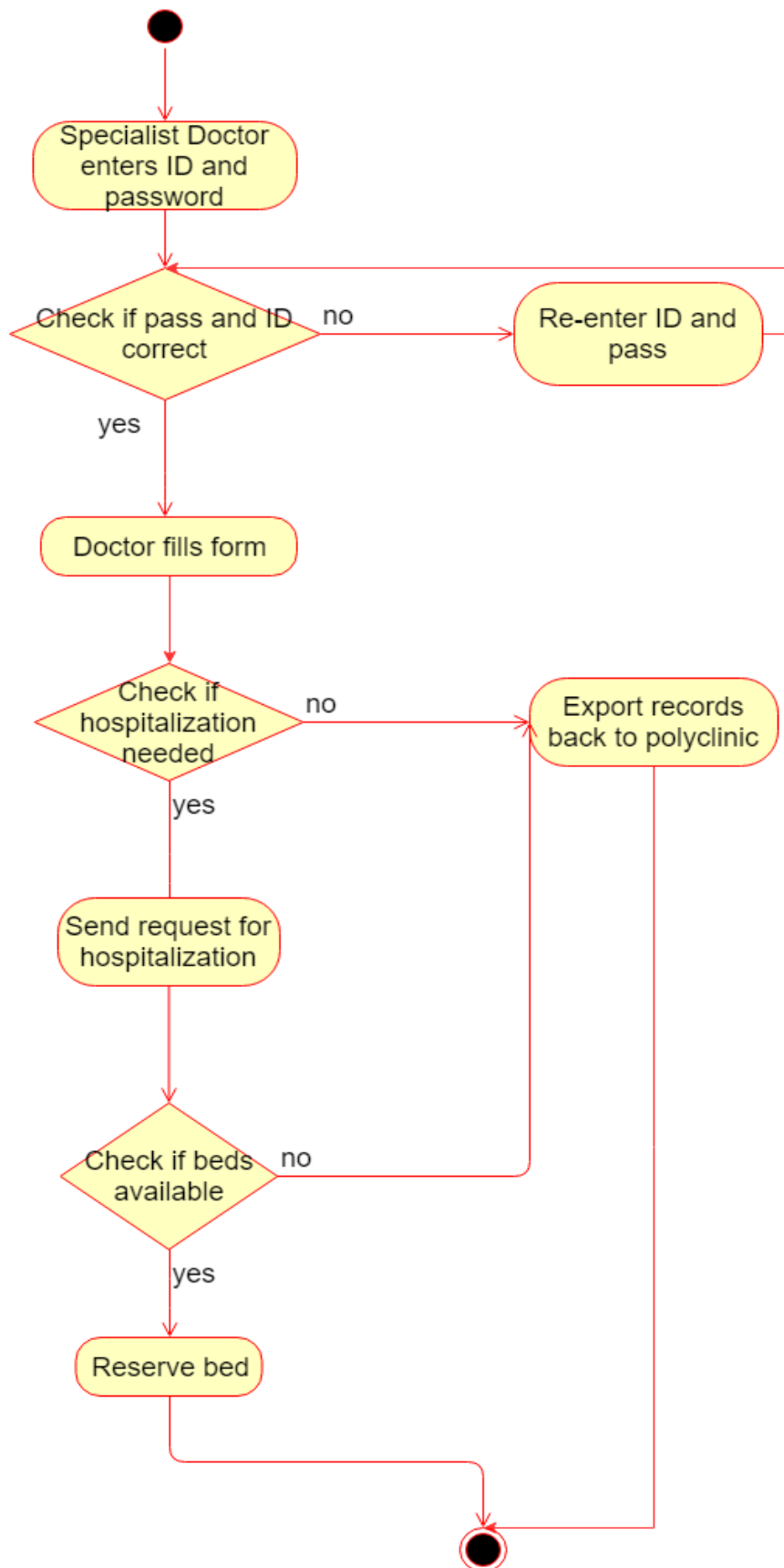
Add Patient



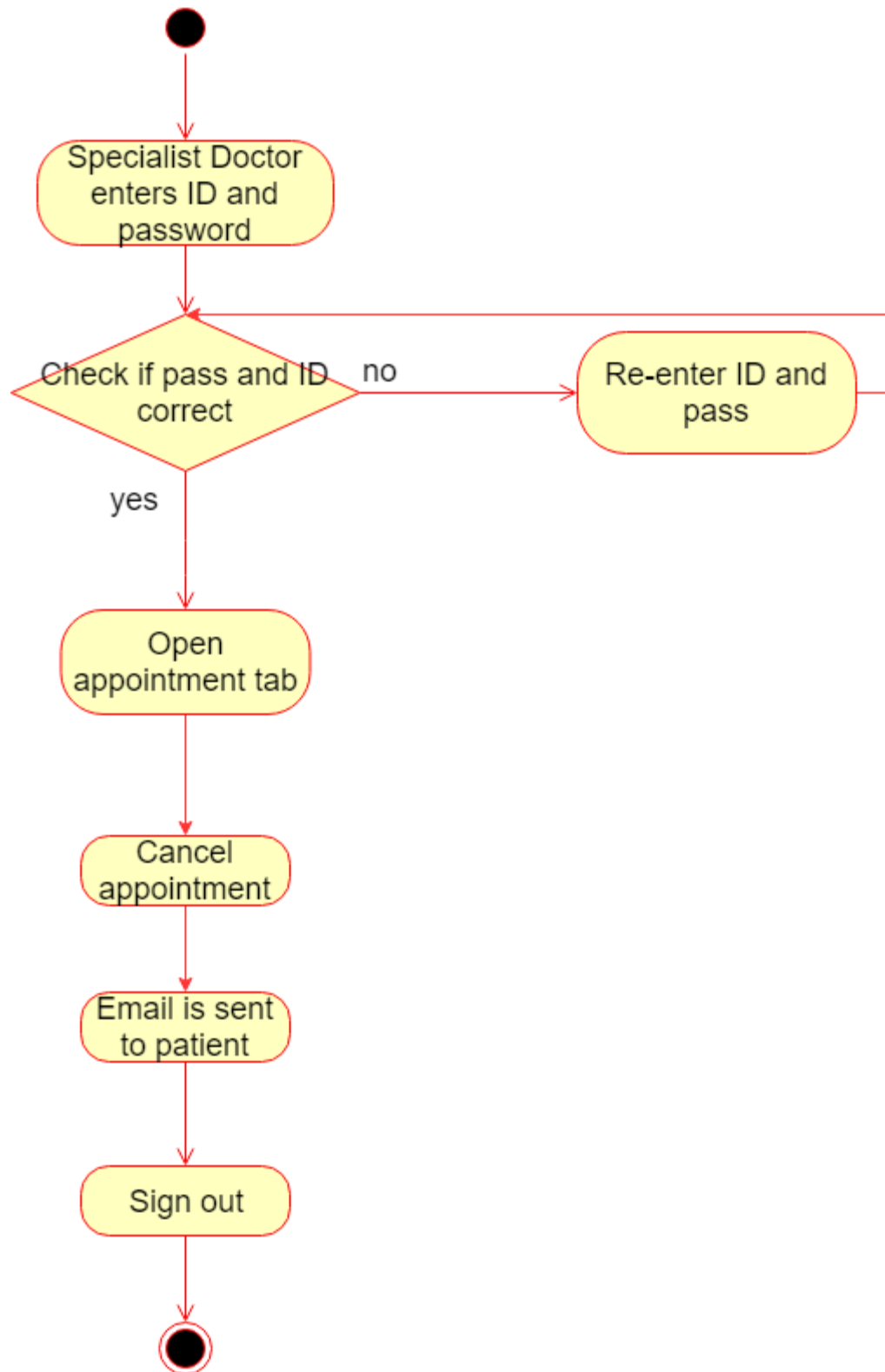
Set Timetable



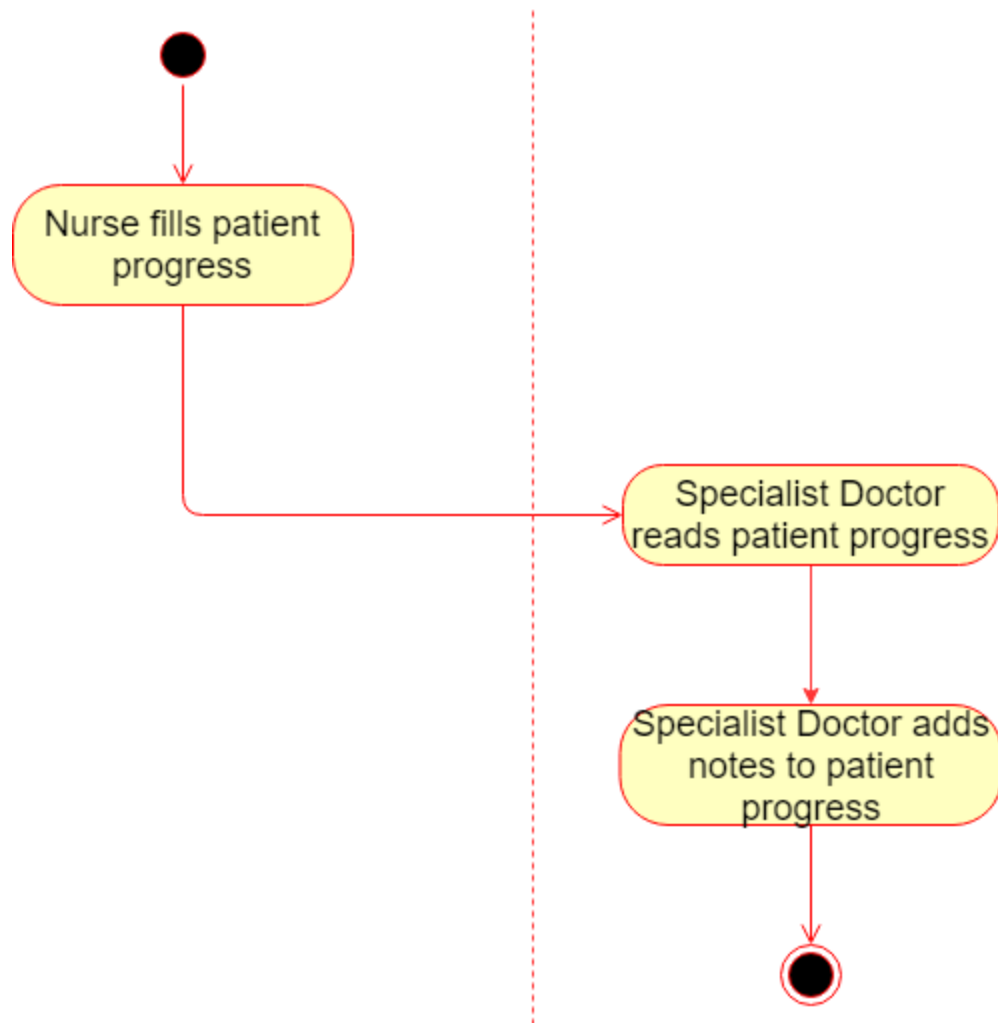
Appointment

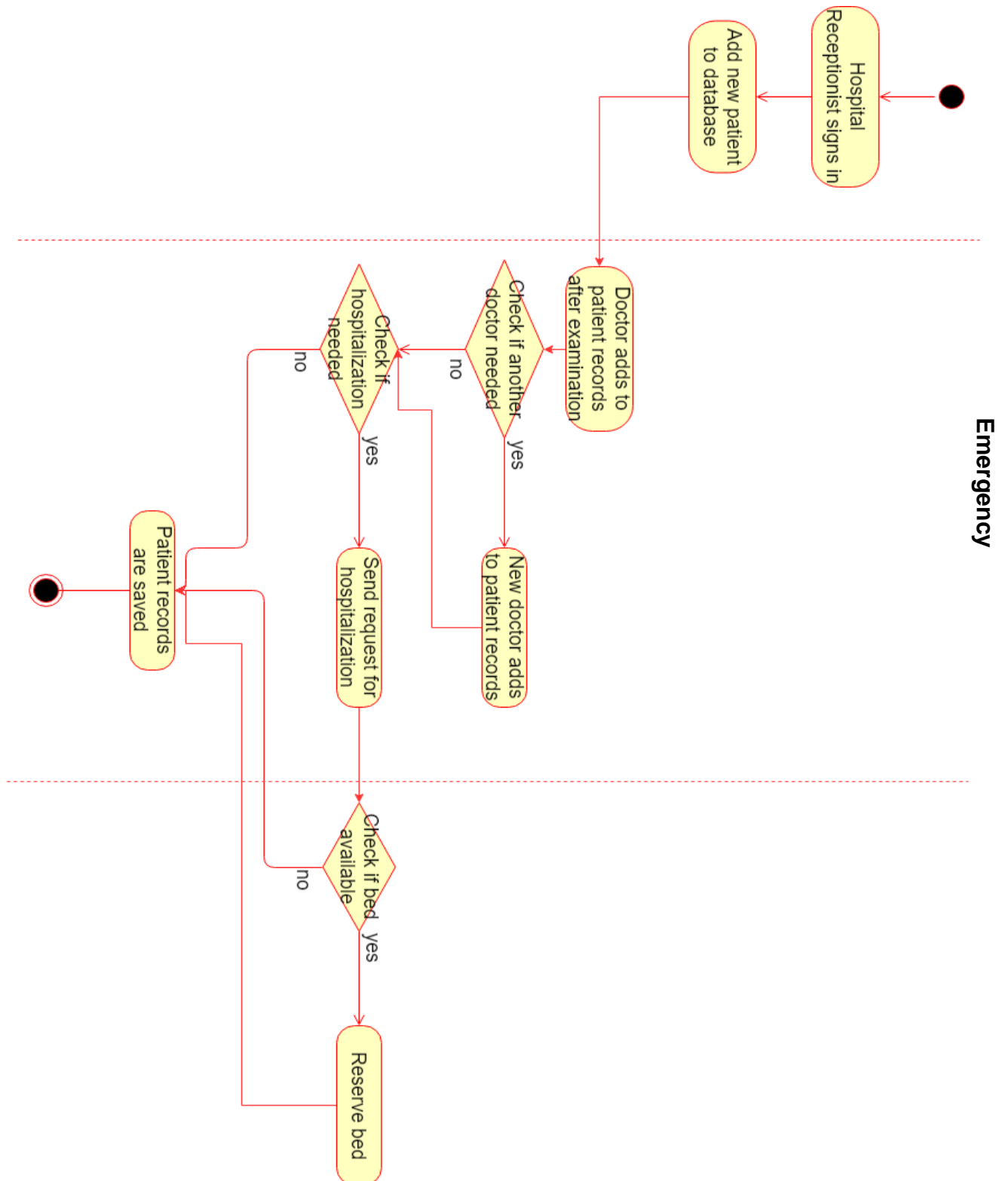


Cancel Appointment

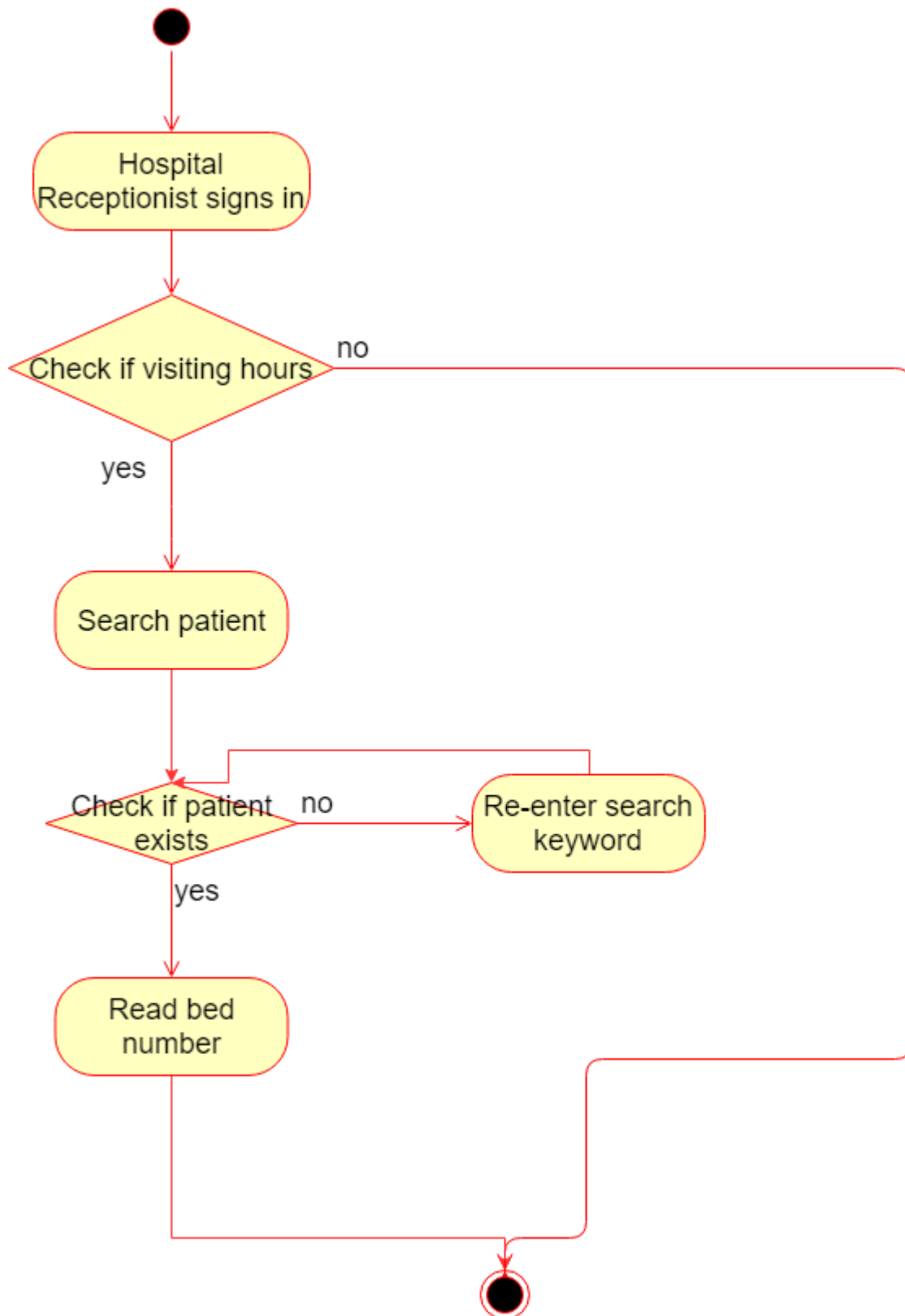


