

Hospital Management System

BRD

Introduced By : G27

-Introduction

Executive Summary

Hospital Management System (HMS) is web based software system made for hospitals in order to ease the medical process and provide a predefined steps for the patients and employees. It should provide various subsystems for different medical aspects like imaging and examinations and most importantly keeping the patient updated with online profile system , achieving that with security in mind for information safety and healthy system. It allows the partnership of pharmacies with ease .

Business Objectives

- ★ Offer easy managed system for patients and hospital employees
- ★ Offer automated processes for various medical departments
- ★ Increase productivity by removing the unwanted delay time
- ★ Offer online service for the hospital decreasing human interactions which takes more time and effort for both ends
- ★ Offer pharmacy partnerships for a rich database of medicines
- ★ Offer better coordination between different departments
- ★ Provide a high level layer of administration

-Background

Introduction [1]

Using Management system for managing information in the health care such as patient record, patient appointment system, patients scheduling appointment, doctor schedule and medicine prescription is not only to save time or reduce cost, but also a way to support and improve the health care information to be more accessible and flexible (modifying, saving, deleting, updating etc)

(Online Reservation, x-Rays Systems, Profile System and Online Results..etc) for system users and storing data efficiently. In addition, it improves the quality of data control.

On the other hand, information system works to interact with the system databases, financial module, scheduling module and the entire system modules. Therefore, to get the best implementation, the health care system should be able to interact with several medical health care staff (physicians, nurses, medical device users, financial and the administrators Which is the conducted way to get a good insight how health care system working and will be more effectively and efficiently for managing the information .

Health care information system is looking at patients, in order to represent their health information history and provide the flexibility and accessibility for patient information to be more reachable by the authorized person.

On the other hand, health care information system have user interface, that provides to the system user the ability to interact with the patient; Once the patient arrive at the medical center they must register their information and health history in the health care center system. The system automatically will update the patient information; then the patient will be under queue to have an appointment for medical check up by the physician. The physician will specify whether the patient case is an emergency case or not. If the case is an emergency, the physician will retrieve the relevant patient information from the system database. Nevertheless, in the general case, the system will request the examination queue for the patient. Finally, after the patient complete the medical check the system will place the prescription order to the pharmacy unit and update the information to the patient record.

What to improve [2]

- ***Lack of immediate retrievals:***

The information is very difficult to retrieve and to find particular information like- E.g. - To find out about the patient's history, the user has to go through various registers. This results in in convenience and wastage of time.

- **Lack of immediate information storage:**

The information generated by various transactions takes time and efforts to be stored at right place.

- **Lack of prompt updating:**

Various changes to information like patient details or immunization details of child are difficult to make as paperwork is involved.

- **Error prone manual calculation:**

Manual calculations are error prone and take a lot of time this may result in incorrect information. For example : calculation of patient's bill based on various treatments.

- **Preparation of accurate and prompt reports:**

This becomes a difficult task as information is difficult to collect from various register.

Medical Reports

- **Analysis Report**

There are a lot of types for medical analysis like **Analysis of Body Fluids , Measurement of Body Functions and Analysis of Genetic Material (Genetic Testing)**.

This type of tests requires a generated pdf document with the result , and it should be a text representing the percentage or the result description.

- **Examination Report**

Doctors can use the system to generate examinations reports and it is a pdf document too which includes text representing patient information, diagnosis and medical prescription.

- **Image Report**

Images in hospitals are stored in special format which can't be viewed by the default applications , but image reports are generated in pdf with the image and medical report written by the doctor

Note: more about medical images coming later.

DICOM [3]

Digital Imaging and Communications in Medicine (DICOM) is the standard for the communication and management of medical imaging information and related data. DICOM is most commonly used for storing and transmitting medical images enabling the integration of medical imaging devices such as scanners, servers, workstations, printers, network

hardware, and picture archiving and communication systems (PACS) from multiple manufacturers. It has been widely adopted by hospitals, and is making inroads into smaller applications like dentists' and doctors' offices.

