

Final Project Data Bases

Hospital-Surgeries



Sabela Otero Fraiz, Andrea Pradas Agujetas y Paula Ruiz Cervantes

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1. Summary and project 's features

Surgeon's chiefs waste countless hours every day organizing surgeries and all the details that planning a surgery involve: choosing the surgical team that will perform the surgery taking into account which surgeons and nurses are available, the time and day in which it will take place or the room that will be available at the time are only some of their worries.

This is why we have created a program to do all that for them with just a few quick simple steps. With this program, surgeon's chiefs will be able to see the surgeons and nurses available in the day that a surgery wants to be scheduled and create the surgical team (composed of a surgeon and a nurse). They will be able to choose the operating rooms that are active (in case a new room has been enabled to carry out surgeries or a room is out of service).

The program will put together all this information and automatically create a schedule with the surgeries, patients, teams and rooms of each day.

The program will also manage the data of the employees. It is able to add, delete and modify the information needed to create the schedule correctly.

2. Design document of our system

We organized our system in several menus so that it looked more organized. In the first menu, you can find the methods to log in and sign in which are controlled by JPA and JDBC. They are controlled by JPA because there are different roles (nurse, surgeon and chief surgeon) and also because all of them are users. We decided to choose these entities as JPA because they are separated from the other methods and carry out the part of the log in system. Doing this, we thought it would be easier to understand how all is connected. As we said, the menu is also controlled by JDBC because each user has a role, and the role is going to be linked with the entity of the JDBC. So, if a user signs in with the Role "Nurse", the system will also create the corresponding JDBC nurse. In user, the PK is the email, so that it can detect properly which is the role and consequently open the correct menu.

When a person logs in, the system is going to open one of the three menus, depending on the role. As it is all related and entities share many components, in our opinion, the better way to do these menus was using JDBC because like that, it can be perfectly controlled. There are two methods which also include JPA, which are the one that lets chief surgeons change the role and the one which deletes the account. The first one, is used when you want another surgeon to be the chief, in this case, we also need to change the Role not just the attribute "chief?" so that when he/she logs in after this change, he/she can have access to the correct menu. Moreover, the role of the previous chief will be changed automatically to the role of surgeon. In the delete method, the same happens, the system must delete the surgeon/nurse (JDBC) and also the user (JPA).

Finally, we introduced a new manager to the system, which is the XML. We decided to choose nurse and patient to have this because it looks useful to have an option that lets surgeons update a patient to the data base using xml and not only by writing its personal data. Moreover, it is very useful to have the possibility to save the information of one patient, so that is why we created the method to pass from Patient to XML. About nurses, we let each of them print their own information so that they can have it in XML. And we also create a method so that chief surgeons can add new nurses to the system in a different way. When adding a nurse in this way, he/she will not have a password yet so then the nurse will have to select sign in, put the email and as the system will recognize that it exists in the data base, it will only ask for the password.

3. Requirements

Since we wanted to create a program that could be useful and could save time to surgeon's chiefs (creating an efficient way to solve this issue) we tried to create it as close to reality as possible. This is why we first established some requirements that we wanted our program to fulfill.

3.1 Related with the surgeon's chief

- Only one of the surgeons must be the chief
- The surgeon's chief is a surgeon so he/she will have all the surgeon's requirements
- Only one that can create the surgical team that will perform the surgery
- Only one that will be able to manage the available operating rooms
- Only one that will be able to define the surgery date
- Only one that will be able to create the schedule (programming surgeries for any day of the year)
- Want to have an option to see which employees are not available in a certain period (in vacation)

3.2 Related with the surgeons

- Every surgeon will be able to register patients
- Every surgeon will be able to define the patient that will be operated and the surgery type
- Every surgeon will be able to modify the phone number of a patient

3.3 Related with all of them

- All users (surgeons and nurses) will be able to register themselves (so the number of employees will be unlimited in case many are hired)
- Both surgeons and nurses will have the right to ask for a maximum of two periods of vacations, each of 15 days in the summer time
- Both will have access to the schedule

- Both will be able to add, modify and delete their vacations
- Both will be able to delete their own account in case they stop working at that hospital