Hospitalized

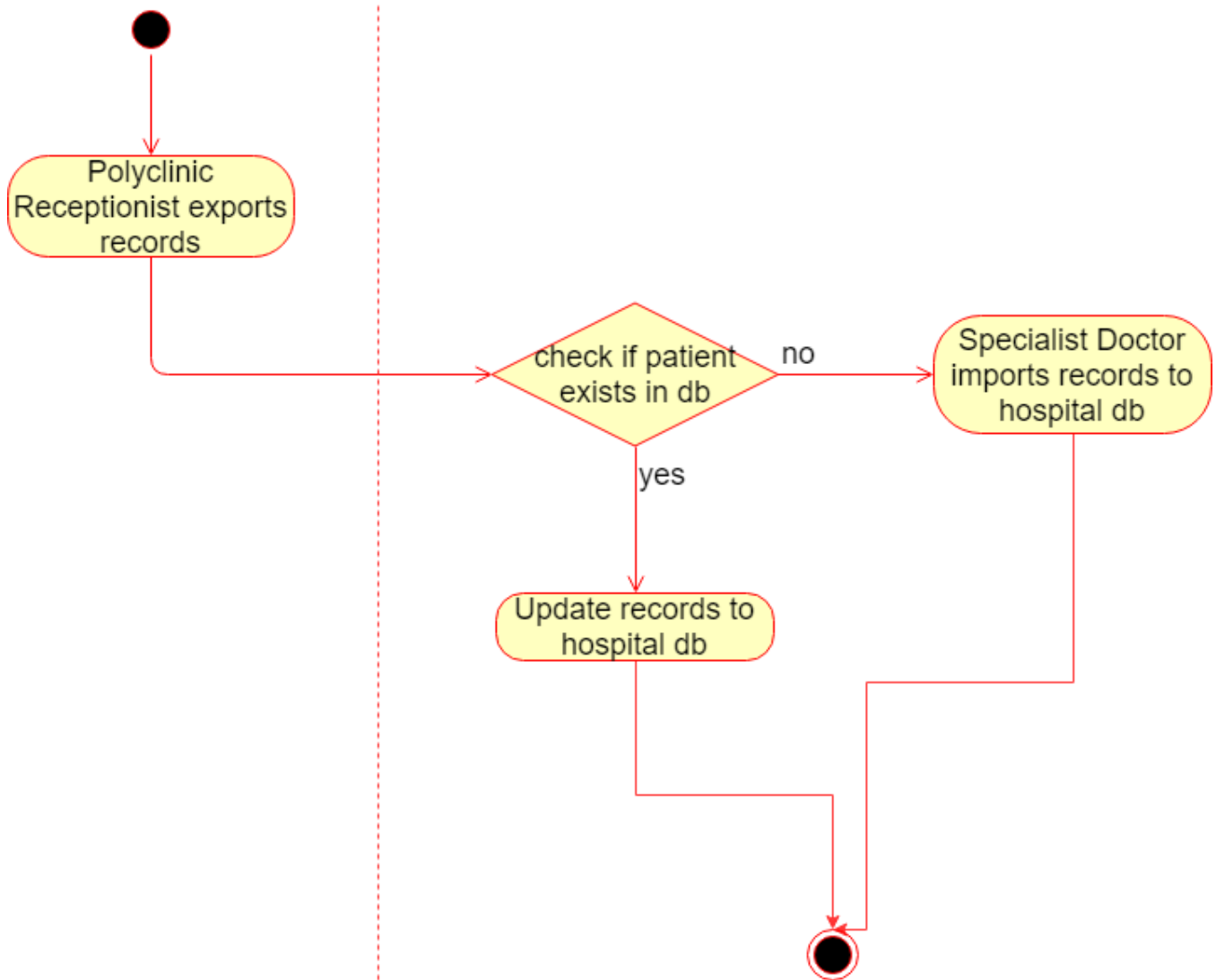




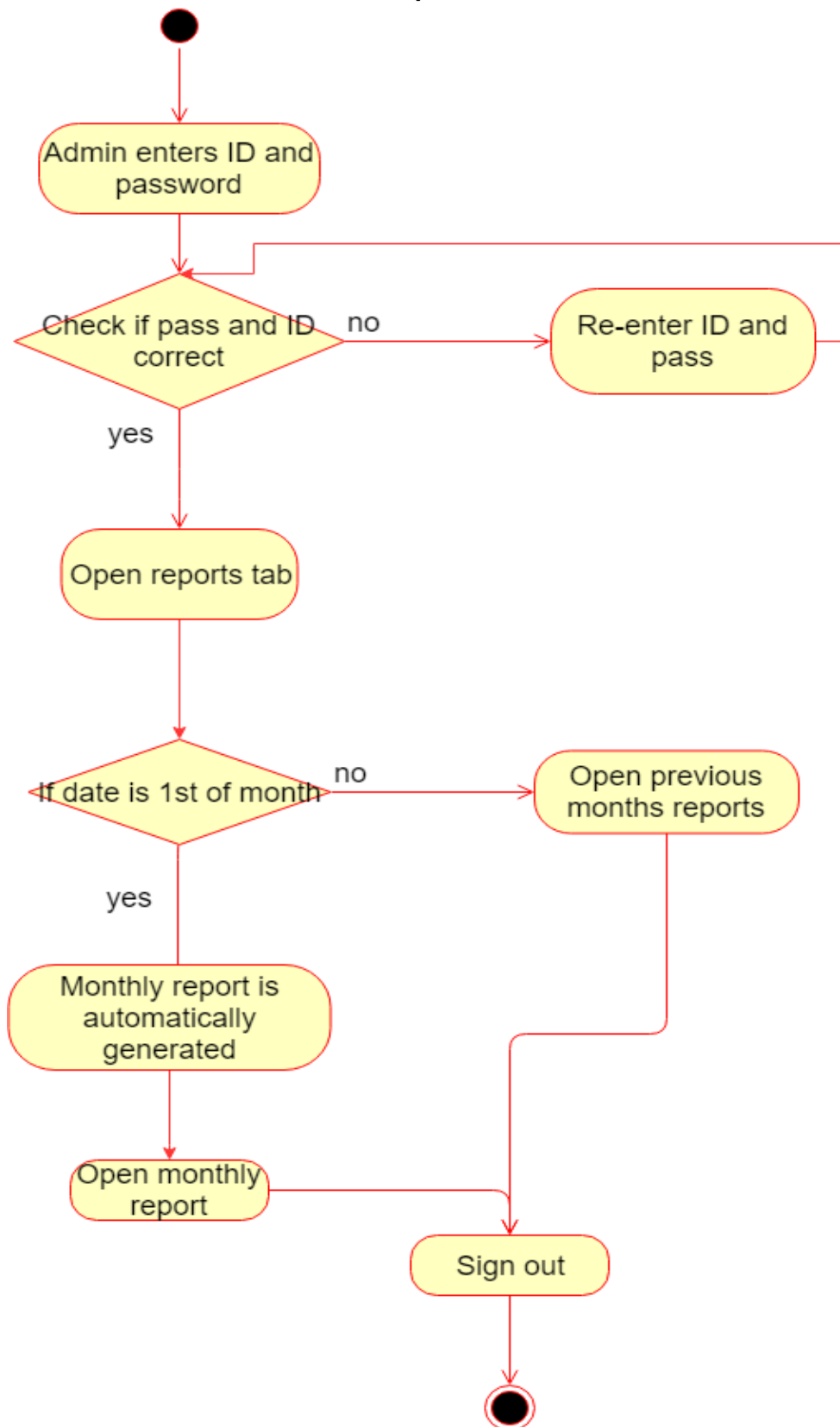
Visiting Hours



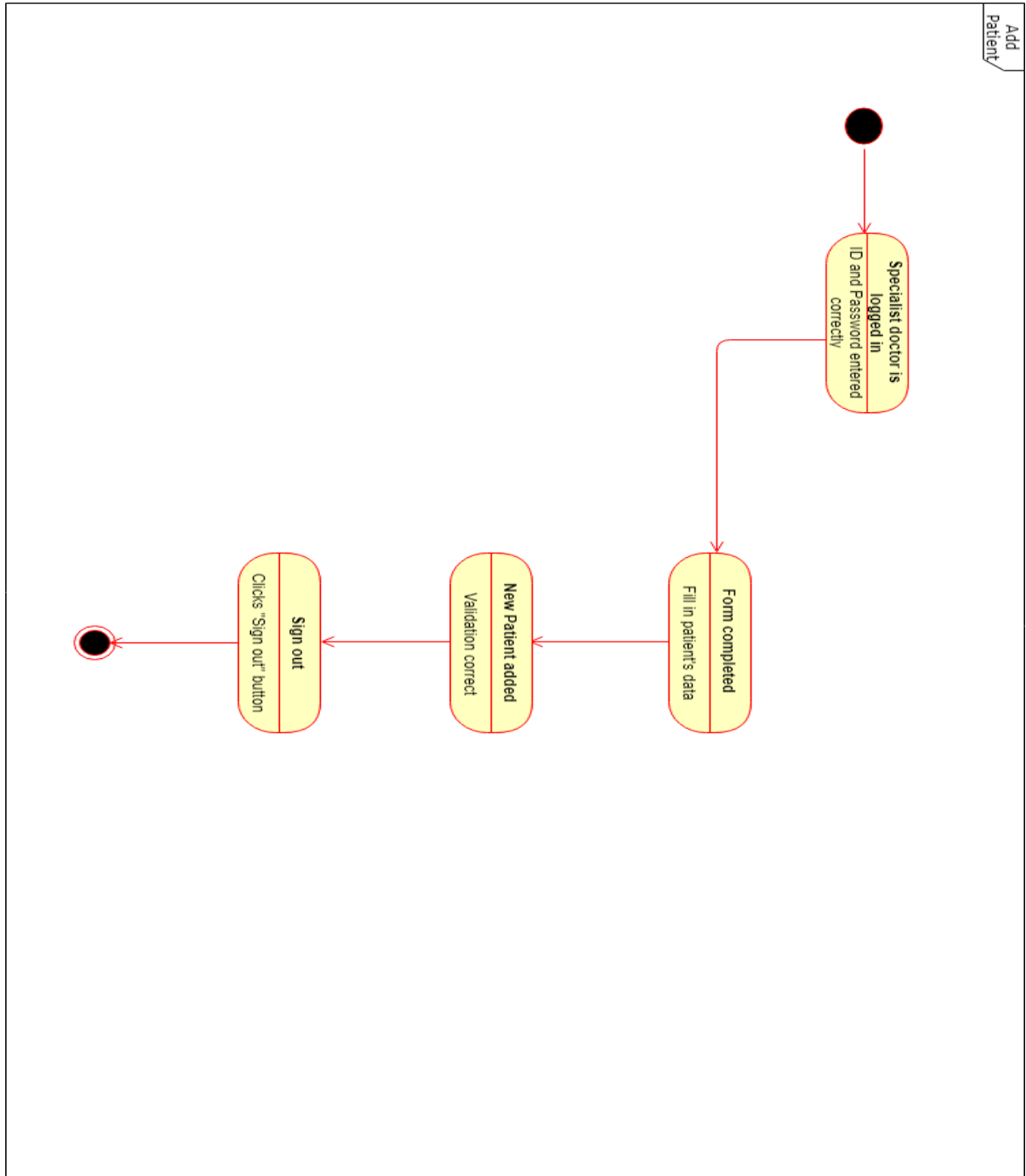
Import/Export



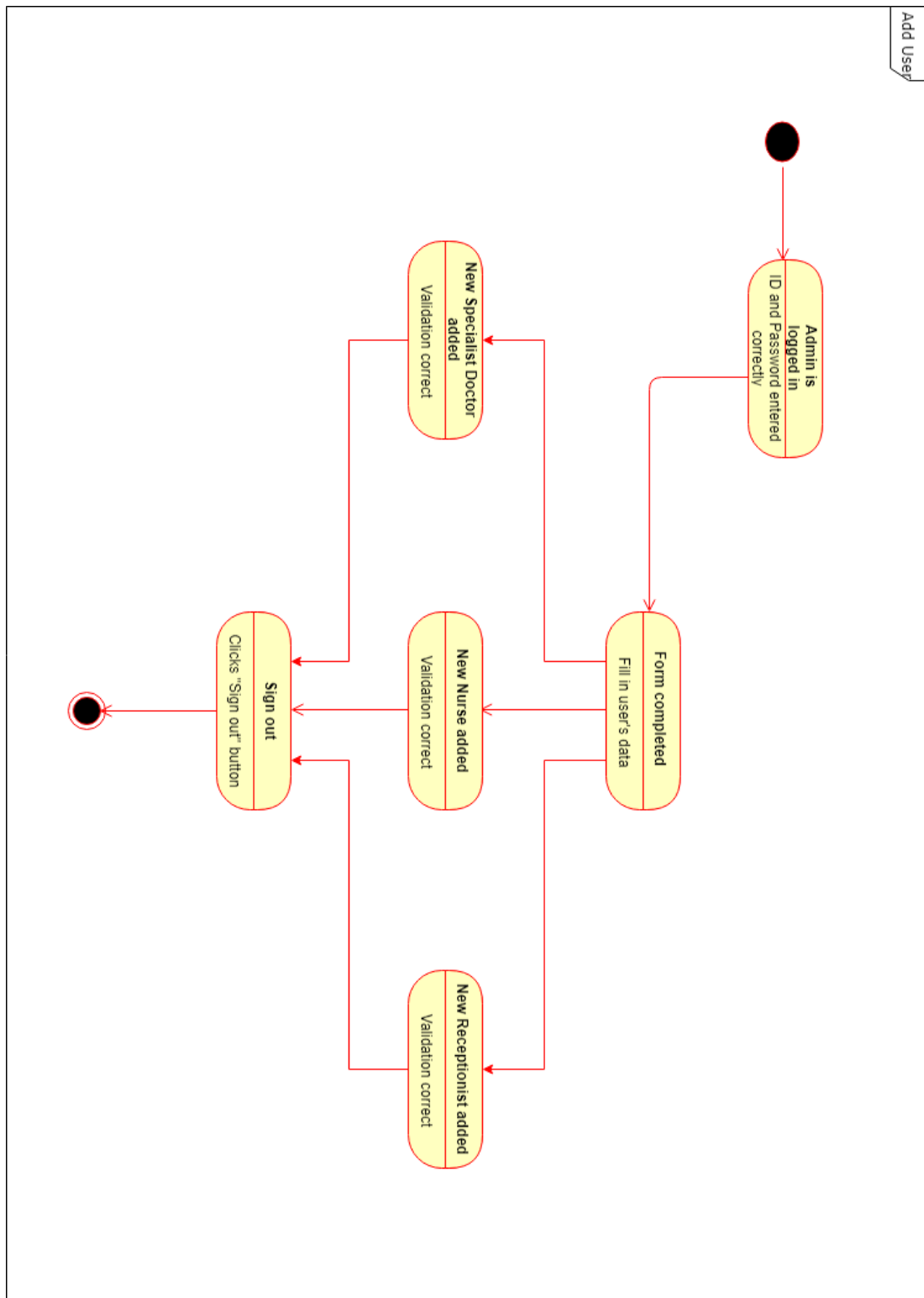
Reports



