International Journal of Innovation and Applied Studies
ISSN 2028-9324 Vol. 37 No. 1 Aug. 2022, pp. 171-187

http://www.ijias.issr-journals.org/

Doctors Appointment Reservation Management System

Sabah Mohammed Fayadh

Department of computer Systems, Al Nassriyah Technical Institute, Southern Technical University, Thi-Qar, Iraq

ABSTRACT: With the major success in applications of electronic healthcare and tremendous technologies in the telecommunications fields that are exceedingly used in the healthcare sector. And because of the massive technological and computing boom, rapid advance of information systems, technology and procedures, the government's decision to reduce overall healthcare expenses, alliances made in the healthcare industry, and the massive emergence of the Internet, most vital areas of daily life seek to computerize their environments to achieve performance and reliability better and lower costs. A dependable web-based doctor's appointment reservation management system (DARMS) is presented in this research. It will be design and implement to replace manual work. It is a consolidated database that contains patient information, and it contains the names of the doctors that the nurse adds. DARMS will enable the patients' ability to use the system and input their information to schedule an appointment with the specialist physician and show their reservation information so that a doctor can diagnose their condition and prescribe the appropriate medication. The proposed system will serve patients, and their physicians, and save time and cost-effective health care.

KEYWORDS: System scope, medical records, Clinical system, DARMS, electronic healthcare, ERD.

1 INTRODUCTION

With the phenomenal emergence of the internet, and the development of the technology in various walks of society, an internet played a significant role in health care domain [1], [2]. In the medical field, hospital records are one of the many sources of large amounts of data, Patients' medical records, medical examination results, and medical instruments that are part of the internet of things (IOT). For generating meaningful information from big data relevant to public healthcare, suitable administration and analysis are required [3]. It must be overlooked that there are several obstacles associated with each phase of processing large data that can only be overcome by utilizing high-end computing solutions for big data analysis [4], [5]. The internet provides better support for patients and their families who care about the health of the disease and take the necessary medicines, this opportunity is especially real when facing the challenges of chronic diseases and aging adults [6], [7].

In this paper a reliable system will build which is online application software for scheduling doctor's visits through the internet. Patients will access to a database where they can submit their information in order to schedule an appointment with a specialist doctor. It is based on Electronic healthcare technologies to serve the patient to manage their reservations in a reliable way. That helped the specialists in this domain to use this system to reduce healthcare costs and time reduction. This method is a cost-effective system that reduces healthcare costs. The system's features are: lower healthcare expenses while also being beneficial to patients and providers.

2 SCOPE AND OBJECTIVES OF THE SYSTEM

This study aims to create a system that benefits health-care professionals through allowing patients to access a database, and enter their information in order to schedule an appointment with a specialist physician for their particular case. It is a cost-effective system that reduces healthcare costs. The system's features are:

- Enhance communication between the patient and the physician.
- Managing healthcare terminology and vocabulary.
- Information on healthcare and management is readily available regardless of access time and party in use.
- Managing medical data to support predicate medicine, and for scientific and statistical research purposes.

The system's goal is to install trustworthy web-based electronic healthcare technologies that help patients and health-care providers communicate more effectively. Five actors were identified in this system: physician, pharmacist, nurse, and admin and they have several functions. Figure 1. explains the scope of the system.