3.4 Related with the operating rooms

- The hours of the surgeries of each day will be predefined: 8:00-10:00 / 10:00-12:00/
12:00-14:00 / 14:00-16:00

3.5 Related with the surgeries

- Only the surgeries that have not been scheduled can be deleted

4. Traceability Matrix

Use cases	Requirements																	
	Only one of the surgeons must be the chief	Chief: Only one that can create the surgical team that will perform the surgery	Chief: Only one that will be able to manage the available operating rooms	Chief: Only one that will be able to define the surgery date	Chief: Only one that will be able to create the schedule (programming surgeries for any day of the year)	The surgeon's chief is a surgeon so he/she will have all the surgeon's requirements	Every surgeon will be able to register patients	Every surgeon will be able to define the patient that will be operated and the surgery type	Every surgeon will be able to modify the phone number of a patient	All users (surgeons and nurses) will be able to register themselves (so the number of employees will be unlimited in case many are hired)	Both surgeons and nurses will have the right to ask for a maximum of two periods of vacations per year, each of 15 days in the summer time	Both will have access to the schedule	Both will be able to add, modify and delete their vacations	Both will be able to delete their own account in case they stop working at that hospital	The chief wants to have an option to see which employees are not available in a certain period (in vacation)	The hours of the surgeries of each day will be predefined: 8:00-10:00 / 10:00-12:00/ 14:00 / 14:00-16:00	Just unprogrammed surgeries can be deleted	
Sign in	<input checked="" type="checkbox"/>								<input checked="" type="checkbox"/>									
Log in		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				
Register patient						<input checked="" type="checkbox"/>												
Request days off										<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>						
Modify vacation												<input checked="" type="checkbox"/>						
Delete vacation												<input checked="" type="checkbox"/>						
Add operating room		<input checked="" type="checkbox"/>																
Active operating room		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>														
Establish surgical team		<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>													
Schedule		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>												<input checked="" type="checkbox"/>		
Access to schedule											<input checked="" type="checkbox"/>							
Operates		<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>													
Change chief	<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>													
Delete account	<input checked="" type="checkbox"/>												<input checked="" type="checkbox"/>					
Create surgery				<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>											
Delete surgery																<input checked="" type="checkbox"/>		
Modify patient								<input checked="" type="checkbox"/>										
See vacations														<input checked="" type="checkbox"/>				

5. User Stories

As a <u>surgeons' chief</u> ,
I want to log in So that I can enter the program and create the schedule Given that I am registered as a surgeons' chief When I want to organize surgeries Then I can do my job
I want to associate the nurse with the surgeon So that the surgical team is created Given that I logged in When I want to prepare the schedule Then I can create the surgeries
I want to organize the surgeries associating them to the active surgery rooms, the surgeon and the nurse that will operate and create the schedule So that I do not have to waste my time doing it manually. This will be a more effective way to distribute the working hours Given that I logged in, I created the surgical team (surgeon-chief) and chose the active rooms When I have to schedule new surgeries Then the schedule is done
I want to be able to request my holidays So that the program and my staff can take it into account Given that I logged in When I feel that I need them Then I will not be available
I want to be able to have access to the schedule So that I know my timetable Given that I logged in When I want to know my schedule of a day Then I will be prepared for the surgeries

As a <u>surgeon</u> ,
I want to log in So that I can enter the program and create surgeries Given that I am registered as a surgeon When I want to create surgeries Then I can do my job
I want to register patients So that I can associate surgeries to them Given that I logged in When I have a new patient Then I can define a surgery with that patient
I want to define the surgeries features of each patient So that in a future I can see what kind of surgery I am going to perform Given that I logged in When I have a new surgery Then the surgery is saved
I want to be able to request my holidays So that the program and my staff can take it into account Given that I logged in When I feel that I need them Then I will not be available
I want to be able to have access to the schedule So that I know my timetable Given that I logged in When I want to know my schedule for the next day Then I will be prepared for the surgeries

As a <u>nurse</u> ,
I want to log in So that I can enter the program Given that I am registered as nurse When I want to Then I can do my job
I want to be able to request my holidays So that the program and my staff can take it into account Given that I logged in When I feel that I need them Then I will not be available
I want to be able to have access to the schedule So that I know my timetable Given that I logged in When I want to know my schedule for any day Then I will be prepared for the surgeries

6. User's manual

This is a manual to explain how the program works. You will be asked to choose between different options on the menus so that you can select what do you want to do. Every time a specific input is required, and you do not put it as expected, the program will let you know that and ask you to write it again until a valid input is introduced.