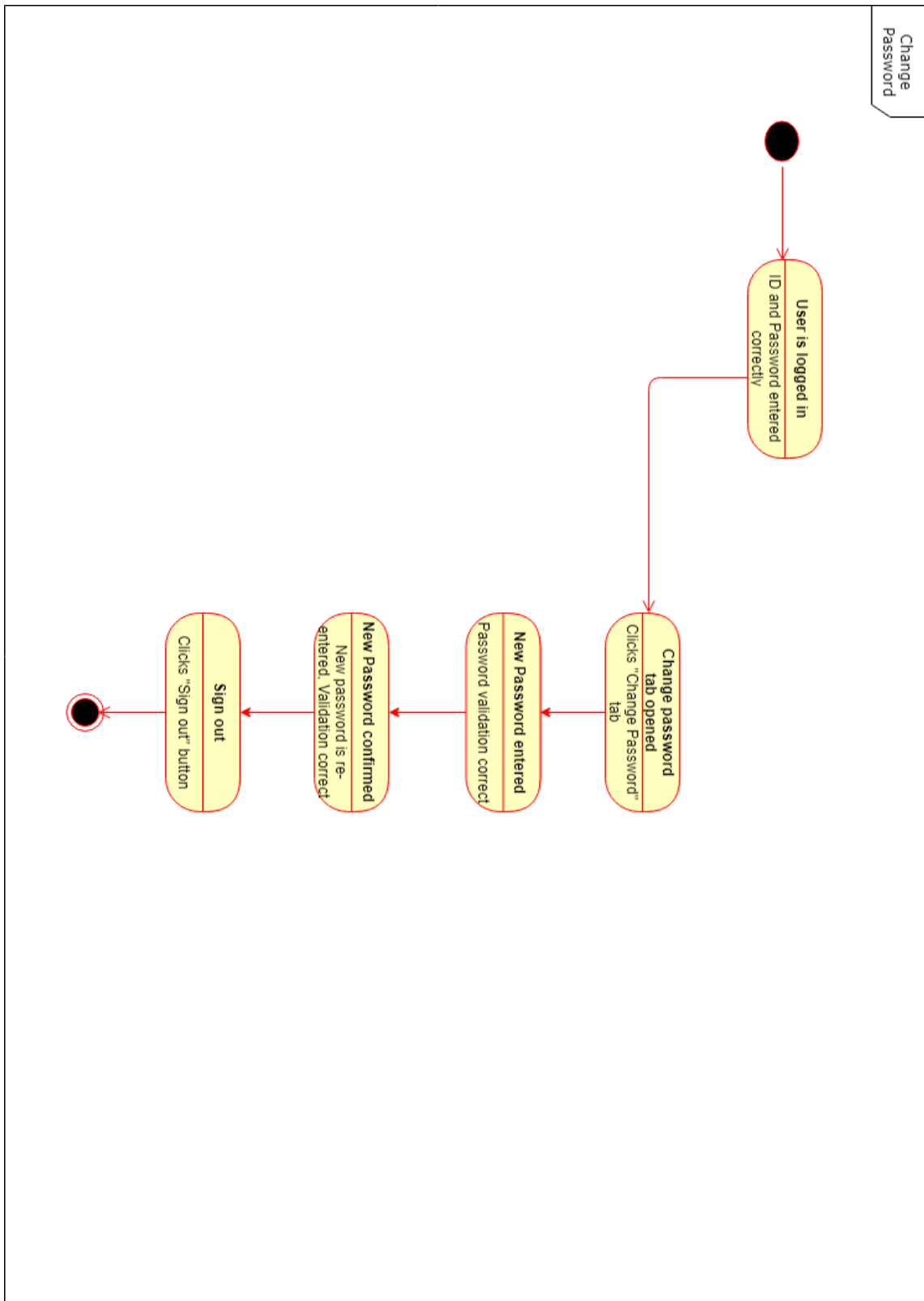
4.6 State Diagrams



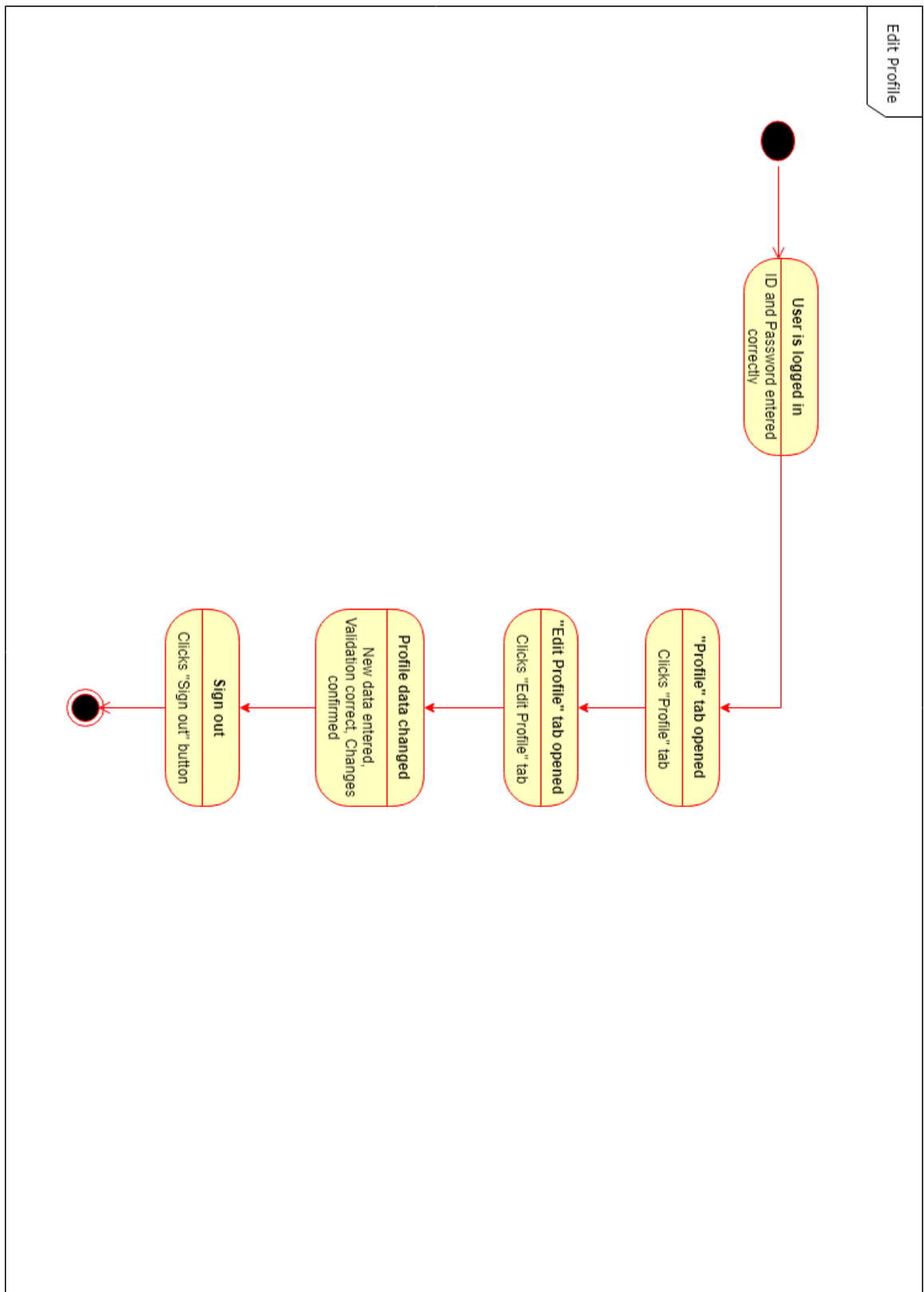
Medical Management System



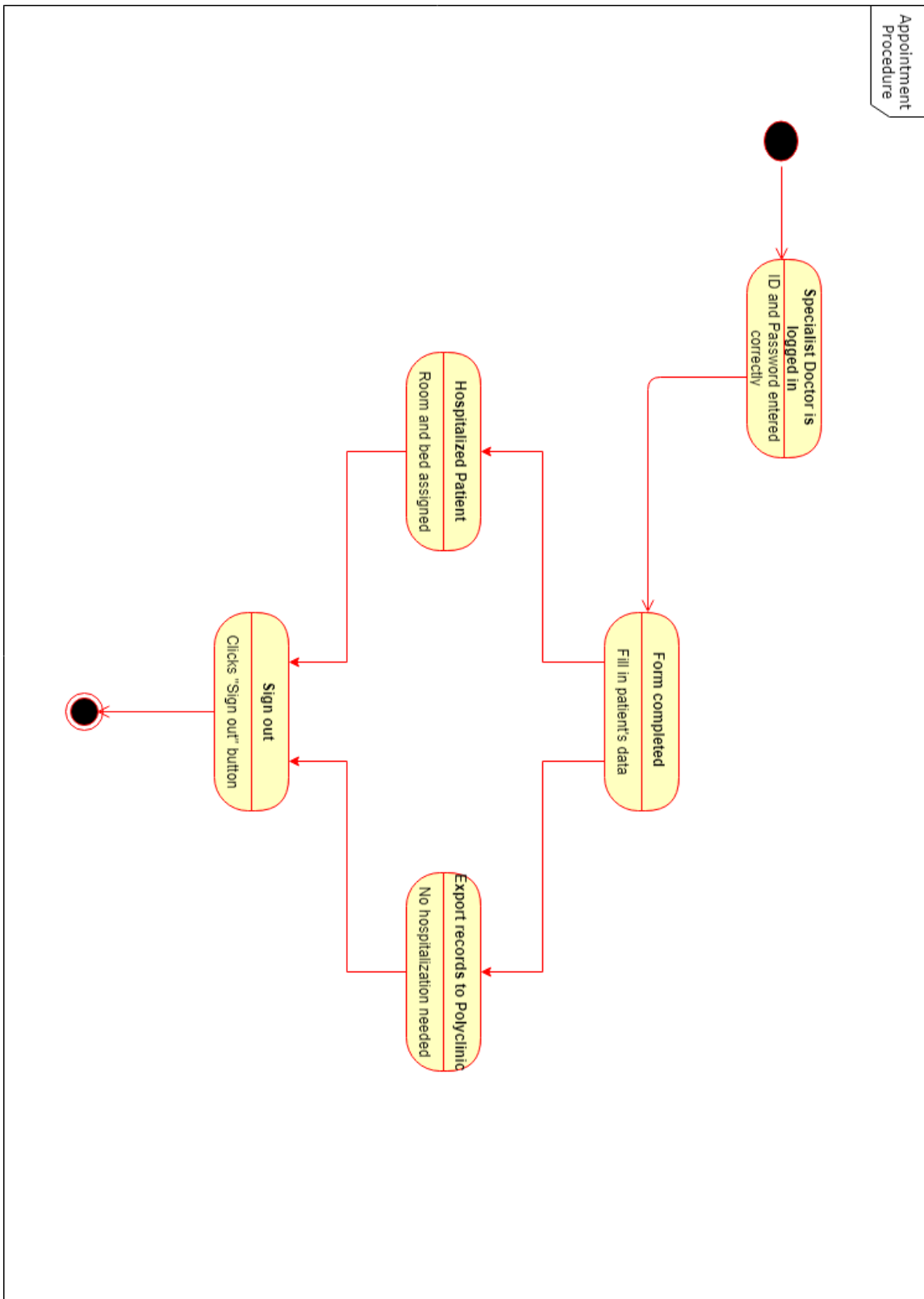
Medical Management System



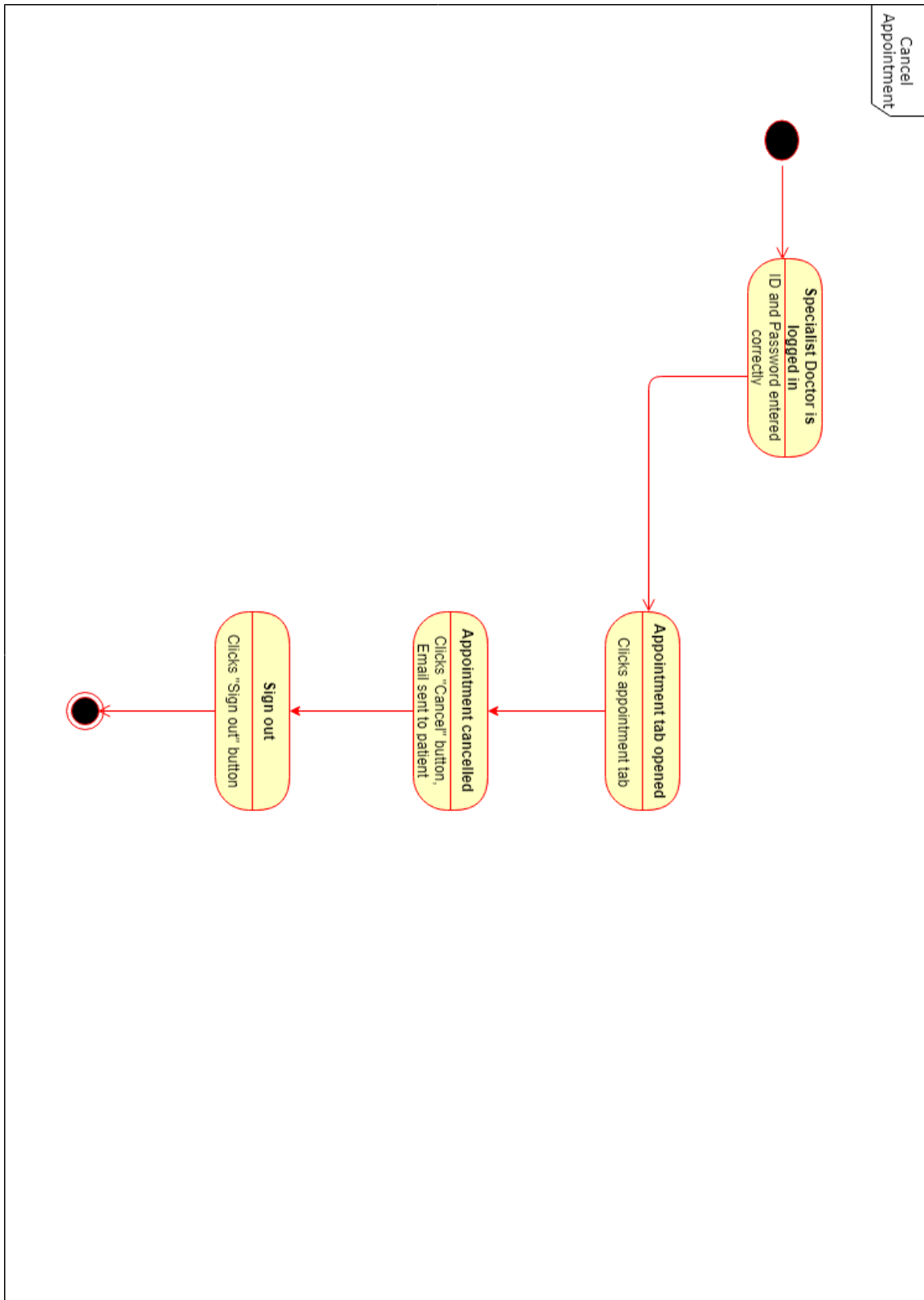
Medical Management System