DICOM files can be exchanged between two entities that are capable of receiving image and patient data in DICOM format. The different devices come with DICOM Conformance Statements which clearly state which DICOM classes they support, and the standard includes a file format definition and a network communications protocol that uses TCP/IP to communicate between systems.

The DICOM Information Object Definitions encode the data produced by a wide variety of imaging device types, including:

- ★ CT (computed tomography)
- ★ MRI (magnetic resonance imaging)
- ★ Ultrasound
- ★ X-ray
- ★ Fluoroscopy
- ★ Angiography
- ★ Mammography
- ★ Breast tomosynthesis
- ★ PET (positron emission tomography)
- ★ SPECT (single photon emission computed tomography)
- ★ Endoscopy
- ★ Microscopy
- ★ Whole slide imaging
- ★ OCT (optical coherence tomography)

Viewing DICOM encoded images requires special software for viewing it , and the HMS might support exporting images in such format in the near future.

-System Description

What is Hospital Management System ?

A website providing software system for managing the hospital resources, from doctors to receptionists to patients, all will have a streamlined process omitting unnecessary waiting time. And giving chance to index all medical info about Medical tests and Medical Radiology. Which will help in future diagnostics and will be valuable for future enhancements.

- **Managing Resources**

-Receptionists can see clearly who are the available doctors right now and see the empty time slots for patients to make reservation and can be able to see patient profiles to see their medical history.

- Receptionists can forward the examination requests to doctors.

-Medical Managers can track work progress through attendance systems for doctors and workers using computer vision and through complaints.

-All hospital info with all doctors and officials and all departments available on the website.

-Pharmacies cooperation system allowing medical prescription generator.

- **Patients Interaction**

-Every patient will be able to have a profile created by him or by the receptionists containing his medical history.

-Patients can check all the doctors available slots and make reservation online.

-They can apply health insurance online.

-They can check their medical results and medical reports online, including radio images.

-They can export their medical reports to use anywhere.

-They can submit complaints for medical managers to review.

- **Doctors Interaction**

-They can provide better diagnosis for patients as they can check their profile before the appointment.

-They can create their medical prescription using the system and check the pharmacies stock and print it with ease.

- They can create and upload examination results for the patient and forward radio image requests for them allowing smoother process for the patient comfort.
- Doctors can forward examination results to each other's.
- Doctors can edit their time slots by requesting that to the manager.

System Architecture

The hospital management systems introduces many services and modules that can help the employees run and manage the hospital in a more efficient way. those can be accessed either by a website , or a native mobile application which is aimed to serve the patients.

The systems supports **2 main platforms** to do its functionality:

- **Website:**

Which is used by

- **The Admin**

- ★ Access all data base for every one deal with system
- ★ View all feedbacks and ratings for all employees
- ★ View all evaluations of all employees
- ★ Feedback , Alert and Punishment forms based on evaluations
- ★ Obtain reports about hospital resources

- **The Receptionist**

- ★ View the doctor's schedule
- ★ Reservations for the patients at hospital
- ★ Registration for patients and Making accounts for them
- ★ Check employees availability
- ★ Feedback form for another employees in hospital
- ★ View his own feedbacks and rating
- ★ Access the database of doctors, users

- **The Doctor**

- ★ Edit his profile information
- ★ Access the pharmacy module and prescription module
- ★ Forward requests to other doctors for any required task (Analysis - Rays ..etc)
- ★ View the medical history for any patient.
- ★ Feedback of another employees
- ★ View his own feedbacks and ratings
- ★ Edit and View his own schedule

→ The Patient

- ★ Edit his profile information
- ★ Online reservation for any service
- ★ View his medical history
- ★ Feedback form for any employee
- ★ View doctor's reviews and ratings

• **Mobile Application:**

The mobile application will be used only by the patient which will be able to:

- ★ Create and Edit their profile information, and login to their profile
- ★ View and Edit their medical history
- ★ Make or Cancel appointments with their preferable doctors
- ★ See their analysis results and X-Rays results through the app and even download and print those results
- ★ See their prescription written to them by the doctors and see if the medicine is available at the pharmacy and see the price.