Main menu:

In this menu you can choose between:

1. Sign in: if you do not have an account yet. It will ask for your role (nurse, surgeon or chief surgeon). If it shows an exception when choosing chief surgeon, it is because there is already one. It will also ask for your email, name, surname and password. If there is any other user with that email, it will give you an error so you must choose a different one.
2. Log in: if you have an account. Here, you must introduce your email and password and it will show you a different menu according to your Role.
3. Exit: This will close the program.

As there are three different roles, there are three different menus.

Chief Surgeon Menu:

If you are a chief surgeon, you will have a menu that includes these options:

1. Register patient:

Here you will be asked for the name, surname and phone number of the patient. You must be careful with the phone, as it could give you an error when introducing a wrong number (it must have nine digits) or a phone number that is associated to any other patient (because the number is a unique element).

2. Modify patient:

This option will let you change the phone number of any patient. You will be asked to write the name of the patient. If there is just one patient with that name, it is going to ask you for the new phone number (considering possible exceptions). However, if there are more patients with that name, it will show you all patients called like that, and you will have to introduce their id to choose the one that you want its phone to be changed.

3. List of patients: This will show you a list of all patients registered in the system.

4. List of surgeons: This will show you a list of all surgeons registered in the system.

5. List of nurses: This will show you a list of all nurses registered in the system.

6. List of all employees: This will show you a list of all employees registered in the system, specifying if they are surgeons or nurses.

7. Request days off: First, you will have to introduce the year and then the program will list six possible periods of vacation. You can only choose one, you must introduce the number that corresponds to that option.

In this section of the menu, you can get an advertisement if you have already chosen two vacation periods for that year, as it is the maximum number of holidays per year. In this case, you will not be able to add a new one. In addition, you cannot add a date that is already in the past, so in this case you will also get an error and it will not be saved.

8. Modify vacation: If you do not have any future vacation yet, it will show a message. In case you have, it will list all your vacations and you will have to introduce the id associated with the one you want to change. If you introduce an incorrect id, it will

ask you to write a new one until you put one that corresponds to any of the options. After this, the process is the same as when creating a new one. First the year and then the period, with the same exceptions.

9. Delete vacation: As in the modify option, it will warn you if you do not have any future vacation and otherwise it will show you a list to select the one you want to modify (same possible errors as in modify). After the correct id is introduced, the vacation will be deleted.
10. My vacations: This will show you a list of all your vacations.
11. Surgeons on vacation (specific period): It is a useful option if you want to know which surgeons are not going to be available during that period. You will be asked to introduce two dates, and it will show you all the surgeons that are not working any of the days. Moreover, it will print the exact dates they are out. You can get an error if you introduce invalid dates, however if you introduce an end date (the second date that is asked for) that is before the start one (the first date that is asked for), the program will understand that you have mistaken the order of the dates and will switch them to give you the list between those dates correctly.
12. Nurses on vacation (specific period): It is a useful option if you want to know which nurses are not going to be available during that period. You will be asked to introduce two dates, and it will show you all the nurses who are not working any of the days. Moreover, it will print the exact dates they are out. You can get an error if you introduce invalid dates, however if you introduce an end date (the second date that is asked for) that is before the start one (the first date that is asked for), the program will understand that you have mistaken the order of the dates and will switch them to give you the list between those dates correctly.
13. All employee vacations: It will print all employees' vacations, ordered by date.
14. Add new operating room: First you will be asked to introduce the number of the room, and then, the floor where it is located. You can get an error if there is already one existing room with those characteristics, in this case, the room is not going to be added.
15. Create surgery: If there are no patients in the database, it will print a warning. If there are patients, you can add a surgery to one of them, so you must write her/his name. If there are several patients with that name, it will print a list with all patients called like that (showing name, surname, and id) and you must select the one that you want by introducing the id. Then you will have to introduce the type of surgery.