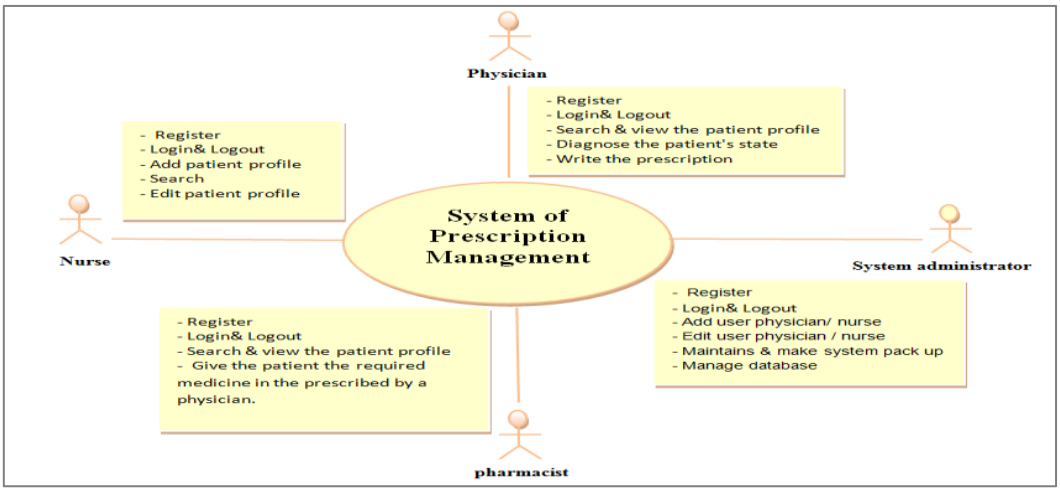


Fig. 1. Displays the system's scope

3 OVERVIEW OF THE SYSTEM

A healthcare practice management software system involves an interactive software tools to manage appointment booking, perform a physical examination, suggest an initial diagnosis, and manage the treatment protocol. The goal of this study is to build a system based on electronic- healthcare technology to better serve patients. The database of (DARMS) maintains information about the users of this system, such as (physician, nurse, Pharmacist, patient, and admin), and each of them has a set of functions in the side system. When a patient first contacts a (DARMS) clinic, the patient's information is recorded. In addition, the details of the reservation requiring an appointment are noted. The nurse can to register, log in, log out, add, edit, delete account of the patient, also add patient details with the appointment date and time, and research the patient record. whereas the physician can to register, login in, login out, search of the patient, diagnosis, and write the drug to the patient. Table 1 depicts the physician and nurse duties in the proposed system.

Table 1. Physician and nurse roles in the proposed system

Actors	Roles
Physician	- Register - Log in & log out - Search patient - Patient state diagnosis - Write medical prescription
Nurse	- Register - Log in & log out - Add and Edit physician account - Add patient account - Add, Edit, Delete patient details

4 METHOD AND SYSTEM ANALAYSIS

4.1 UNSTRUCTURED MEETING

Regular interviews with health care providers which are (physician, nurse, and pharmacist) have been conducted, and everything was up for debate during this process to identify the system's functional and non-functional requirements [8], [9]. As well as the system's users, their roles, and their interactions with the system have been identified to clarify any ambiguities in the system [10], [11].

4.2 DATA FLOW DIAGRAM

The data flow diagram (DFD) is the most commonly used system analysis model. It's a tool that shows how people can visualize how the system will work, what the system will achieve, and how it will be put in place [12]. DFD is used to assist understand the existing system and to represent the desired system. It is utilized to illustrate the desired system, and to help understand the existing system. DFD is a tool that allows users to see how the system will function., what the system will achieve, and how it will be put in place [13], [12]. It is used to represent the required system and to aid in the understanding of the current system.

These diagrams were created to show how information is processed and where the information is Knowledge management refers to health care within medical and administrative facilities, in order to manage knowledge, and it can help him to make it fit for and then help him take the correct medical procedures [14]. Figure 2 depicts a data flow diagram (DARMS).

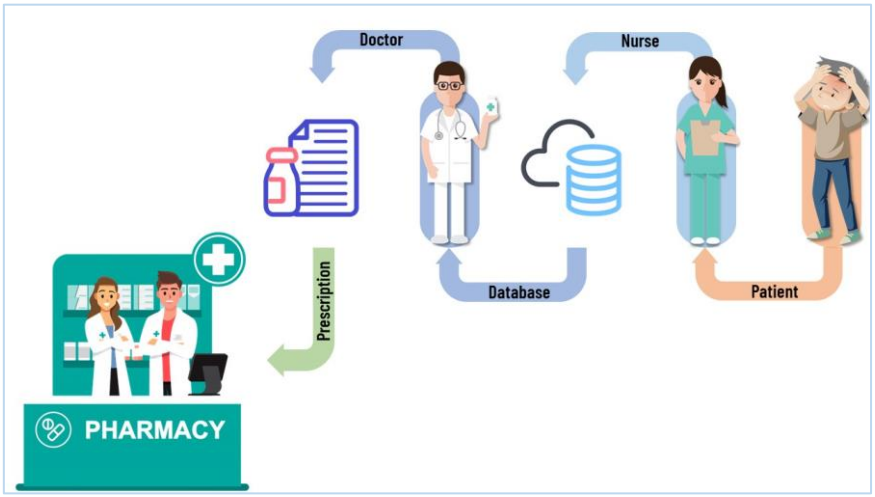


Fig. 2. Data flow diagram of (DARMS)

4.3 SYSTEM NEEDS

Generally, the requirements are able to effectually predict the needs and wants of specific user markets and ensure that capacity planning is suitable to enclose delivery [15]. It prioritizes actions, negotiates successful outcomes, and influences changes in direction, involving engineering changes in the supply chain [16], [17]. Figure 3 illustrates the relation between the common features in the system approach. Existing system requirements are described in terms of a set of suggested system needs, such as:

1. Add new user (physician, nurse, Pharmacist) account.
2. Add new physician account.
3. Add physician details.
4. Input appointment diagnosis.
5. Diagnosis the physician disease.
6. Add treatment.
7. Print the medical prescription.
8. Document the history of the patients' cases.