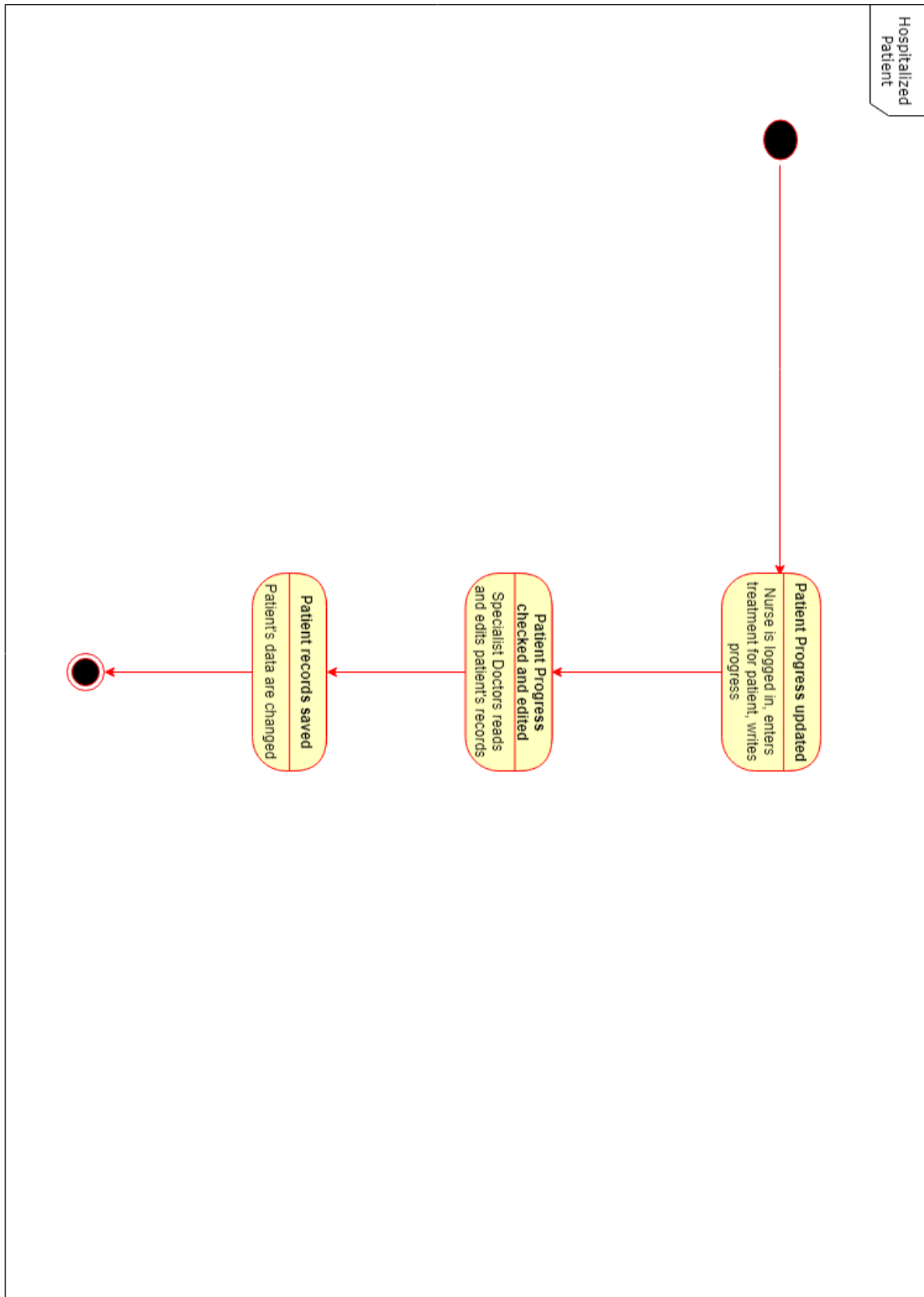
Medical Management System



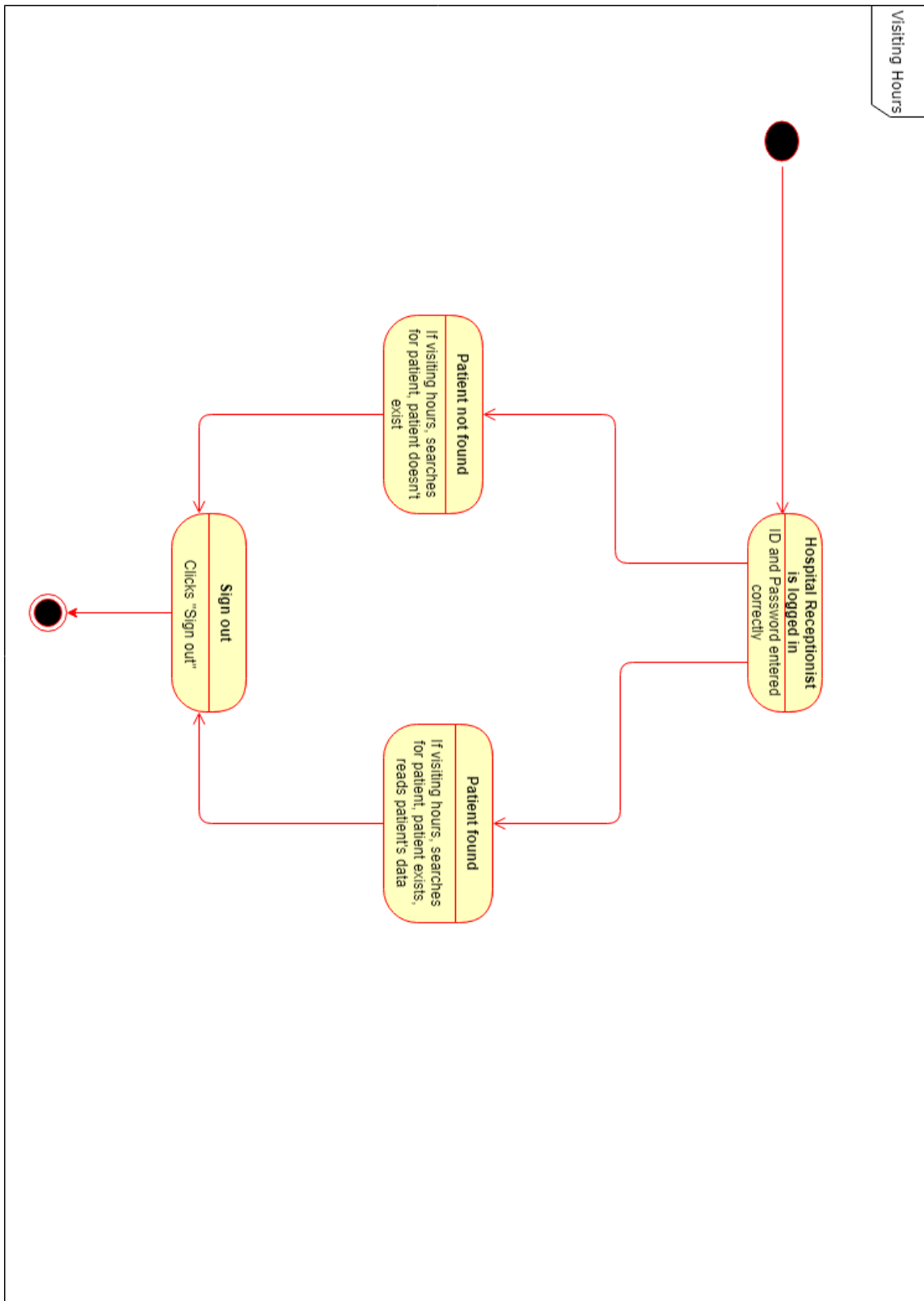
Medical Management System



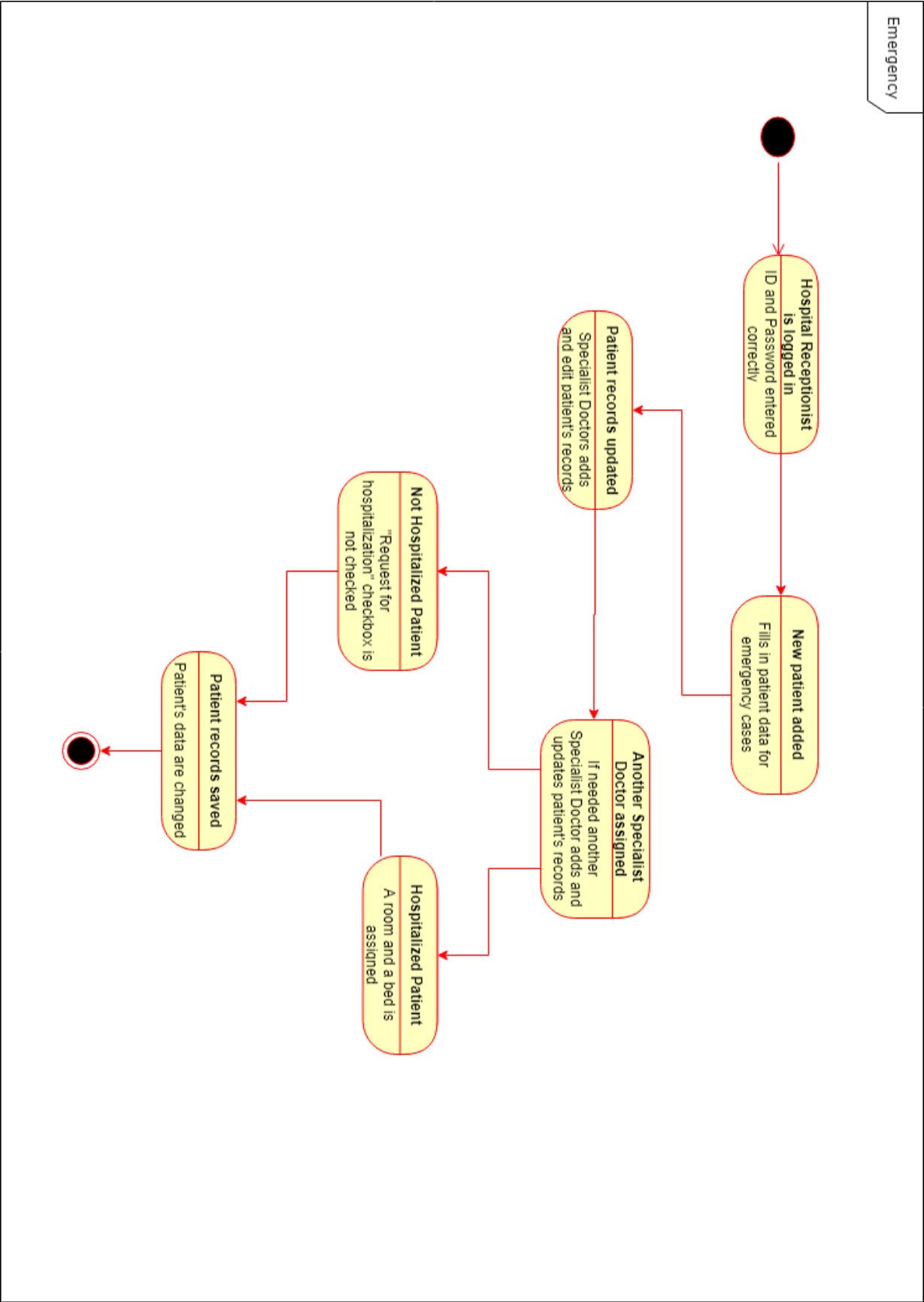
Medical Management System



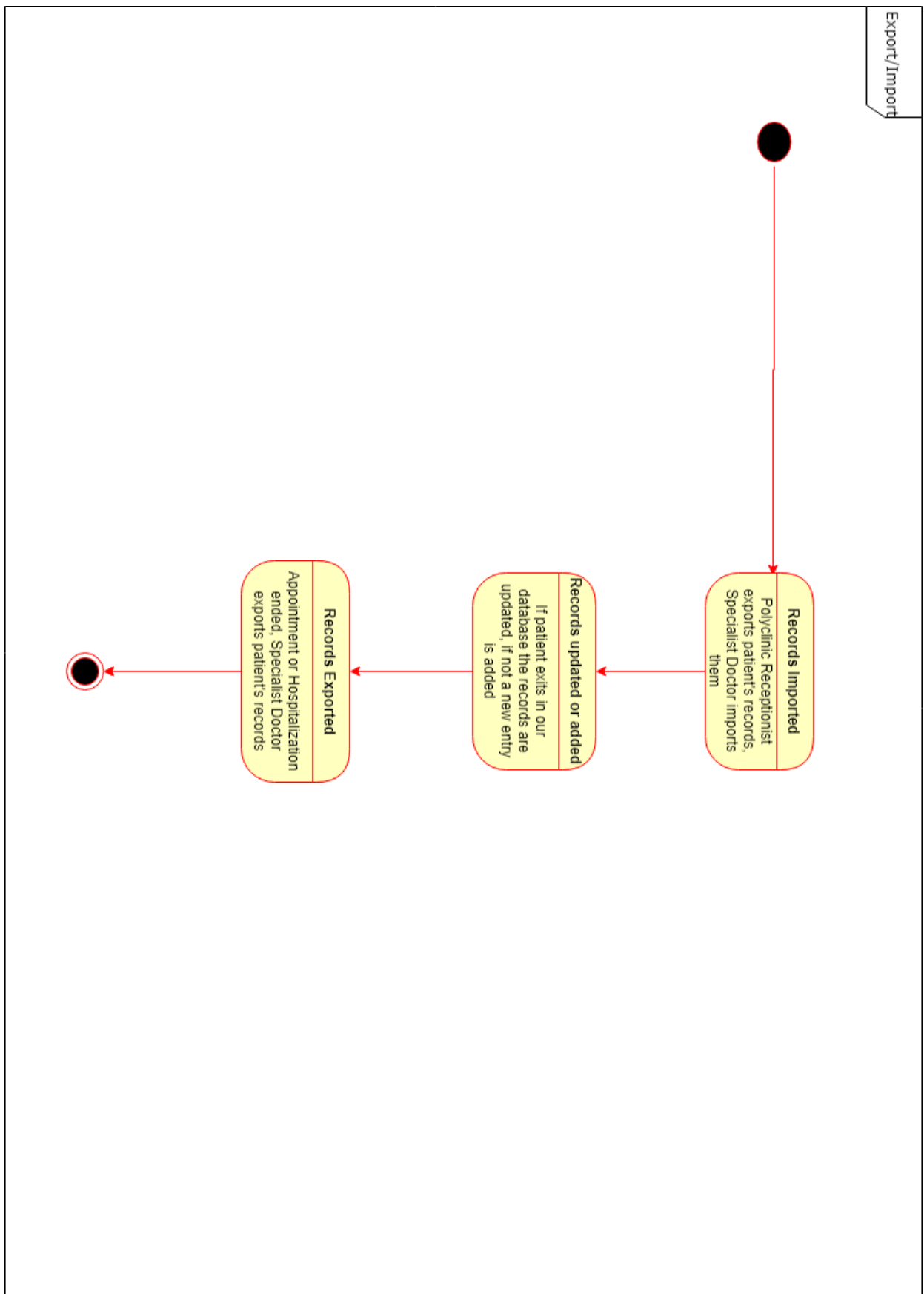
Medical Management System