16. Delete surgery: First, a list will be printed with all surgeries which can be deleted (only the ones which are not programmed nor done). Then you must introduce the id of the one you want to delete. If it is correct, the surgery will be deleted. Otherwise, you will have to introduce another id.
17. List of surgeries: It will print all surgeries in the database.
18. Change chief surgeon: You will get a list with all surgeons so that you can know the id of the future chief. Then, you must introduce the id of the new one and after that, you will not be a chief anymore. It is going to load to the first menu, so you will need to log in again, now as a normal surgeon (less options will be available). The other surgeon will be saved as chief. Here, you may have to repeat the id if there are no surgeons matching the id you introduced.
19. Create schedule: If there are no available surgeries (all of them have been programmed, or none have been introduced yet) you will not be able to create a schedule so you may return to the previous menu. If there are surgeries, you will have to choose the date you want to program the surgery. An error can be printed if you introduce an invalid date, and you must write a new one. Invalid dates: not existing day, past date and date where there is one schedule.

Then, you will have a list with all available nurses for that day, you must choose one. After that, a list with all surgeons available will be shown and you must select the one who is going to work with that nurse that day. While doing this, you can get errors if you introduce some incorrect id so you must write it again. You will now have the option to add a new working team or not by answering "y"/"Y" for adding a new one or "n"/"N" for not doing so. If you want another one, you will repeat previous steps and if not, you will go to the following. You will not be able to select a new team if there are not surgeons or nurses available.

In the next step you may have to activate an operating room (if none of them are active) by writing the corresponding id (you will have a list with all rooms). You may need to repeat your input if that room does not exist. If there are some rooms available, you can activate more, disable some of them or make no more changes. For the first and second option you will need to introduce the id of the room and you will have a list with possible options. Errors can appear if you introduce an invalid room. After any change, you will be back to the main options. This process will continue until you press the third option. Now the program will show you the schedule.

20. Show schedule: You will have to type the date you want to check, and it will print the schedule. Here you can get two errors, one if that date is not programmed yet, and another one if it is an incorrect date (you will be asked to write it again).
21. Print patient to xml document: This will show all patients and ask you to write the id of the one you want to print to the xml document. If wrong id, you will need to write it again.
22. Load patient from xml: This will load the patient saved in the xml and print it.
23. Load nurse from xml: This will load the nurse saved in the xml and print it.
24. Log out: After this, you will close your profile and the main menu will be loaded.
25. Delete account: Here, you will need to confirm if you want to delete your account. After the confirmation step, your account will be deleted, and you will not be able to log in. If you decide not to delete your account, you will be back to your menu.
26. Exit: This option will close the program.

Surgeon Menu:

If you are a surgeon, you will have a menu that includes these options:

1. Register patient: Here you will be asked for the name, surname and phone number of the patient. You must be careful with the phone, as it could give you an error when introducing a wrong number (it must have nine digits) or a phone number that is associated to any other patient (because the number is a unique element).
2. Modify patient: This option will let you change the phone number of any patient. You will be asked to write the name of the patient. If there is just one patient with that name, it is going to ask you for the new phone number (considering possible exceptions). However, if there are more patients with that name, it will show you all patients called like that, and you will have to introduce their id to choose the one that you want its phone to be changed.
3. List of patients: This will show you a list of all patients registered in the system.
4. List of surgeons: This will show you a list of all surgeons registered in the system.