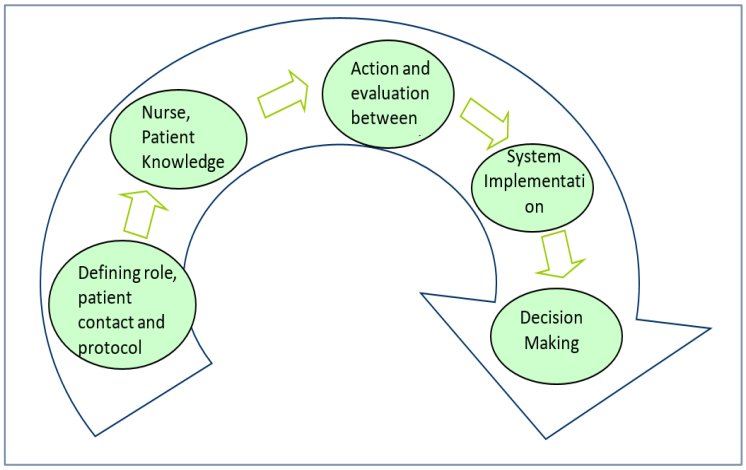


Fig. 3. Relation between users and activities

4.4 User Analysis

User analysis is an important tool that influences the creation of software systems or other technological goods throughout the systems design phase. [18], [19]. In web site of DARMS, five actors (users) were identified like: patient, physician, nurse, pharmacist and admin, and each user has diverse roles. Tables 2, 3 illustrate the activities of two users who related to (DARMS).

Table 2. Activities of physician user

Actor	Physician
Role	- The physician can review the patients records via searching their names, and review history of patients cases. - The physician can access the system after input their username and password.
Activities	- Diagnosis the patients state. - Enter the disease name. - Enter the medicinal drug. - Document any note related to the state.

Table 3. Activities of nurse user

Actor	Physician
Role	- The nurse can access the system after enter their username and password. - The nurse can review the patients records via searching their names and review history of the patients cases.
Activities	- Enter the patient details. - Enter the patient details. - Edit the patients details. - Take appointment with the Physician

4.5 Case Study Model

It was used in this system to identify difference actors and upon completion; the functional needs of the final system can be determined. Figure 4. illustrates the Use Case Model of exiting systems.

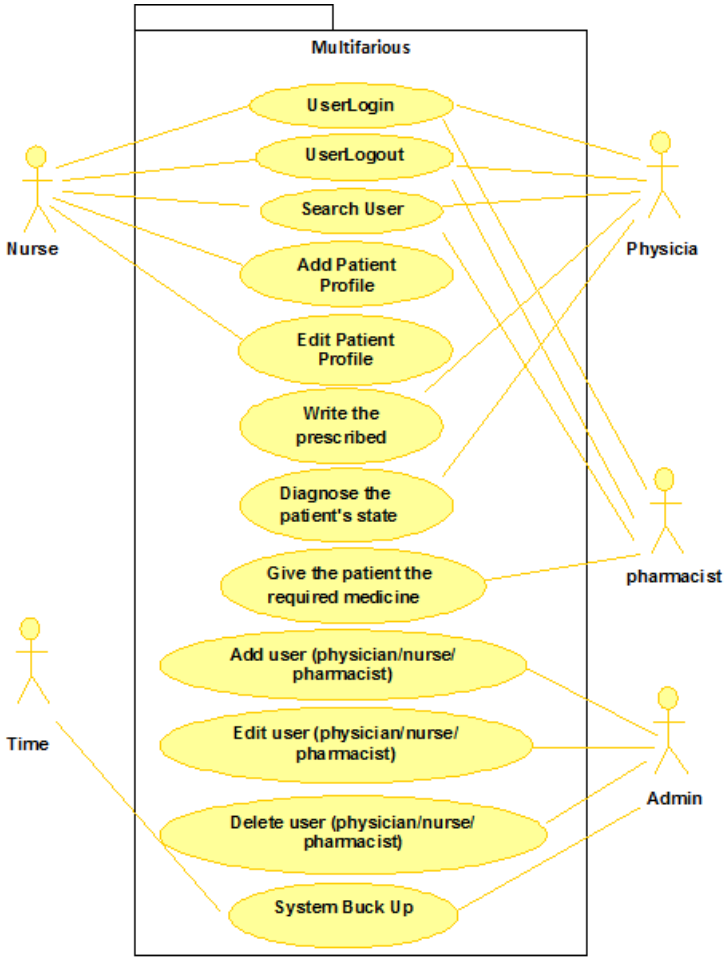


Fig. 4. Use Cases Models

5 SYSTEM DESIGN

The process of defining the reservation management system architecture, the medical equipment, operations packages, interface design, and healthcare system requirements to meet stated needs are referred to as system design in this work. It is defined as the application of system theory to the development of products. Its goal is to develop a technical solution that meets the functional needs of system [20].

The project lifecycle should be a functional definition. This functional definition is translated into a physical architecture during the system requirements analysis. The system components are dispersed throughout the physical structure. Usable interfaces are built and prototyped, and Technical Specifications are created for Application Developers to aid in the development and testing of the system.

5.1 USE CASES MODELS

It is depiction the behaviour of the system from a users' standpoint through utilizing actions and reactions. It uses to identify of system's boundary, and the relationship between the system and outside of the system [21]. This model is used to establish the difference users and on completion of this. It is possible to identify the functional requirements of the final system.

In (DARMS), five users (actors) are available in the use case diagram, and each actor has several roles in this system as illustrates in figure 5.