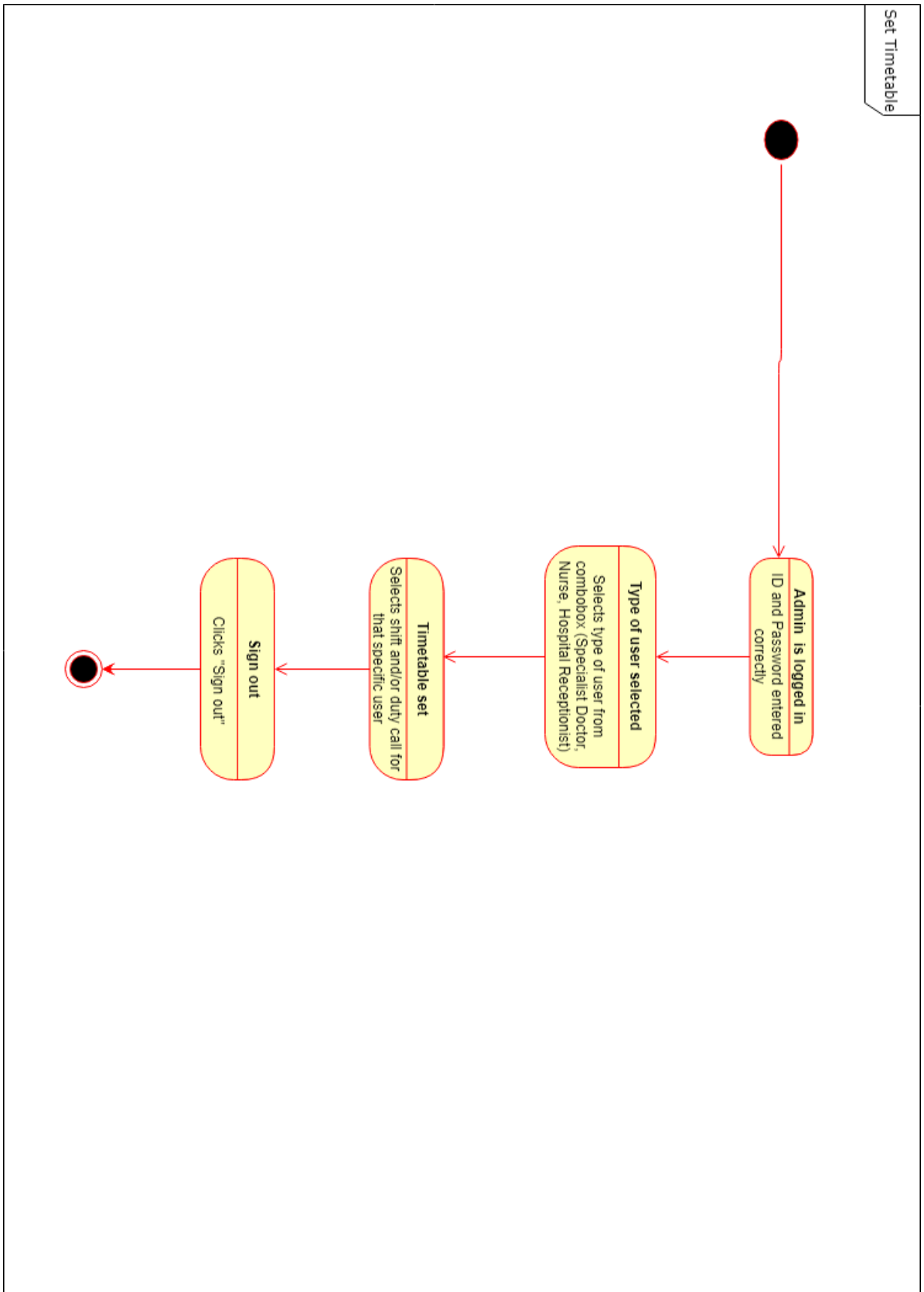
Medical Management System

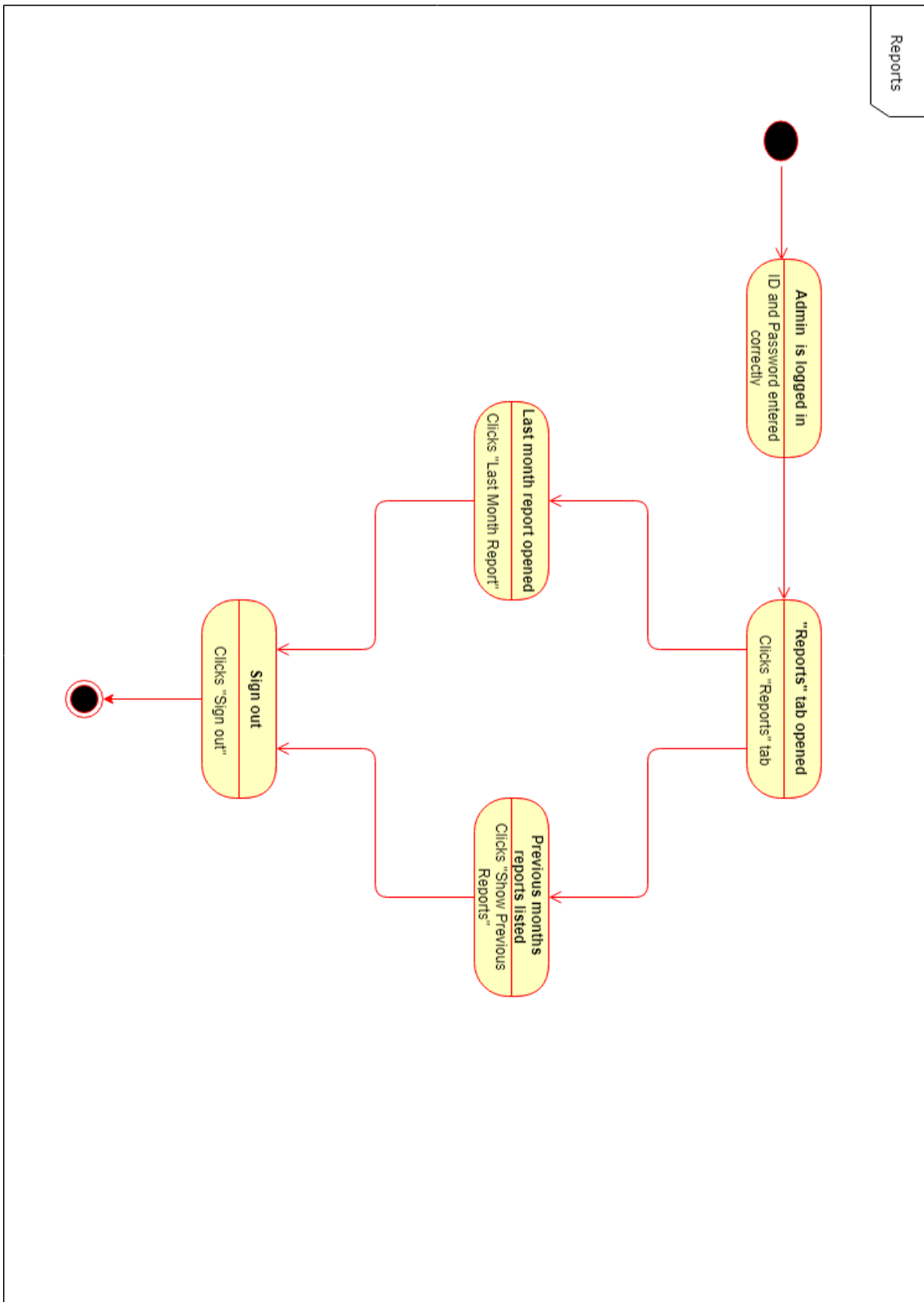


Medical Management System



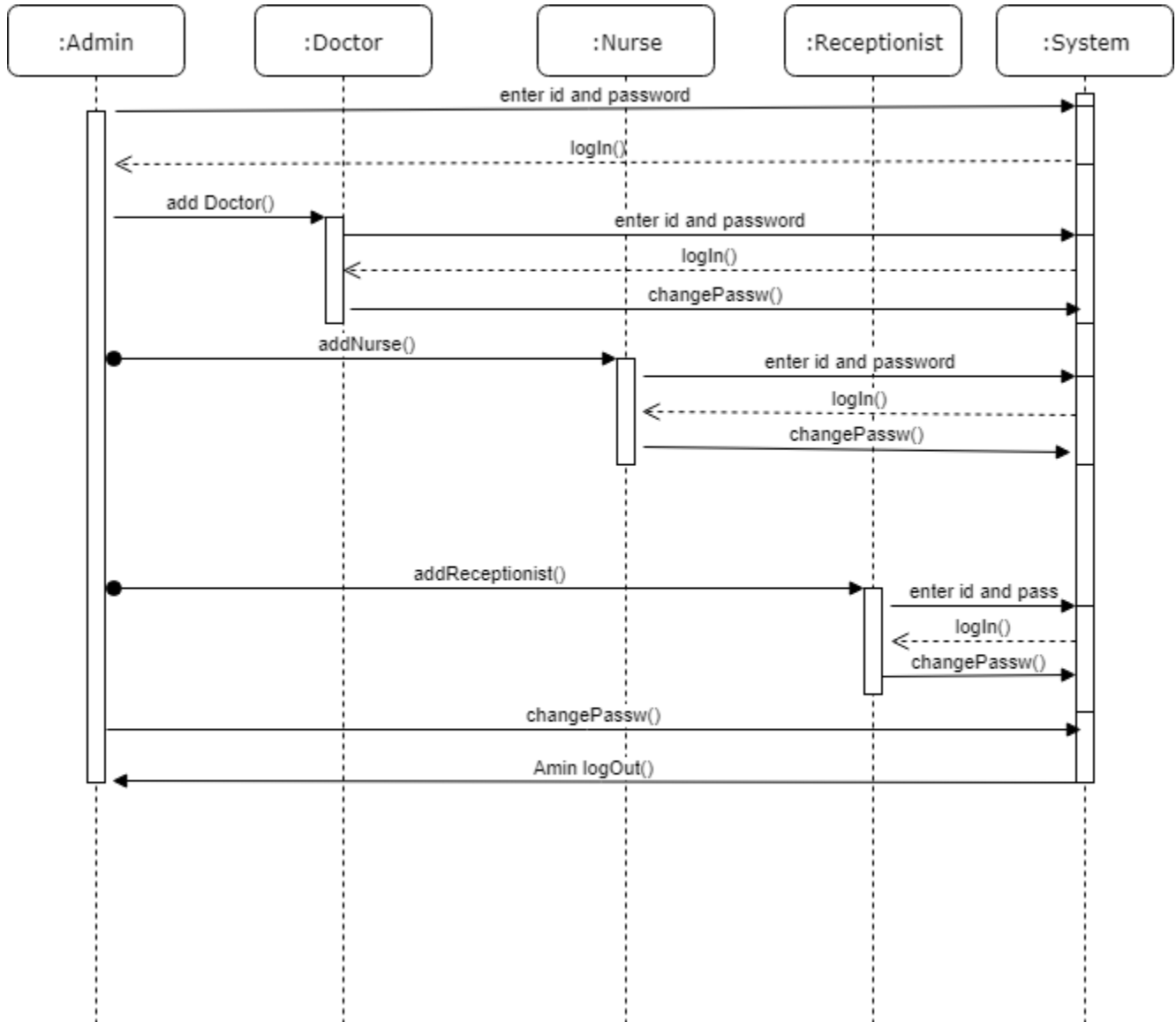
Medical Management System



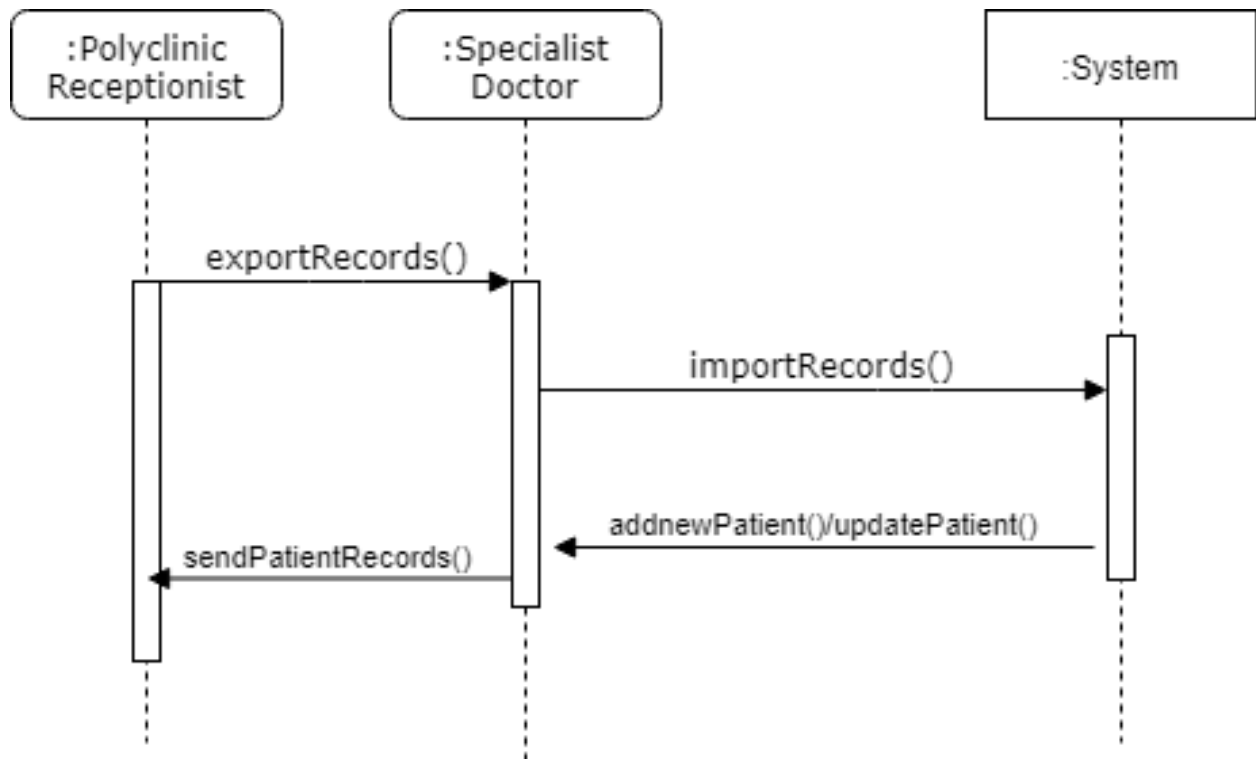