5. List of all employees: This will show you a list of all employees registered in the system, specifying if they are surgeons or nurses.
6. Request days off: First, you will have to introduce the year and then the program will list six possible periods of vacation. You can only choose one, you must introduce the number that corresponds to that option.
In this section of the menu, you can get an advertisement if you have already chosen two vacation periods for that year, as it is the maximum number of holidays per year. In this case, you will not be able to add a new one.
In addition, you cannot add a date that is already in the past, so in this case you will also get an error and it will not be saved.
7. Modify vacation: If you do not have any future vacation yet, it will show a message. In case you have, it will list all your vacations and you will have to introduce the id associated with the one you want to change. If you introduce an incorrect id, it will ask you to write a new one until you put one that corresponds to any of the options. After this, the process is the same as when creating a new one. First the year and then the period, with the same exceptions.
8. Delete vacation: As in the modify option, it will warn you if you do not have any future vacation and otherwise it will show you a list to select the one you want to modify (same possible errors as in modify). After the correct id is introduced, the vacation will be deleted.
9. My vacations: This will show you a list of all your vacations.
10. All employee vacations: It will print all employees' vacations, ordered by date.
11. Create surgery: If there are no patients in the database, it will print a warning. If there are patients, you can add a surgery to one of them, so you must write her/his name. If there are several patients with that name, it will print a list with all patients called like that (showing name, surname, and id) and you must select the one that you want by introducing the id. Then you will have to introduce the type of surgery.
12. List of surgeries: It will print all surgeries in the database.
13. Show schedule: You will have to type the date you want to check, and it will print the schedule. Here you can get two errors, one if that date is not programmed yet, and another one if it is an incorrect date (you will be asked to write it again).

14. Log out: After this, you will close your profile and the main menu will be loaded.
15. Delete account: Here, you will need to confirm if you want to delete your account. After the confirmation step, your account will be deleted, and you will not be able to log in. If you decide not to delete your account, you will be back to your menu.
16. Exit: This option will close the program.

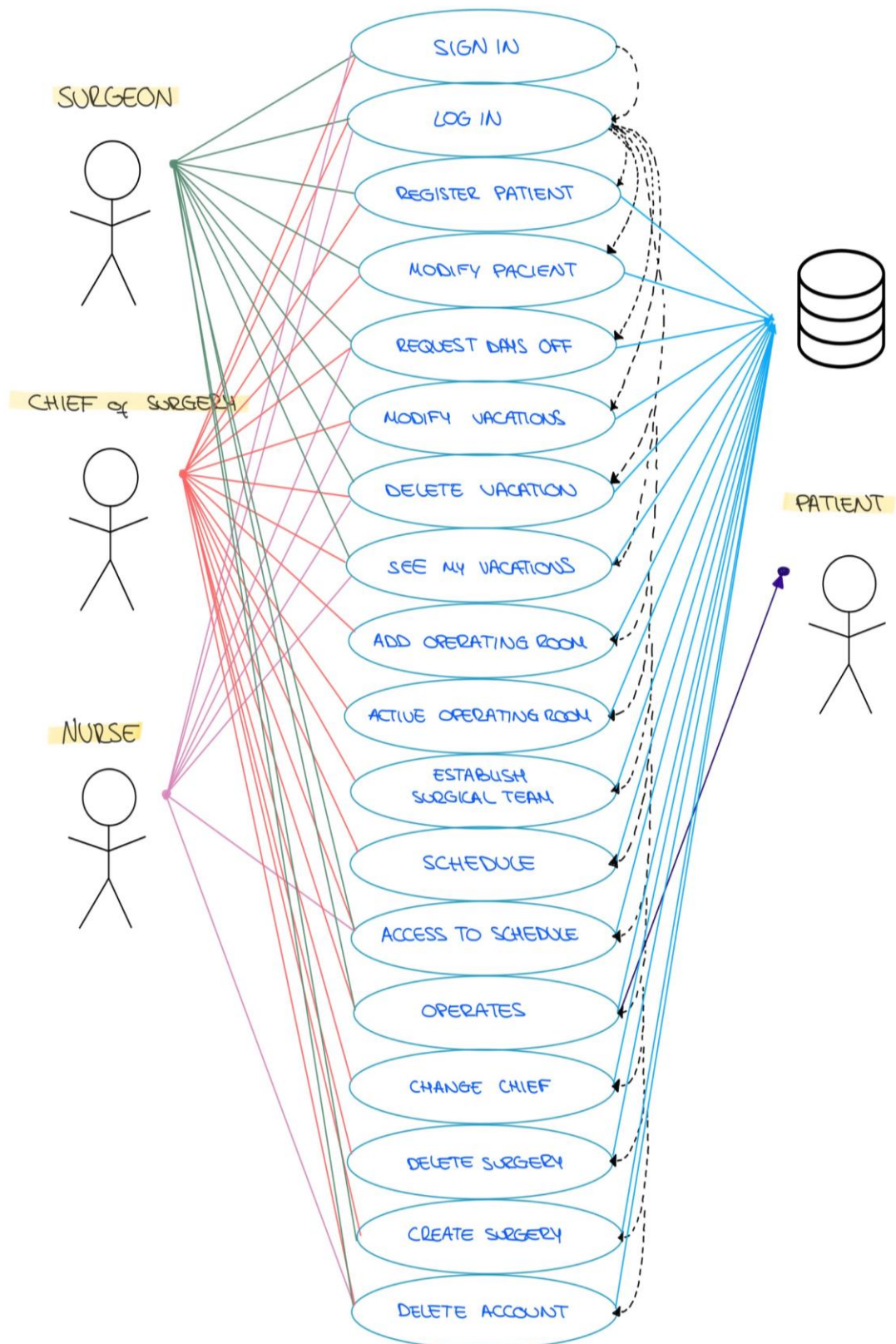
Nurse Menu:

If you are a nurse, you will have a menu that includes these options:

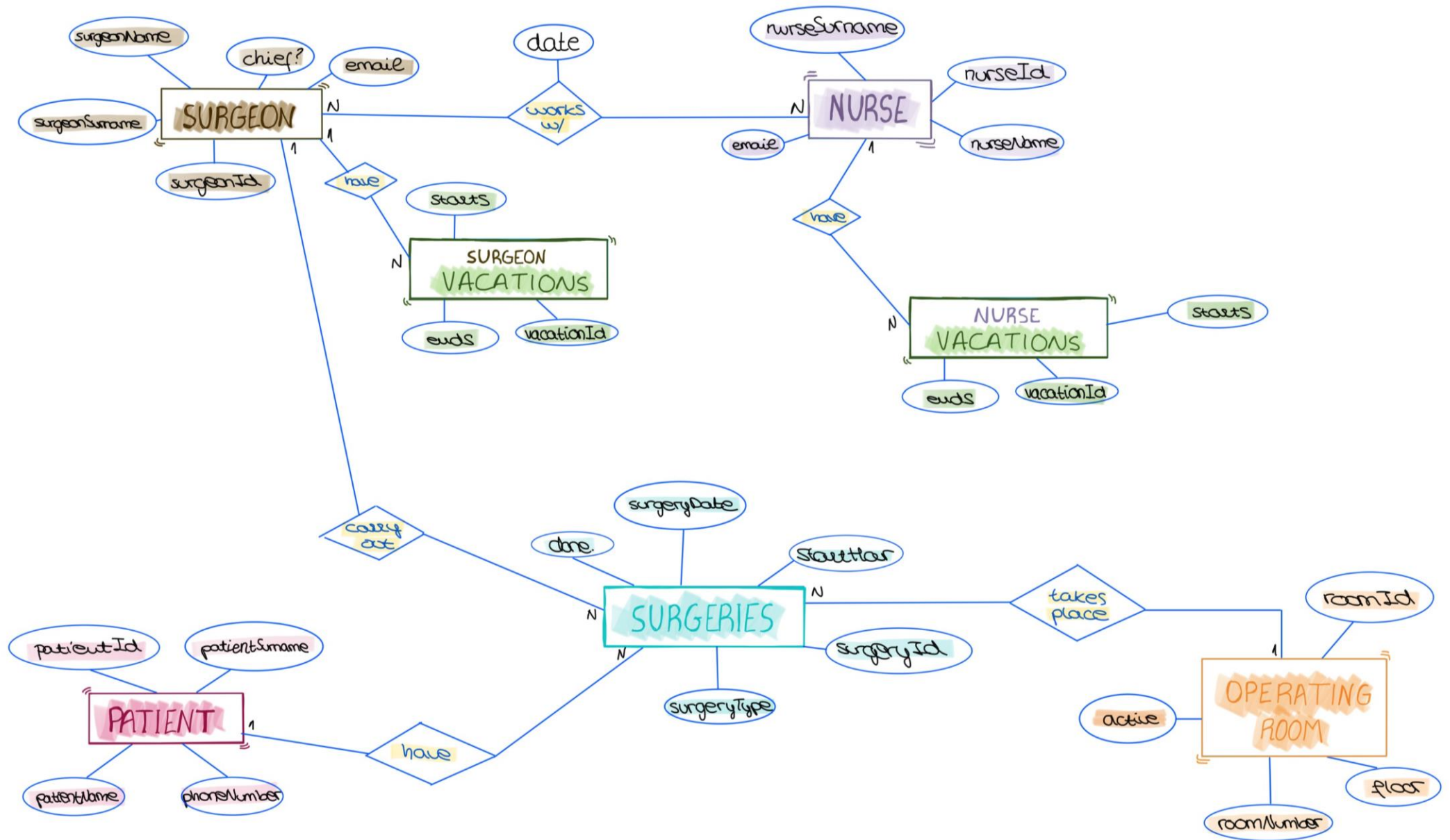
1. List of patients: This will show you a list of all patients registered in the system.
2. List of nurses: This will show you a list of all nurses registered in the system.
3. List of all employees: This will show you a list of all employees registered in the system, specifying if they are surgeons or nurses.
4. Request days off: First, you will have to introduce the year and then the program will list six possible periods of vacation. You can only choose one, you must introduce the number that corresponds to that option. In this section of the menu, you can get an advertisement if you have already chosen two vacation periods for that year, as it is the maximum number of holidays per year. In this case, you will not be able to add a new one. In addition, you cannot add a date that is already in the past, so in this case you will also get an error and it will not be saved.
5. Modify vacation: If you do not have any future vacation yet, it will show a message. In case you have, it will list all your vacations and you will have to introduce the id associated with the one you want to change. If you introduce an incorrect id, it will ask you to write a new one until you put one that corresponds to any of the options. After this, the process is the same as when creating a new one. First the year and then the period, with the same exceptions.
6. Delete vacation: As in the modify option, it will warn you if you do not have any future vacation and otherwise it will show you a list to select the one you want to modify (same possible errors as in modify). After the correct id is introduced, the vacation will be deleted.
7. My vacations: This will show you a list of all your vacations.
8. All employee vacations: It will print all employees' vacations, ordered by date.