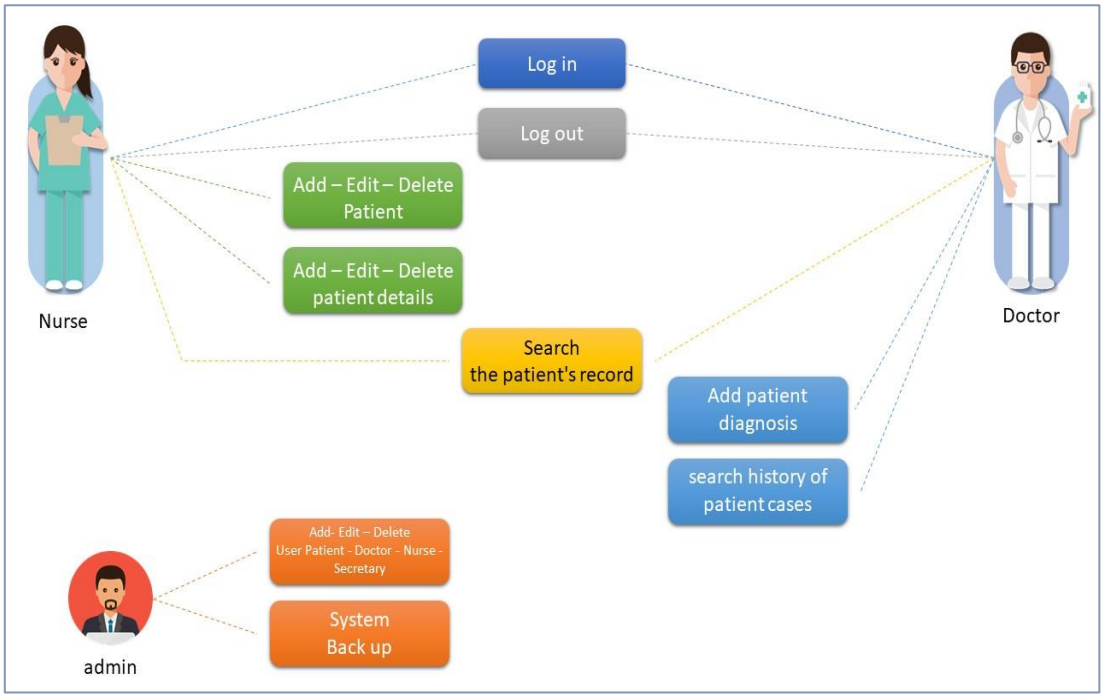


Fig. 5. Use case diagram for (DARMS)

5.2 DATABASE DESIGN

The process of determining an appropriate database structure is known as database design.

For instance, in the Entity Relationship Diagram (ERD); A number of acceptable entities, properties, and relationships which must be represented in the system database have been identified [44].

The database design is critical to the current system's success; a badly constructed database will cause errors, which may result in poor patient decisions, which could have major consequences for the organization. In contrast, a well designed database, on other hand gives the correct information for the medical decision making process to run smoothly [22]. There are three key phases to the clinical database design process: conceptual, design, and implementation, figure 6 illustrates the logical and physical design.

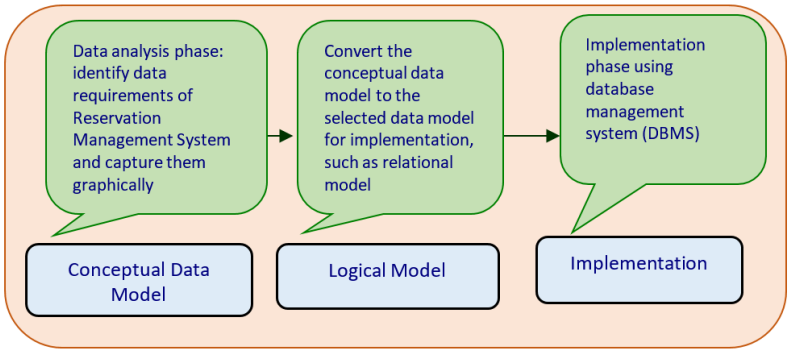


Fig. 6. Clinical database design methodology

The conceptual design is the first phase in the design technique, and it depicts a diagram that depicts the relationship and connectivity between all of the system's components. The next phase, in the design technique is to create a logical data model which it is based on the recognized set of relationships among classes and is driven through the “conceptual data model”. The logical database design is then translated in the final phase of the database design technique (entities, attributes, relationships,

and constraints), into a physical database that the target database management system can implement (DBMS). In this work, the sketches of system have been made, and then they have been transferred to Entity Relationship (ER) as shown in figure 7.