■ Users will have access to the system using the website or the mobile application. From the mobile application they will be able to create a new profile, login to their profile, view and edit their medical history to help the doctors.

■ They will be able to make appointments with their preferable doctors from a page in the application and cancel the reservation.

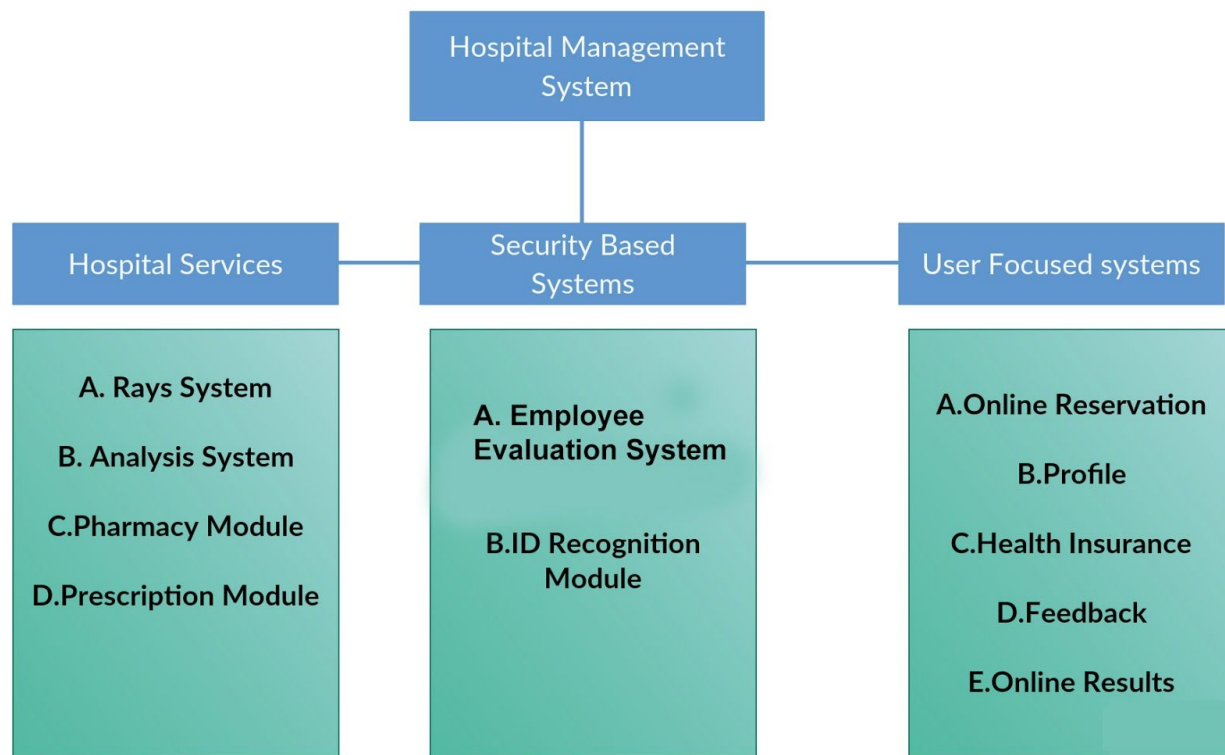
■ They will be able to see their analysis results and X-Rays results through the app and even download and print those results.

■ They will be able to see their prescription written to them by the doctors and see if the medicine is available at the pharmacy and see the price.



The system contains the following modules:

- ★ **Online Reservation**
- ★ **Rays System**
- ★ **Analytics system (Laboratory)**
- ★ **Profile system**
- ★ **Pharmacy partnership**
- ★ **Online results**
- ★ **Registration**
- ★ **Feedback system**
- ★ **Health insurance system**
- ★ **Prescription module**
- ★ **Evaluation module.**
- ★ **Availability Module**



We will discuss each module in details to help build a better understanding of the system and start with :

- **Profile System:**

- ★ This will help aid two of the three ends we assist in the system, the patient and the managing(Receptionist) in the hospital.
- ★ This module is aimed to create the user that is going to be stored in the patients database by providing the Full Name, Mobile, and the national id.
- ★ A profile can be made, this allows its owner to access the platform funcuntailites such as making online reservations.

