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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 and keeping medical records for each patient in a digital form instead of on paper, how they are now.

The implementation of the idea will work closely with polyclinics by having access at their databases for patients they forward to us. Polyclinic's doctors will be the one 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 doctors), cancel them, write prescriptions, check the medical records of a patient and alter them if needed.

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.

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 and also add new entries for people who come for an emergency.

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 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. Thus records will be less likely to get lost or get mixed up.

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

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 an accessible database with polyclinics. So it is dependent on the polyclinic.

### 2.2 User Characteristics

In this project there are four types of users:

- Administrator
- Family Doctor
- Specialist Doctor
- Receptionist

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 and receptionists.

b. Family Doctor

In this project the family doctor 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

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

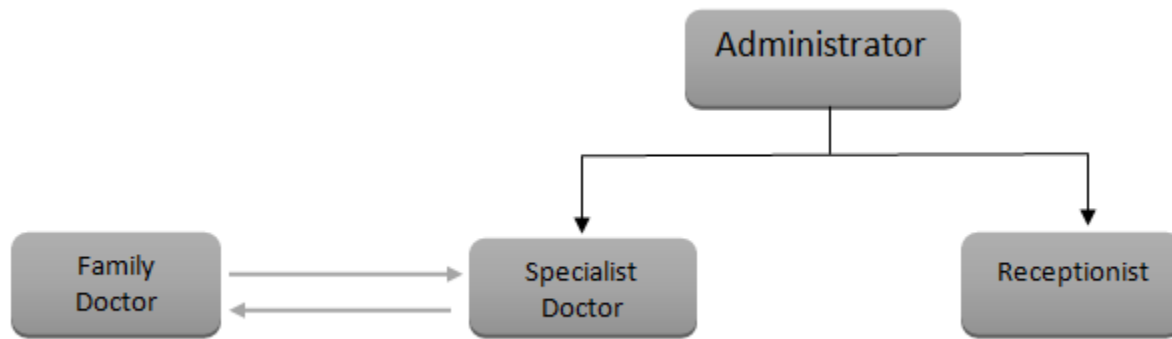
In cases where the patient comes to emergency without being sent from family doctor, the specialist doctor in charge will create a new entry in that hospital, by completing the medical parts of his/her charts.

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

d. Receptionist

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

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



### 2.3 Assumptions

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

### 2.4 Constraints

- A management system should be implemented at polyclinics too
- Access to polyclinics' databases is a must
- Patients should have medical records at the corresponding polyclinic
- Patients should go to the polyclinic first and then be forwarded to us if necessary
- Only the doctor 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

### 2.5 Dependencies

- "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 clinic's doctor forwarding it to us when leaving an appointment for a patient at our hospital

### 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"> <li>- A view for family doctors</li> <li>- A view for specialist doctors</li> <li>- A view for the receptionist</li> <li>- A view for the administrator</li> </ul>			
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 and receptionists, as well set the timetable for each doctor.	Admin is the only user responsible for updating or editing users such as: doctor, receptionist.			
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 family doctor is able to set appointments for patients.	The family doctor is the only user that has the right to set appointments.			

### Medical Management System

Req#	Requirement	Comments	Priorty	Date Rvwd	SME Reviewed / Approved
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 family doctor 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 family doctor.	For every change in the anamnesis of a patient, the specialist doctor has to inform the family doctor.			
FR_12	Receptionist can only add personal information when creating a new entry for a patient that comes to the emergency department.	Receptionist fills in the formalities for each new patient that comes in the emergency.			
FR_13	The specialist doctor at the emergency department adds a new patient after examining him/her.	The specialist doctor has the right to add a new patient, when in emergency department.			
FR_14	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 department in a month, types of most faced medical diagnosis, etc. are generated in pdf format.			



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Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
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 and receptionists without any limitation, but not patients.	Getting information for doctors and receptionists, but not for patients (ethical issues).			
FR_18	Admin can search the timetables for the doctors that stay in the emergency department.	Search for the doctors who have the shift at the emergency department.			
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 receptionist can search the timetables and get information for the availability of a specialist doctor and also for the doctors at the emergency department as well.	Search the doctor's appointments and the doctors who are at the emergency department.			

### 3.2 Non-Functional Requirements

#### 3.2.1 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: administrator, receptionist 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 and an interface where he/she can complete a prescription for each patient.

### 3.2.2 Usability

- The software is very user-friendly which makes it very easy to work with.
- 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 doctors and receptionists. 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, receptionists and doctors are the only ones with access to their accounts.
- The system is conceptualized to be easy to learn and to use.

### 3.2.3 Performance

- 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

#### 3.2.3.1 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.

#### 3.2.3.2 Availability

- 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 department.
- The system is not available on patients.
- The system will be reliable because the failures would cause unwanted queues.

#### 3.2.3.3 Latency

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

### 3.2.4 Manageability/Maintainability

#### 3.2.4.1 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.

#### 3.2.4.2 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 favours implementation of new functions and additions of new lines of code. Also, modularity in the organization provides for a better maintenance.

#### 3.2.4.3 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 own profile
  - Set timetable for all staff
  - Access automatically-generated reports
- Receptionist
  - Log in
  - Update his/her own profile
  - Add new entry in emergency
  - Views the timetables
- Family doctor
  - 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 family doctor
  - Export anamnesis of that patient to the family doctor
  - Update the patient anamnesis

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- Complete the register of that day
- Update his/her own profile
- Add patient in case of emergency
- Search a patient
- Cancel an appointment

### 3.2.5 Security

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.

### 3.2.6 Data Management

- 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.

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