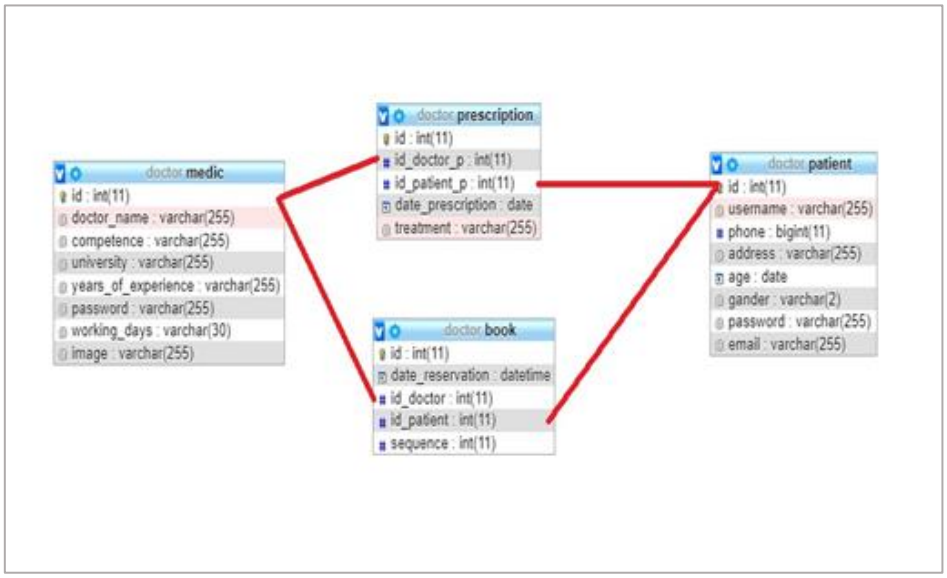


Fig. 7. ER diagram of the database of Doctors Appointment Reservation Management system

6 SYSTEM INTERFACES

The interfaces of (DARMS) which have been achieved during the implementation of this system are displayed in this part: Figure (8) shows the main page of the site while Figure (9) shows Sign in to the patient or doctor's website.

Fig. 8. Main page of the system

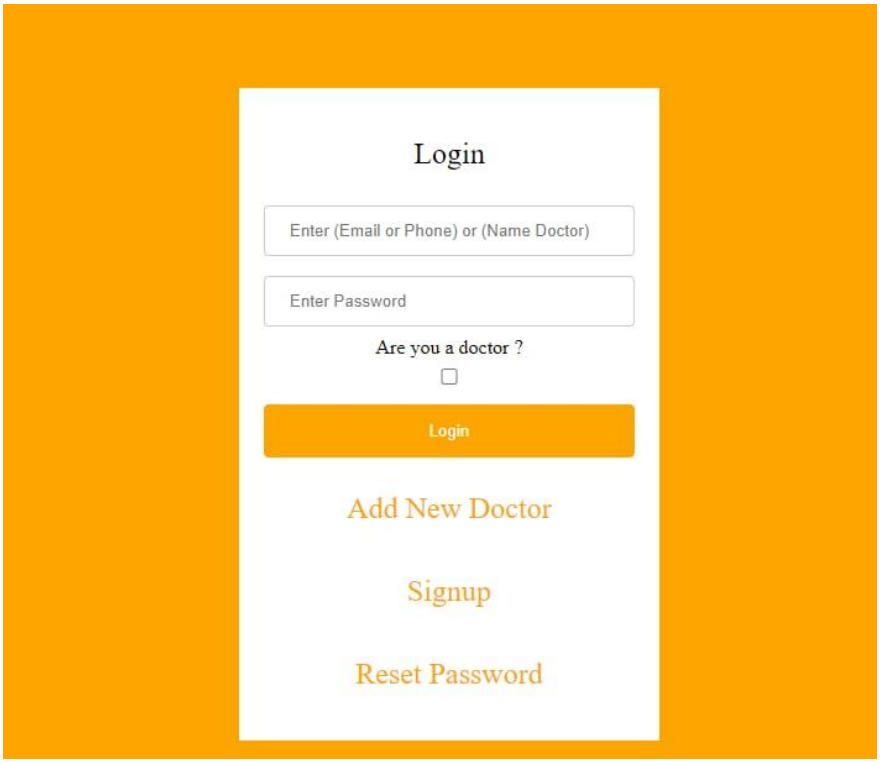


Fig. 9. A patient or Physician' website sign-in page

Figure (10) shows page for the patient to create a new account if it is not pre-registered.

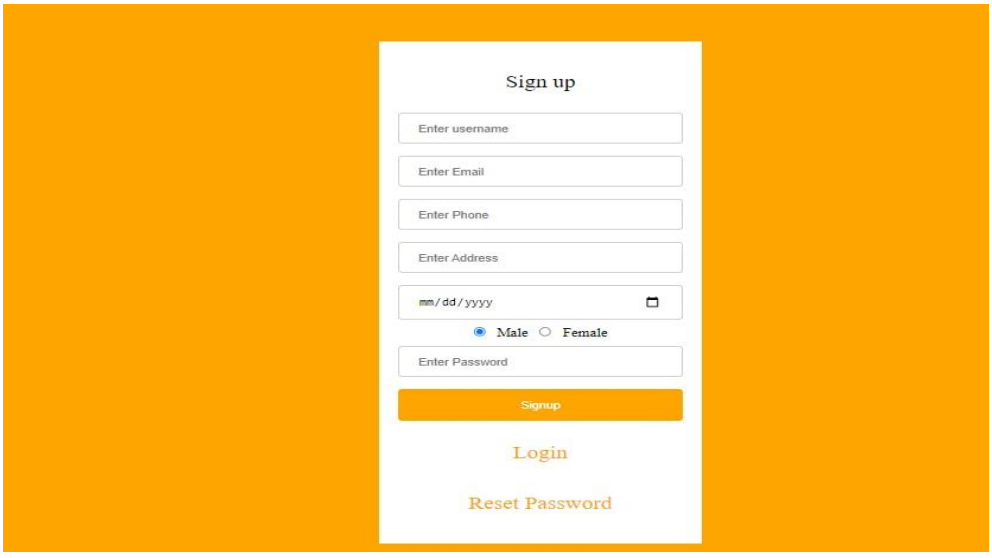


Fig. 10. Page of patient register

Return the patient's secret code if the pin is lost, as shown in Figure 11.