4.7 Sequence Diagrams

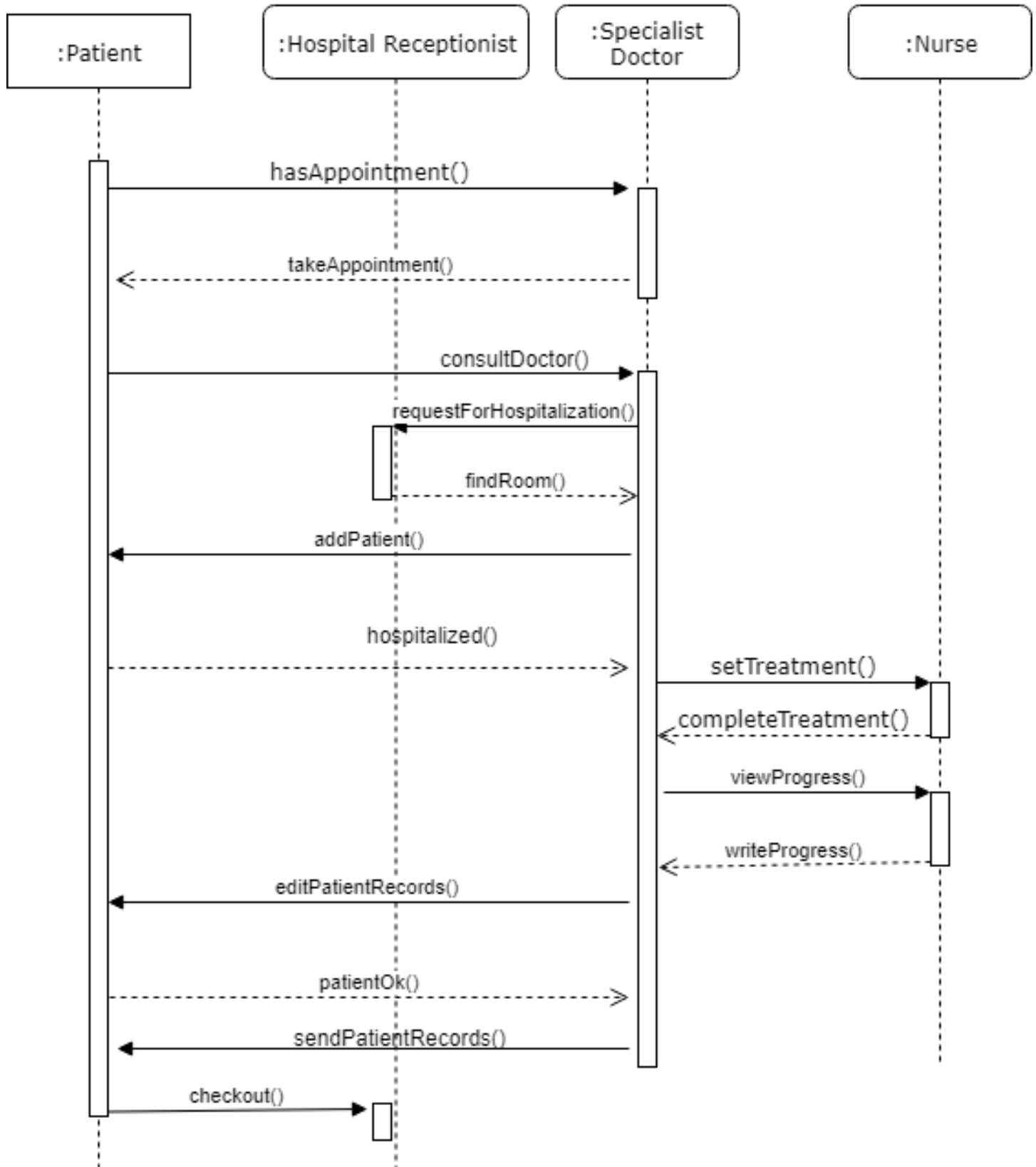
Add User



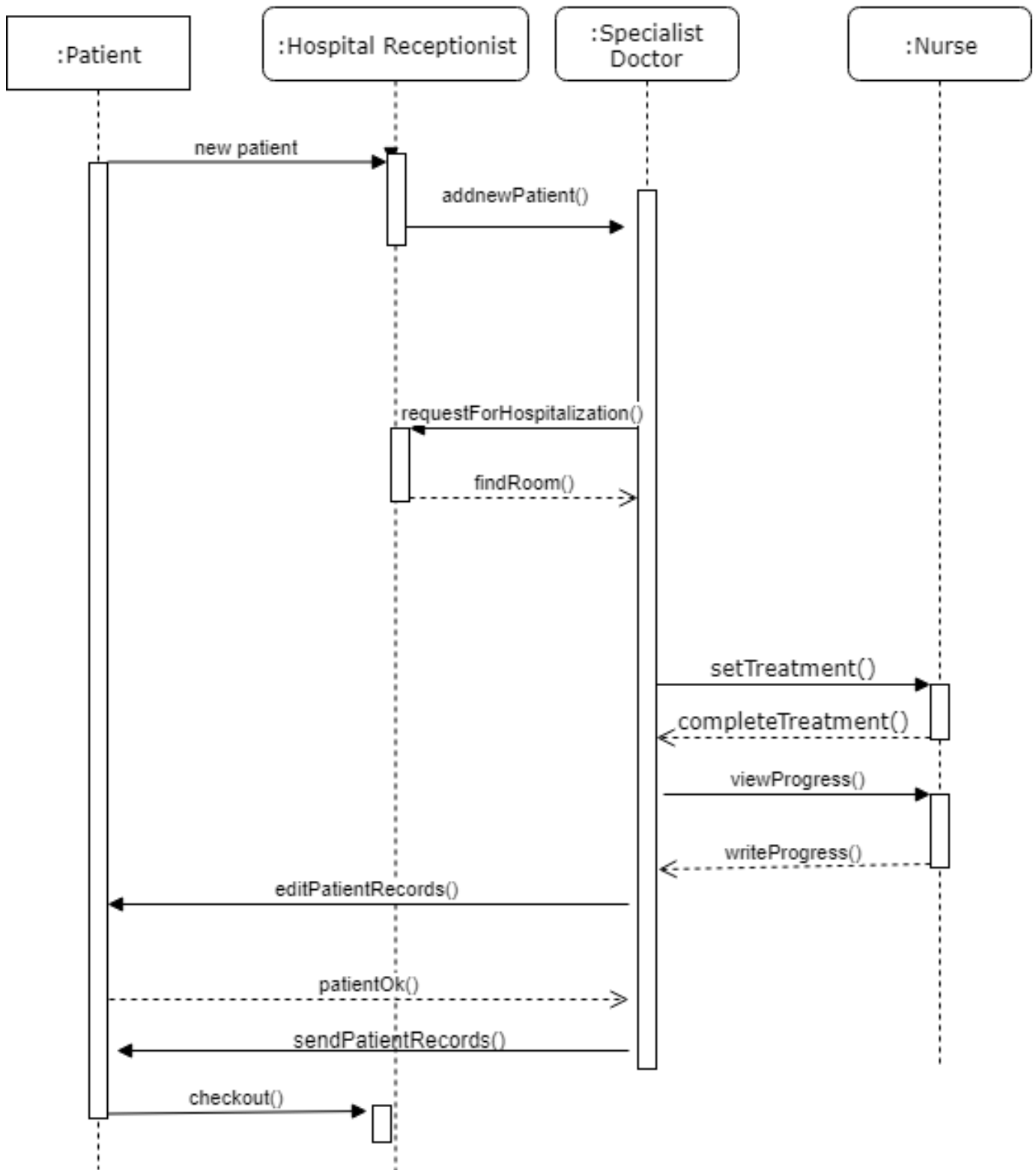
Import/Export



Appointment & Hospitalization

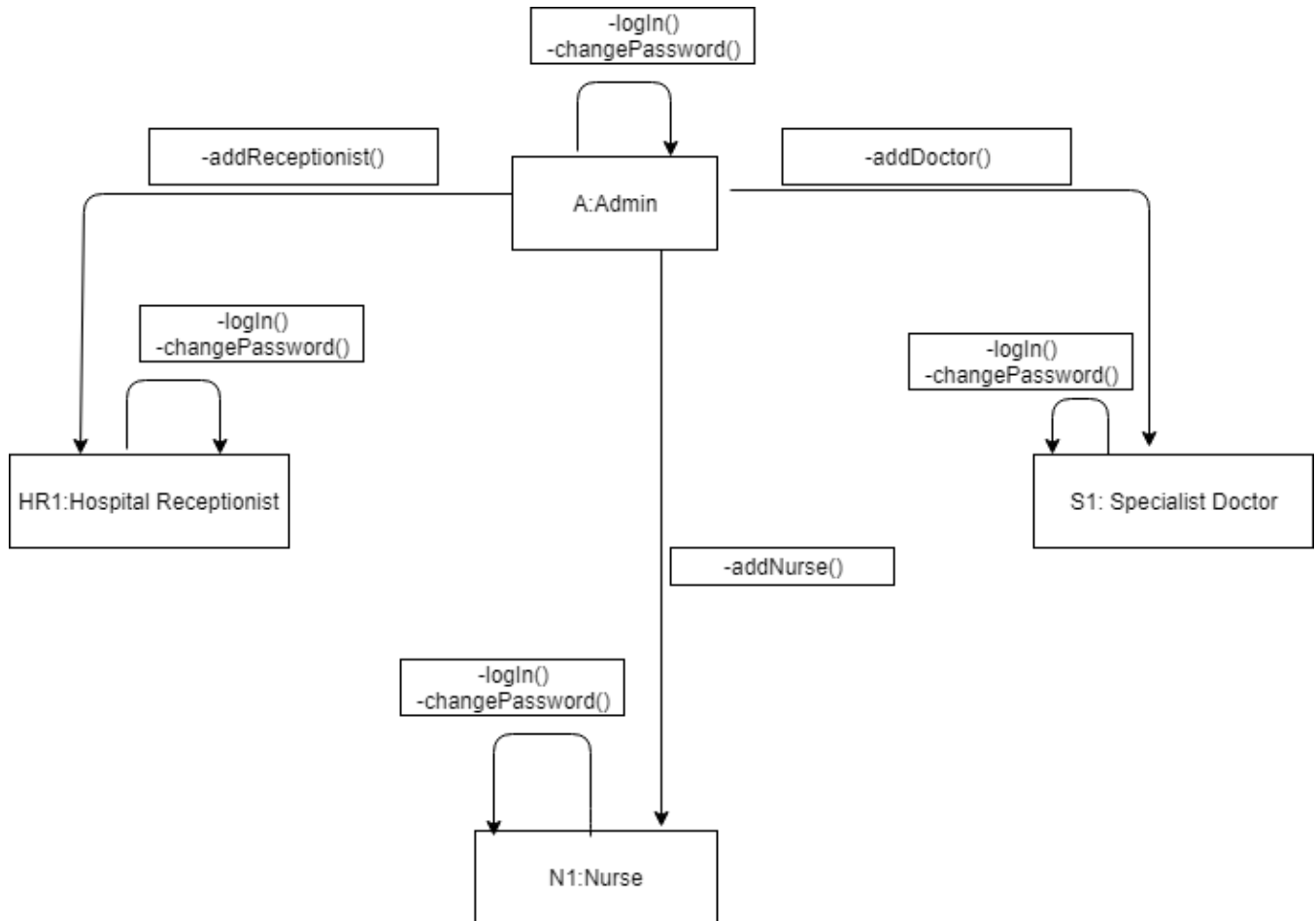


Emergency



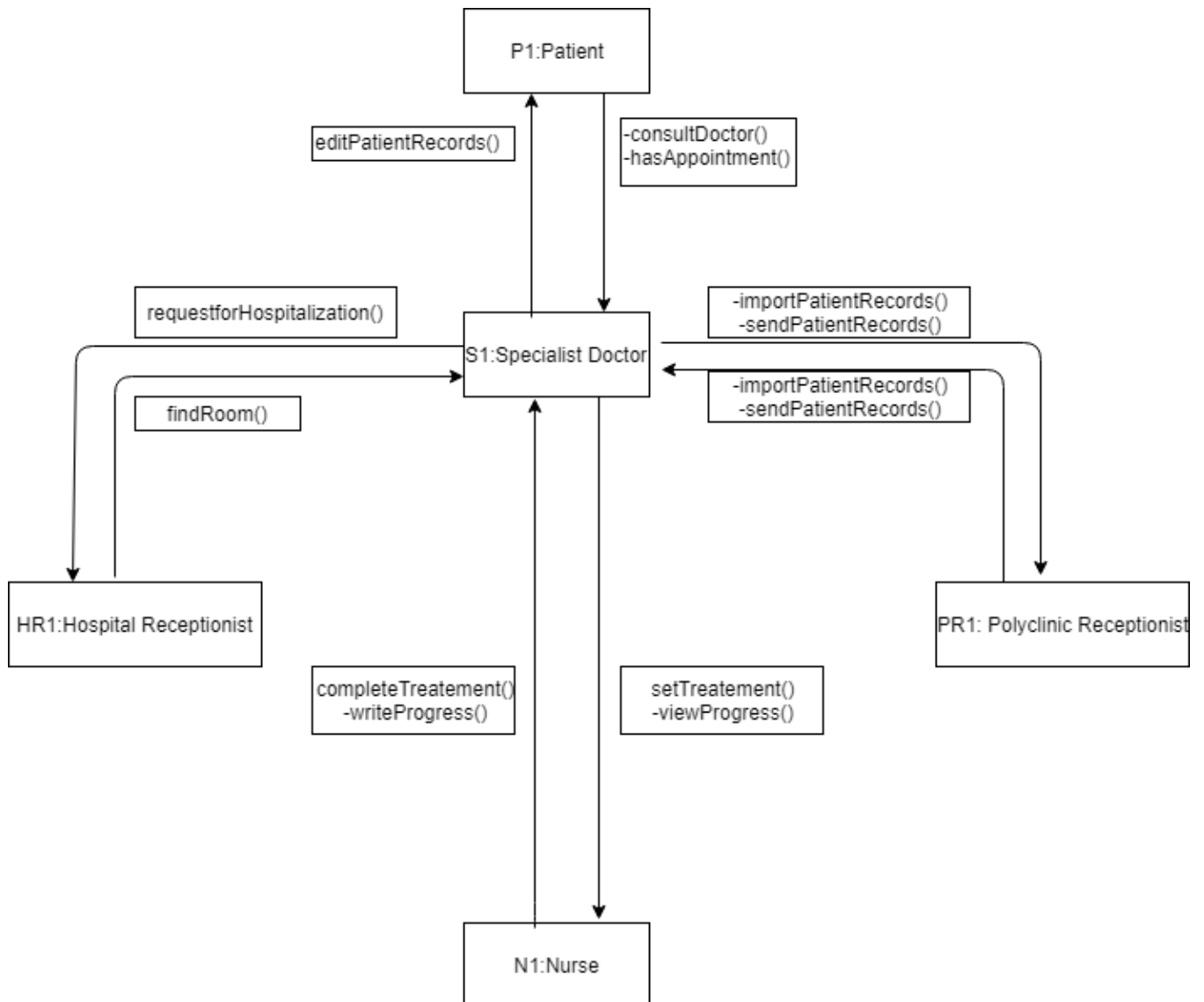