Starting from the **Receptionists** they will be able to :

- Create a profile for each new patient coming to the hospital and that goes by them collecting the:
 - Full name
 - National ID obtained by scanning it (ID will be used as the password for the first login for the new user).
 - (optional) they can ask for the mobile number of the patient.
- They will be able to check the info of the client coming to the Hospital each time he comes (see his reservations, will be Discussed in details in the online reservation module).

Now we will talk about the other end which is the **Patient** , to fill his/her own profile they will need to provide the following data :

- Full name entry and this will be checked using our computer vision algorithm (by comparing the name provided in the id with the name given by the patient) This is done to avoid fake accounts being made and as extra precaution.
- Mobile number.
- Email.
- Also a password as part of the login/signup process.

The employees of the hospital can have profiles:

- A. The doctors have a profile which shows them the appointments they have, submit a request to edit their schedule to the manager, forward requests and see details about the patient they are dealing with.
They also can post, view the results of tests.
- B. The reception's profile allows them to make a reservation, check the schedule of the doctors and it has the privilege of creating a new profile for the patients.

The employees of the hospital have in their profiles info that will be checked using our computer vision to check their id, and the availability module.

For example:

- A. The photo in the id, will be checked for better security.
- B. The doctor will have a section in his profile about the feedback done about him.

- **Online Reservation Module:**

After the **patient** creates his profile :

1. He needs to choose the desired doctor in the desired specialization and also the preferred time period.
2. He can cancel the reservation before an agreed time limit.

The Receptionist can then confirm that the patient came in the timeslot he chose when the patient arrives in the hospital, also he can cancel reservations if the time limit to arrive passes, or just simply if the patient could cancel the reservation due to some technical issue or just not able to use the system.

- **Prescription System:**

This module is aimed to help the doctor and the patient , using the pharmacy module which will be discussed in detail later on, the doctor can then generate a prescription for the patient's needs, which can be printed and the user can view them from his profile.

- **Feedback System:**

The patient (has to be logged in) can then give his/her feedback about the preservation, the doctor he took an appointment with and leave a review, this can be viewed by user to the website/Mobile application.

To submit a proper feedback, it must have a title and a description; for it to be successfully stored and submitted to the feedback database.

- **Pharmacy Module:**

This module can be used by the Prescription module, it access the databases of medicines (the doctors can access it) and this allows him to see if the drug is available in the hospital's pharmacy or the pharmacies that have a partnership with the hospital, he will be able to see their stock and determine the availability of it , helping him to choose a replacement if the desired is not available at the moment.

- **Rays System:**

The user will be able to see the results of the rays he/she had in the hospital, and it will be available to download as well (he can export it as PDF image and analysis). The doctor will be the end uploading the rays results , and the patient would be able to see it from his profile.

- **Online Results:**

Like the previous module, this will help the patient see the results of a waited for test requested by the doctor.

The results of previous examinations for example past symptoms showed on the patient, past allergies that are discovered can be found there.

- **Registration:**

By using our computer vision algorithms we will be able to check the authenticity of the provided ID card of the employees or patients, if their name matches the one in the ID, their image, etc.

Mainly it's used for registration by scanning the ID and make checks for new patient's informations after reservation either online or offline

- **Analysis System:**

Similar to the previous 2 modules, the patient will be able to see his own analysis results obtained from the hospital's lab.

The user only have viewing access to those results. (we will discuss in detail how those previous three systems will be handled in the following table)

Guidelines for the results systems:

1- The doctor is the only one that have creation access for any of those 3 modules.
2-Receptionists only have viewing access.
3- Doctors can submit a request that a patient should have a chosen operation (X Ray-blood analysis for example) and this is viewed by another doctor in the lab, which tells him that a patient is to be expected to do the mentioned test and then accept it .
4-Doctors can write the results.
5-Doctors can view results
6-Patients have only VIEWING access to the results.
7-Every results has its own template to be successfully stored and loaded into the databases and the user's profile.