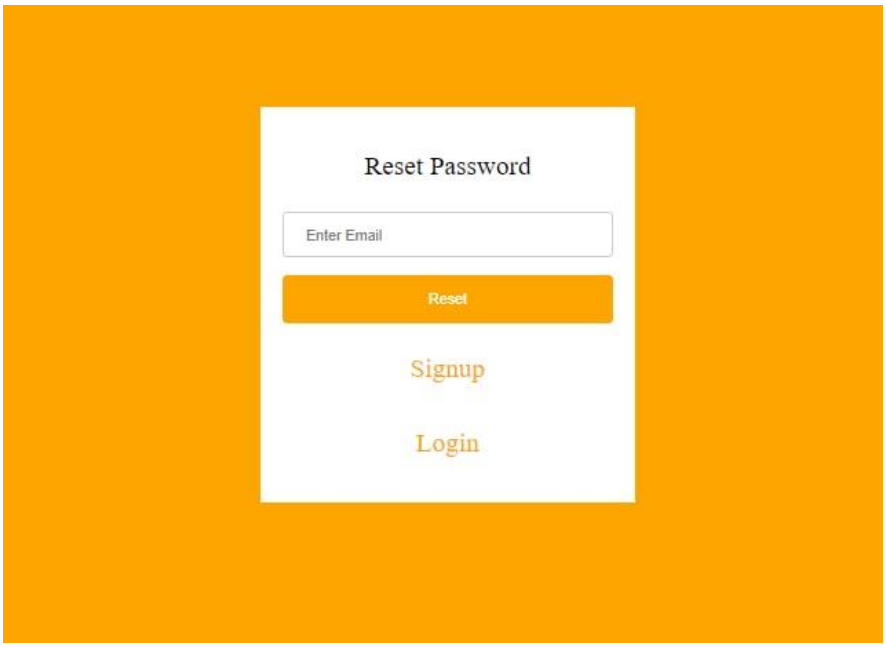


Fig. 11. Return the patient's secret code in case the pin is lost

Figure (12) shows doctors page added to the site.

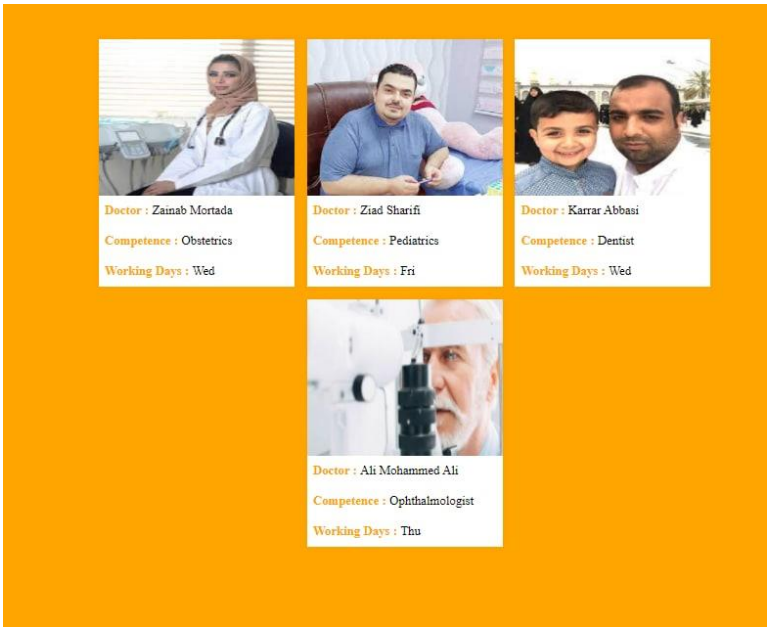


Fig. 12. Doctors page added to the site

Figure 13. shows the page of physician details which related to their information and their working days.