4.8 Collaboration Diagrams

Add User



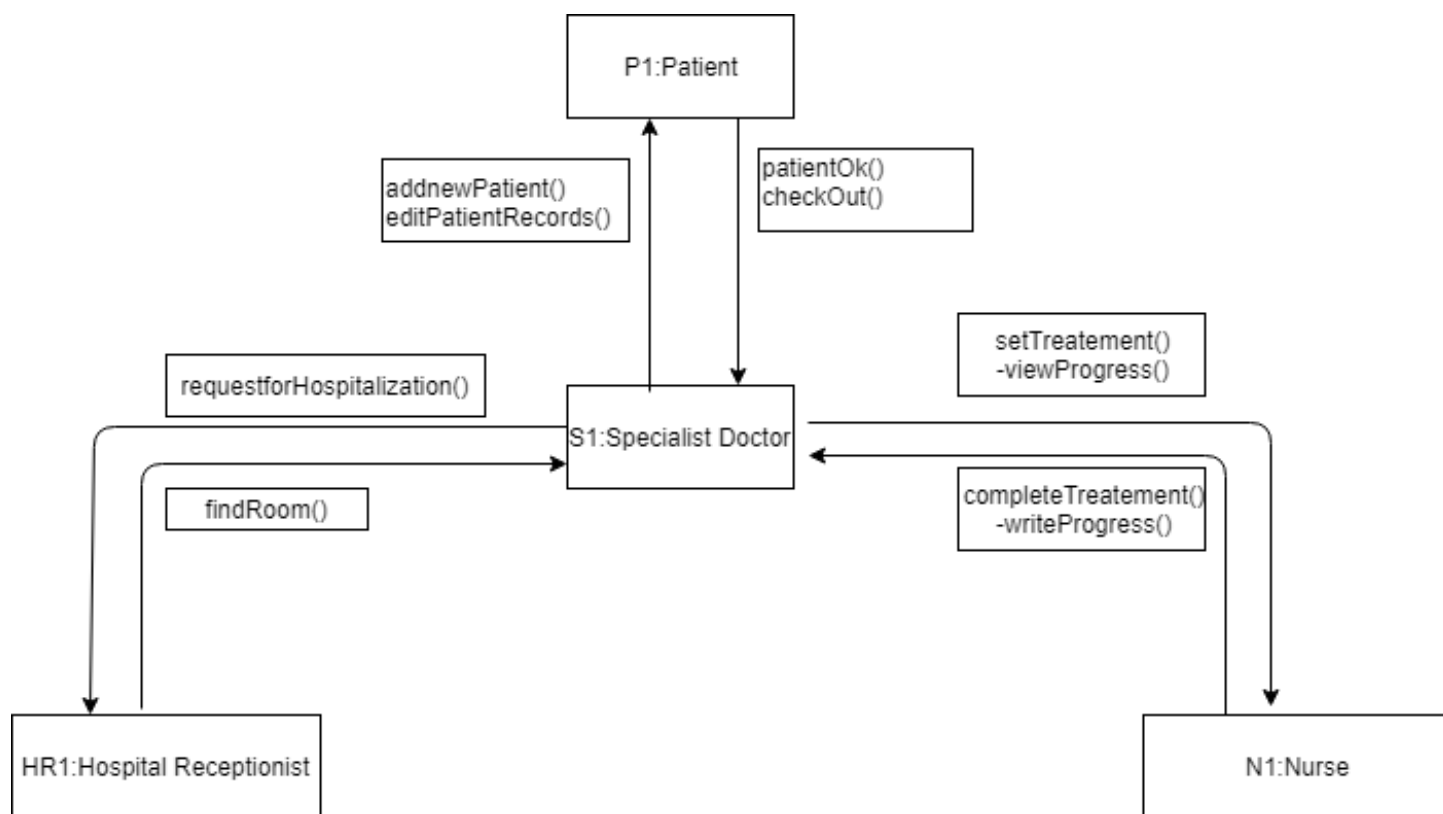
Medical Management System

Appointment & Hospitalization



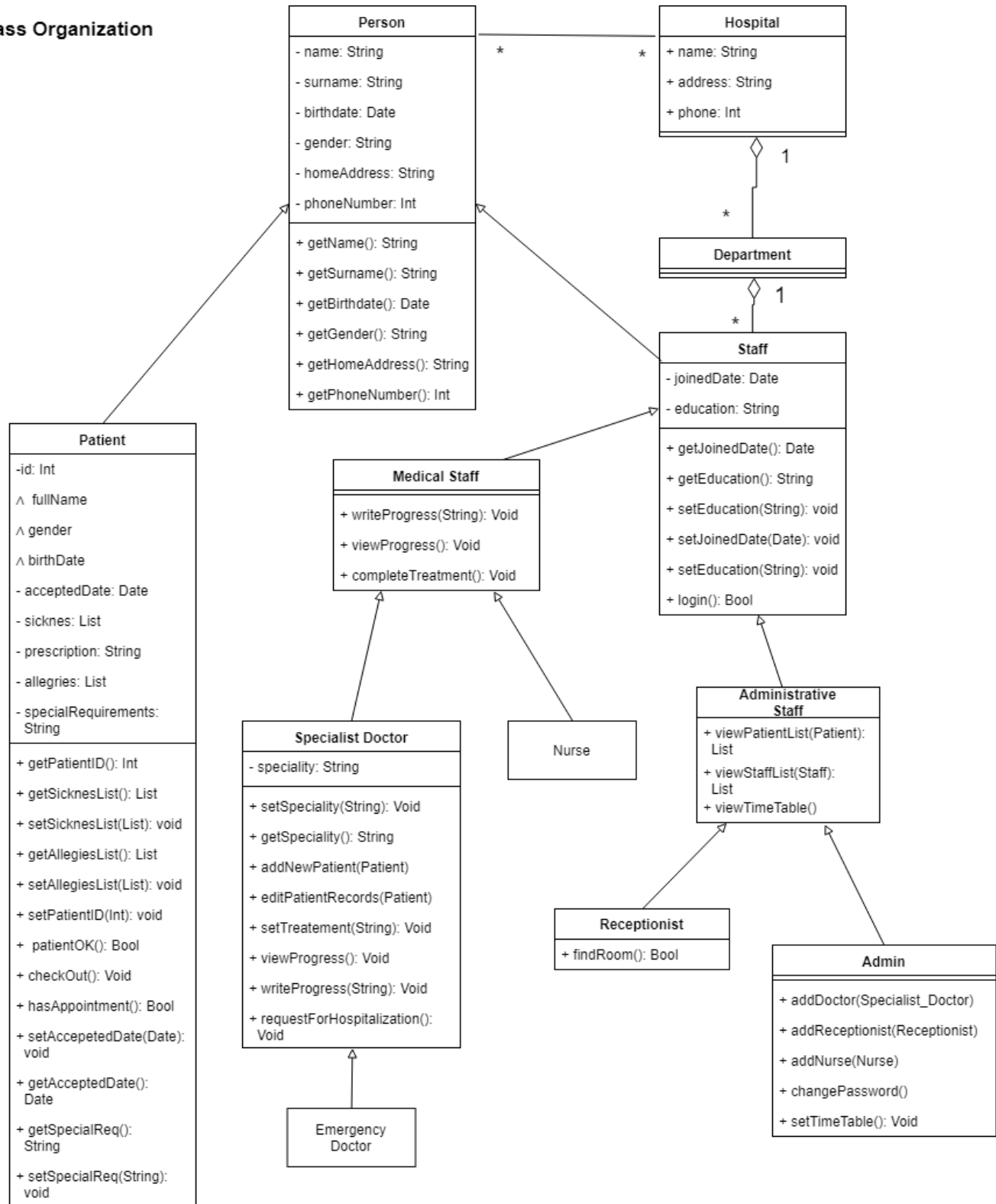
Medical Management System

Emergency

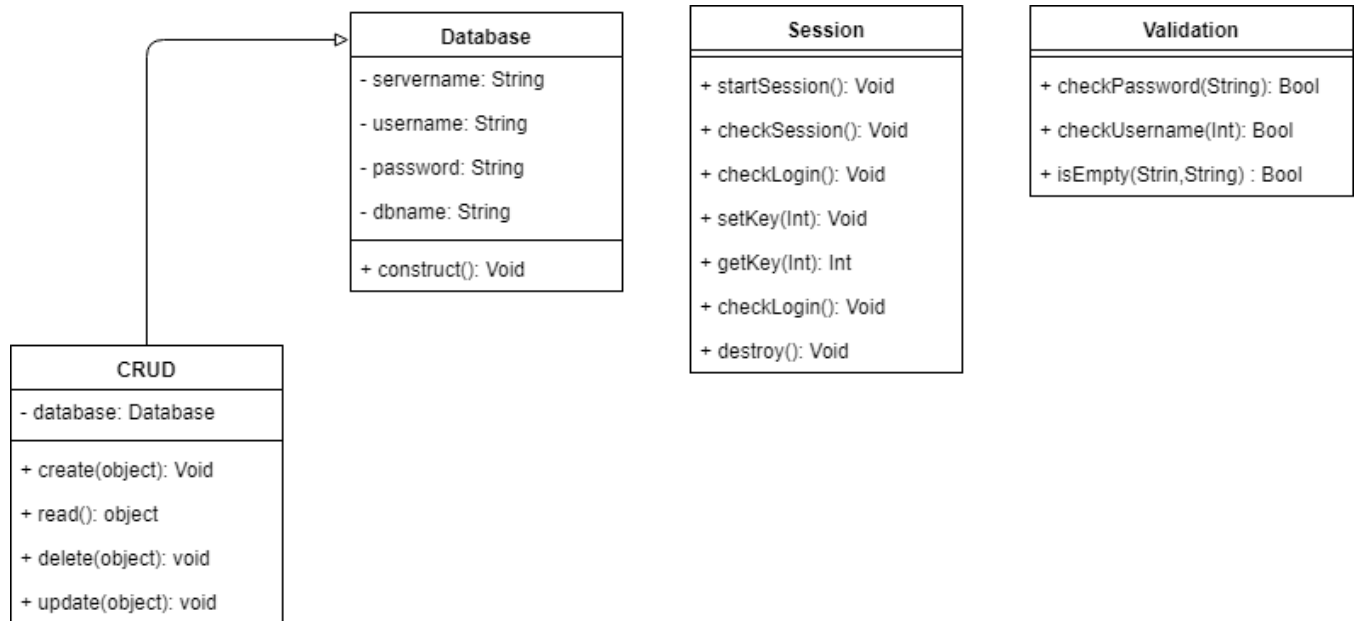