- **Availability Module:**

By using cameras throughout the whole hospital, receptionists will be able to check which doctor is available in the hospital area and determine exactly where he is , check also who attended today and who didn't come. This will help control the workflow.

- **Employee Evaluation Module:**

By using cameras throughout the whole hospital, admin will be able to track all employees performance and efficiency . and this will be done based on feedbacks , ratings , attendance and availability.

- **Health Insurance module:**

By applying on a health insurance in hospital, this will grant you some discounts. This module can be used by the user, and the receptionist can check the integrity of it, then provide the discounted cost.

System Features



Patient:

- 1-View and create his profile
- 2-Can make online reservations
- 3-Can view his examination results and also export them to the desired format
- 4-apply for insurance.



Doctor:

- 1-View patient profile
- 2-Create test results, 3-Create medical prescription, 4-Edit his schedule
- 5-Forward requests to other doctors



Receptionist:

- 1-Create a profile for the patient
- 2- forward requests
- 3-View doctor's schedule.
- 4-Create a reservation

• Patient Features

Create a profile

Patient must register with the receptionist at the beginning to make a profile then he / she will download the mobile app and complete his/her profile data .

Patient will provide in his/her profile his/her full name similar to the one in his/her national id , his/her email address , his/her mobile phone , his/her password for login ,his/her medical history like the permanent diseases he/she have or the sensitivity to a certain element . He/she will provide his/her medical history in the form of questions as he/she will be asked some questions and he/she will provide answers to them to know his/her medical information.

View and Edit profile information

Patient can edit the information he supplied in his profile like his/her email address , his/her mobile number , his/her password and his/her medical information .

View examination results

Patient can view his/her examination results produced from doctor at the time of his/her examination , he/she can view them on the website or the mobile application and he/she can download them in a pdf format .

View Rays results

Patient can view his/her xray results he/she done in the hospital and he/she can export them in a PDF to preserve its details as the document will hold the ray image and the doctor analysis for it .

Make online reservation

Patients can make a reservation online and book a free time slot for a certain doctor that he/she wants to visit and this preserves he/she the time he wastes in waiting for his/her turn in the hospital .

Apply health insurance

Patient can apply his/her health insurance and benefit from the advantages it provides for him/her like a certain discount or paid treatment and options like that that his/her insurance facility provides .

View medical prescription

Patient can view the prescriptions the doctors gave him/her and he/she can download them in a pdf format , this makes it easier for him/her to show it to another doctor or the pharmacist as it doesn't depend on the doctor handwriting .

Feedback and reviews

Patient can rate and give comments on the specific doctor he examined with also reviews about the hospital in general are accepted .feedback will give a strong incentive for the hospital to know the weak points in it ,and for the doctor himself to improve himself .

- **Doctor Features**

View patient profile

The system will contain a profile for each patient that will be updated with his information and his reservations and his progress . So the doctor will be able to view this profile and see The Patient's condition and see his examination results and Xray result . He can check all his history in the hospital with date of each examination . The Doctor can have a daily review of all his patient daily which will make health care better for them. Through this if he find urgent thing in any result or xray he can take action early and solve the problem once he discover it.

Create Examination Results

When the patient go to the Doctor he can open his profile and check his progress . Then he can create new Examination Result and put it's date and put the patient condition and what is the new observations . Then he can put a request for him to make a xray or any needed examination also .Then he gives his feedback about this examination and the patient condition .After that the examination Result will be added to The Patient Profile that he can see it and also any other doctor that check This patient condition can view it so they never have conflict between each others . This will create a great reference to go back to it if anything is lost after that time.