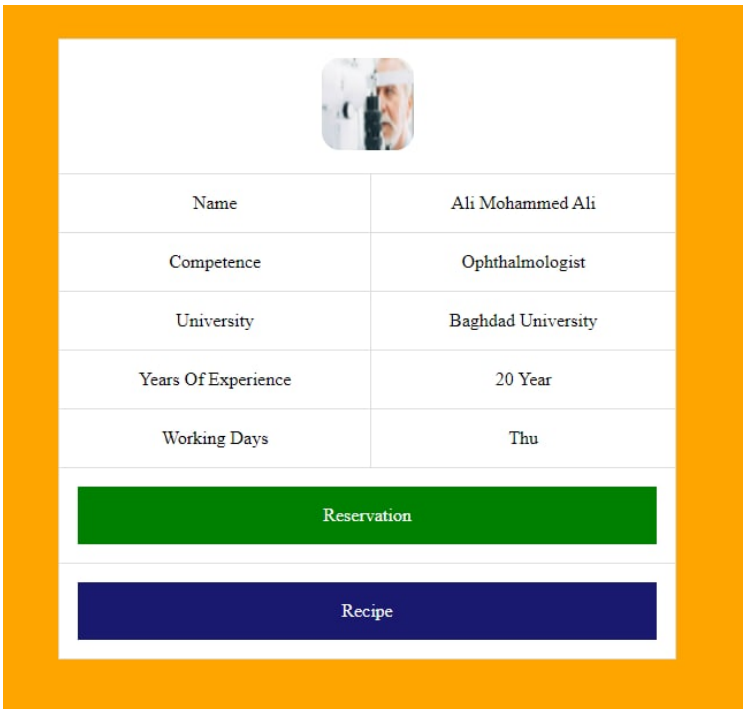


Fig. 13. Doctor details

Figure 14. shows the page of booking time for the patients.

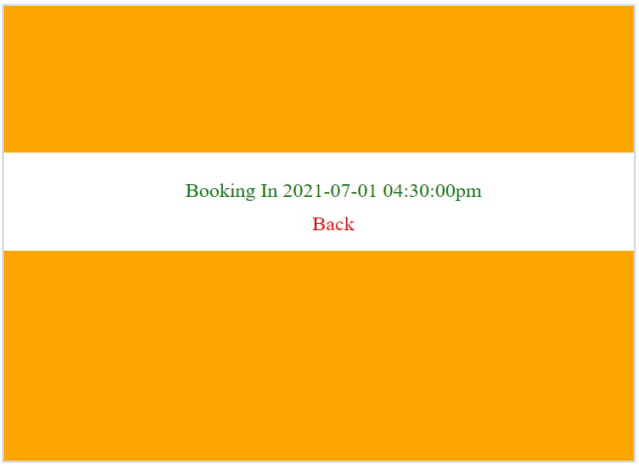


Fig. 14. Booking time

Figure 15 shows the page which has a second booking with the same physician and in the same day, so the system refusing to book again.

Fig. 15. Rejected booking with the same physician in the same day

When the system booked 10 patients for the same doctor, the page will appear "Booking Finished" as shown in figure 16.

Fig. 16. The process of booking has finished successfully

When booking at a physician who is not present on this day, there is no reservation for this day. But the patients can see the prescriptions that have been written for them as shown in figure 17.

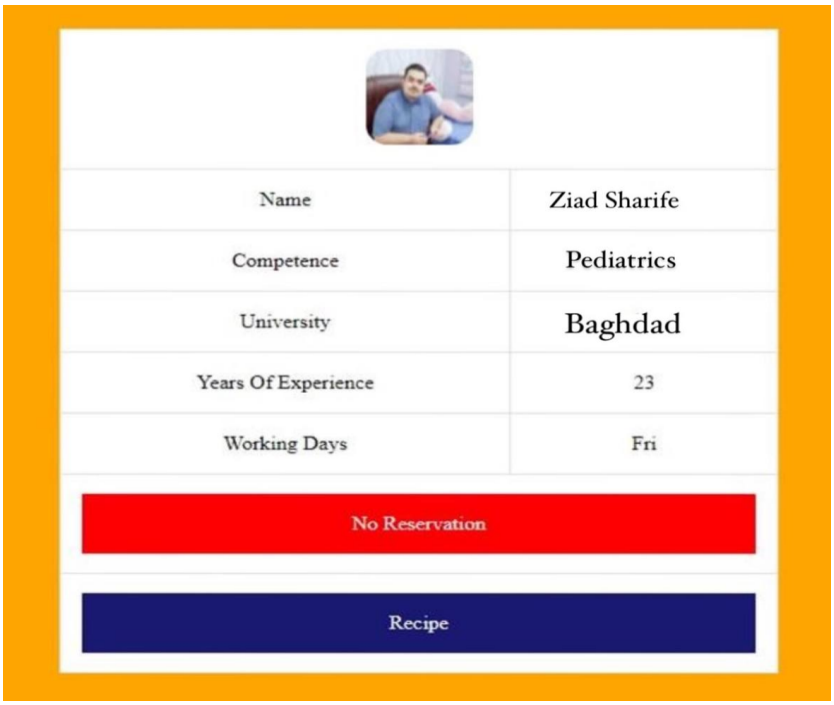


Fig. 17. No reservation is available when the doctor is not present

When entering the prescription of the assigned doctor, a list of prescription dates that have been recorded for the last case and for pre-existing cases will appear as shown in figure 18.