9. List of surgeries: It will print all surgeries in the database.
10. Show schedule: You will have to type the date you want to check, and it will print the schedule. Here you can get two errors, one if that date is not programmed yet, and another one if it is an incorrect date (you will be asked to write it again).
11. Print me to xml: This will save you in an xml document.
12. Log out: After this, you will close your profile and the main menu will be loaded.
13. Delete account: Here, you will need to confirm if you want to delete your account. After the confirmation step, your account will be deleted, and you will not be able to log in. If you decide not to delete your account, you will be back to your menu.
14. Exit: This option will close the program.

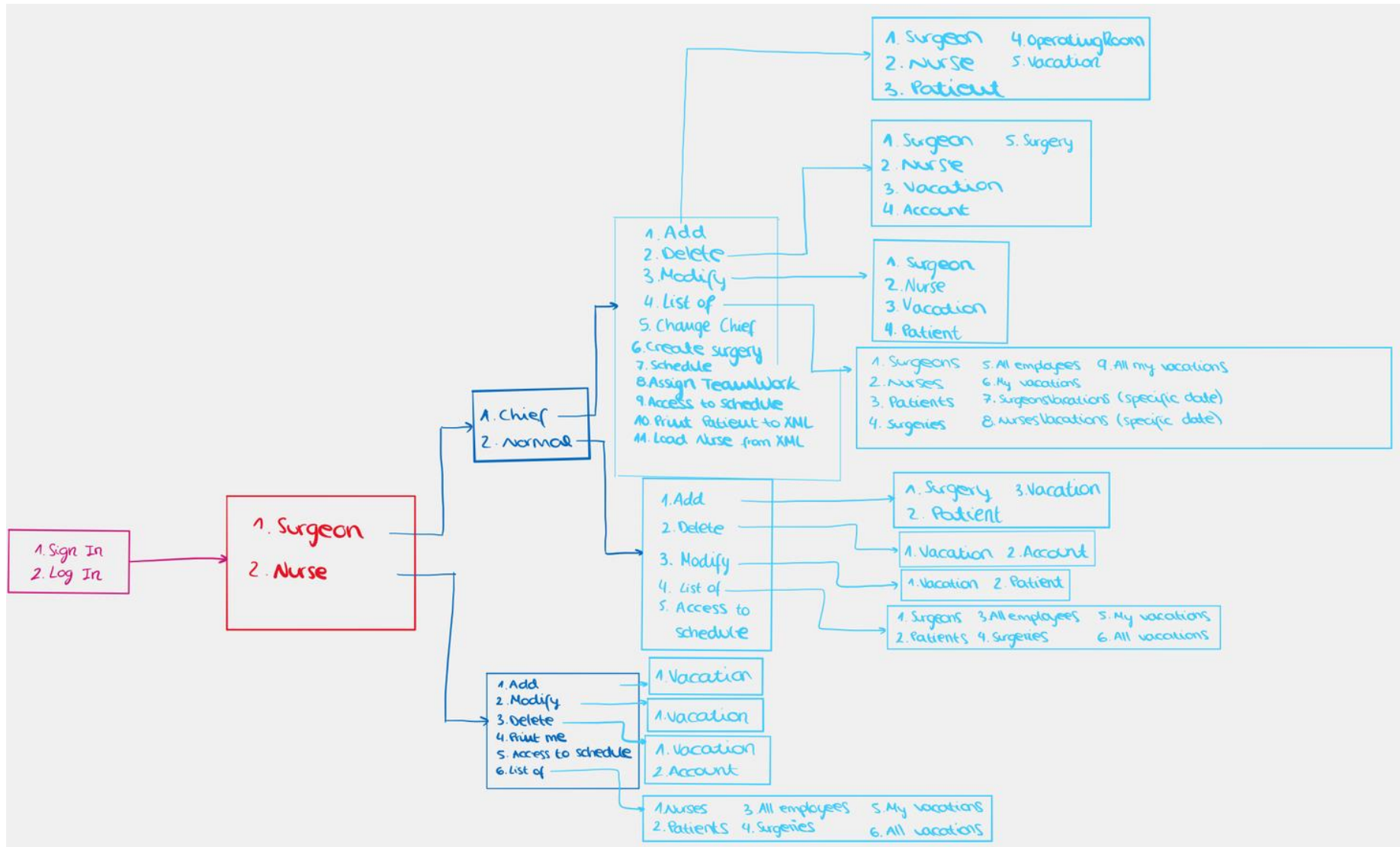
7. UML Use Case Diagram



8. E-R Diagram



9. UI mockup



When the user selects a method to see something or when the user is asked about the id, a table like this will be shown:

Name	Surname	Id
Maria	Perez	2

Patient name	Patient surname	Id	Surgery type	Surgery Id
Juan	Rodriguez	2	Heart	3

Id	Patient	Date	StartHour	Surgery Type	Surgeon	Nurse	Room number	Room floor
1	Juan	10/6/2023	10:00	Heart	Maria	Lucia	102	3

When the user must introduce data:

- Program: Specification of the data needed (Ex: "Choose option", "Select the patient you want to print"...)
- User: Data

If data → incorrect value

Message "Not valid input, write it again"

Ask for new data

If data → correct

Show result table, corresponding menu or ask for more information

Ex for vacations:

These are the vacation periods, please choose one of them:

- 1) 1 june to 15 june
- 2) 16 june to 30 june
- 3) 1 july to 15 july
- 4) 16 july to 30 july
- 5) 1 august to 15 august
- 6) 16 august to 30 august

- (User): 2

10. E-R Diagram (tables)