4.9 Class Diagrams

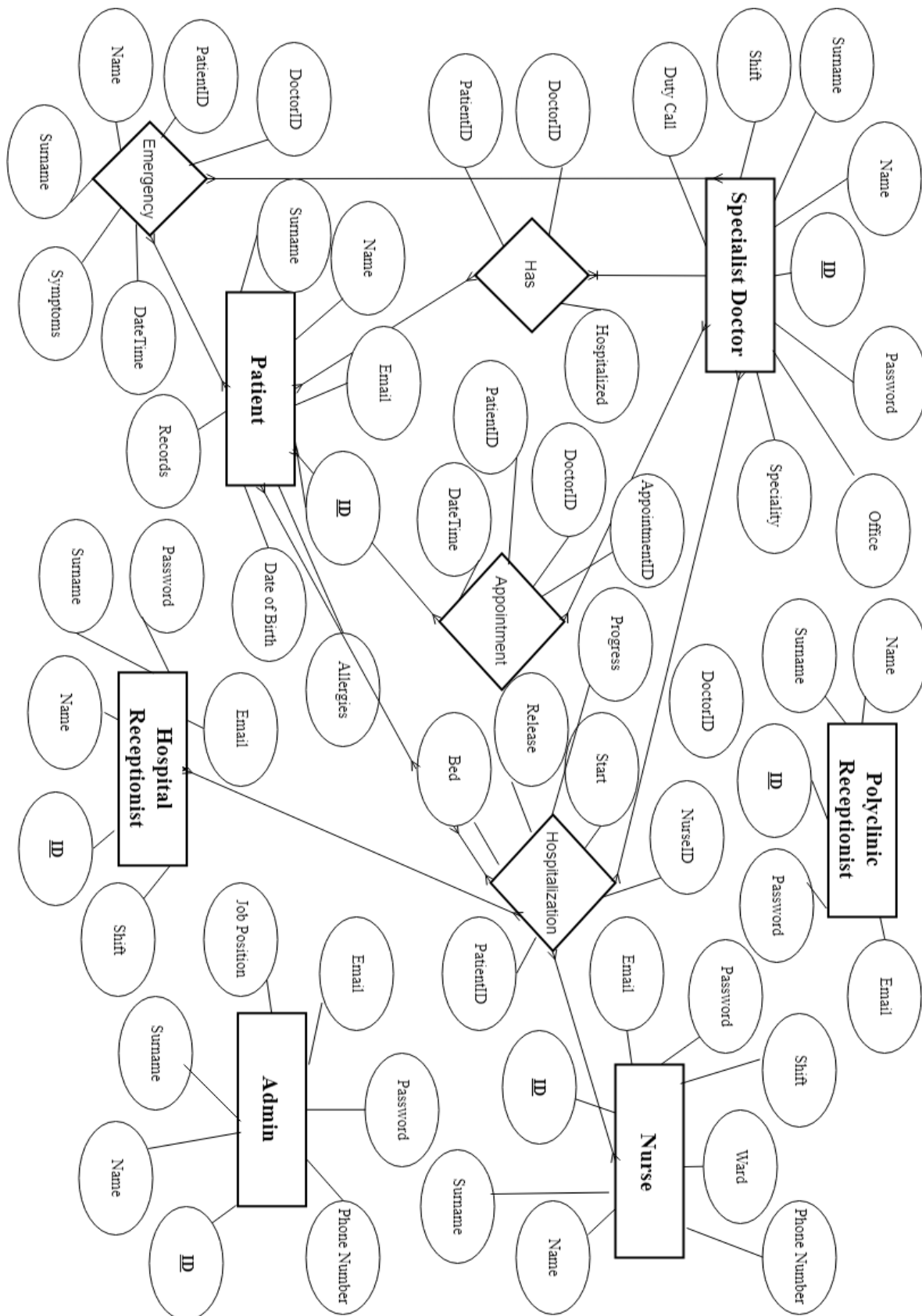
Class Organization



Medical Management System



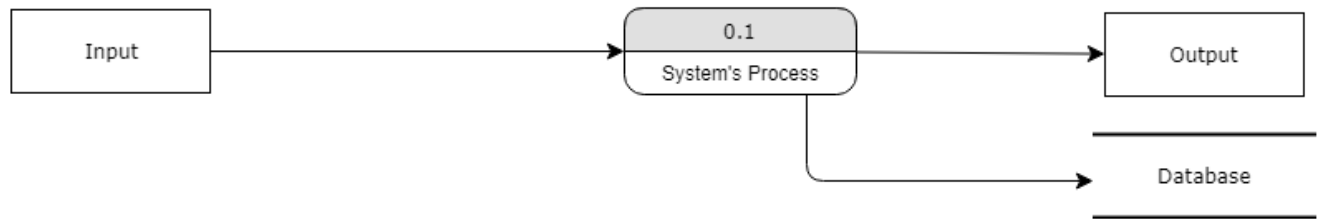
4.10 ER Diagram



4.11 Data Flow Diagrams

Data Flow Diagram

lvl: 0



Data Flow Diagram

lvl: 1