Create medical prescription

When the doctor creating examination result he can create using the prescription template a medical prescription for the patient to tell him about the cure that he should take and how often the patient should take it . so that the patient profile will be updated with this information and he can check any medication cure's times that he should take it in at anytime . Also if the doctor is viewing the patient profile and found something wrong he can Create medical perception for the patient to solve the problem and take actions faster .

Radiology photos online

Upload rays results so patients can view his/her photos from his home with the ability to export them in a certain format to preserve the xrays photos details so he/she can show them to the doctor .

Change schedule

A doctor can send an online request to the admin to change his schedule ,and he will get the response online through the app .

Forward patients

A doctor can forward patients to other department to get the required analysis without any hassle as it will take time for the patient to book a slot in another department and the case could be urgent so this saves this time.

- **Receptionists Features**

Create a profile

When a patient visits the hospital for the first time without being registered online, the receptionist should make him an initial profile which contains:

Full name

"By capturing photos for his national ID card and uploading it in required place at the

website, which will use the computer vision to detect the full name of the patient exists on the ID card and will save it in the database”.

National ID Number

“By capturing photos for his national ID card and uploading it in required place at the website, which will use the computer vision to detect the national ID number of the patient exists on the ID card and will save it in the database”.

Phone number

“Which the receptionist will ask the patient for and write it into the required field at the website”.

After the receptionist registration, the patient is required to download the mobile application of the hospital, login for the first time with patient’s national ID number, and then the patient could create his/her password and complete his/her profile information.

View and Edit profile information

Receptionist can edit the information that the patient has supplied in his/her profile mainly which couldn’t be edited by the patient himself/herself which are:

- Full name.
- National ID.

If there is any problem from recapture his national ID, after checking them from the patient’s national ID card.

Create Reservation

Receptionist could see the available time slots of the doctors and reserve an appointment for the patient.

View doctors’ schedules

Receptionist could see the doctors’ schedules so he/she can know when the doctor is free and who are the patients that the doctors will serve at any slot so the receptionist can search with the patient ID to know which slot that the patient has reserved, and which doctor will serve him/her.

- **General Features**

Cross Platform Support

The system is offered via web and mobile interface . The web interface allow responsive design support either desktop or mobile interface. Mobile application is offered for Android, iOS and windows mobile.

Availability Check

This system is offered via web only and it uses all cameras data in the whole hospital for computer vision and machine learning algorithms .The web interface allow responsive design support either desktop which allows receptionist and admin to know which doctor is available at certain time and where he is, And this mainly for urgent cases or administrative purposes.

Employee Evaluation

This system is offered via web and uses all cameras data in the whole hospital for computer vision and machine learning algorithms, it's only for admin to track the performance and efficiency of the employees based on several parameters.

Profile information security

Attackers may try to steal profiles' information so

- only authenticated users can login to the system to malicious users
- Robot test is applied while registering and login to avoid automated registration and login.
- User account must be verified by email
- The receptionist only can create the profile for the patient at the beginning to check his/her national id .

-Development

The development will be made using Agile method .

Team

- ★ *Dyaá Adel ElNahal*
- ★ *Omar Ahmed*
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- ★ *Abdelrahman Wael Helaly*
- ★ *Ahmed El Rashed*
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- ★ *Abdullah Khairy*
- ★ *Abdullah Shaker*
- ★ *Mohammed Hassan*
- ★ *Ahmed El Sherif*
- ★ *Abdelrahman Al Wali*
- ★ *Abdullah Ahmed Fathy*

Tools

Version Control	Github
Task tracking / issuing	Github
Frontend	React.js
Backend	Python Django
Structured Database	Postgresql
Documents	Google Docs
Mobile	Flutter

Assumptions

The system assumes that no rooms for operations in hospital and nurses will be managed manually as they have no profiles on the system

-References

[1] HOSPITAL MANAGEMENT - AN INTRODUCTION CHAPTER : 1

[2]

http://www.academia.edu/7149341/HOSPITAL_MANAGEMENT_SYSTEM_A_PROJECT_REPORT

[Submitted in Partial Fulfillment of the requirements for the Award of the](#)

[3] <https://en.wikipedia.org/wiki/DICOM>