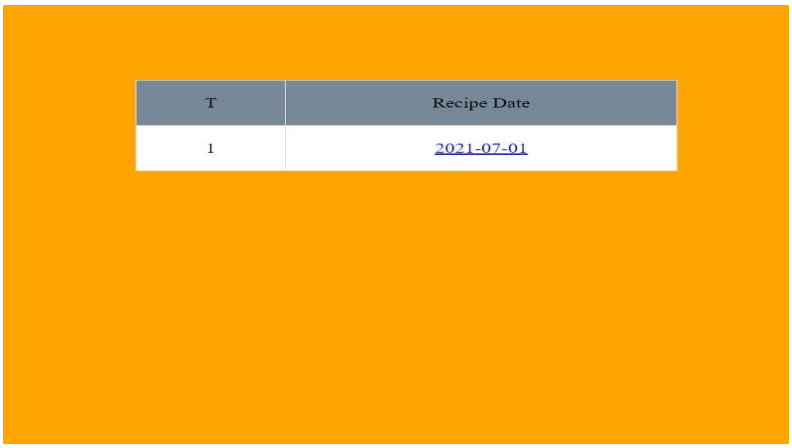


Fig. 18. Recipe Date

Figure 19 shows the page of prescription for each patient.

Fig. 19. Prescription for each patient

figure 20 depicts the page of adding the physician by the nurse for enter their information like: name, medical specialization, years of practicing the profession, and working times.

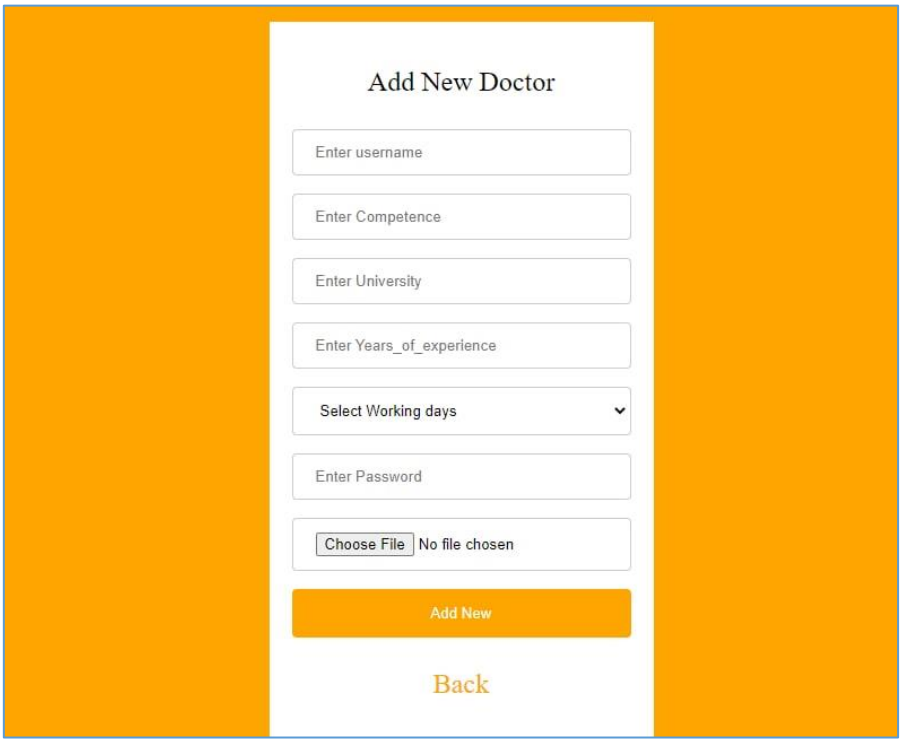


Fig. 20. Add a physician

Figure 21 shows when a doctor wants to access the site, he registers his name and the secret code provided to him by the nurse and correctly puts him as a doctor. Until he distinguishes him from the patient and enters

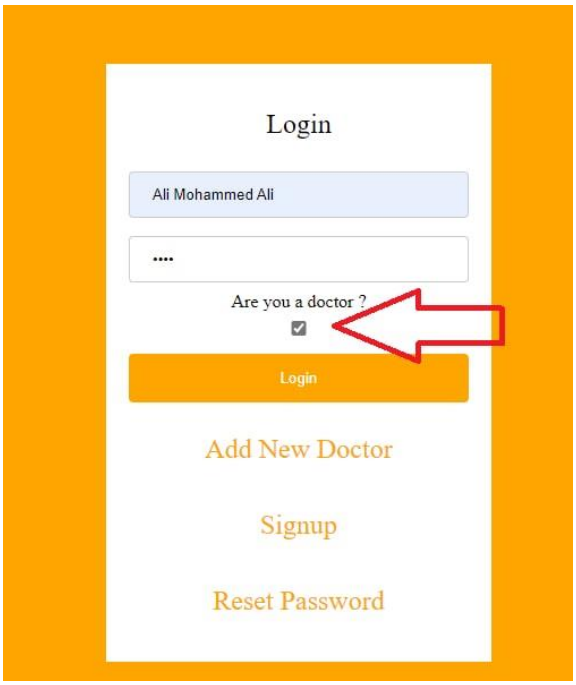


Fig. 21. Login to the system

Figure 22 shows the page of booking date to the patient with the doctor.

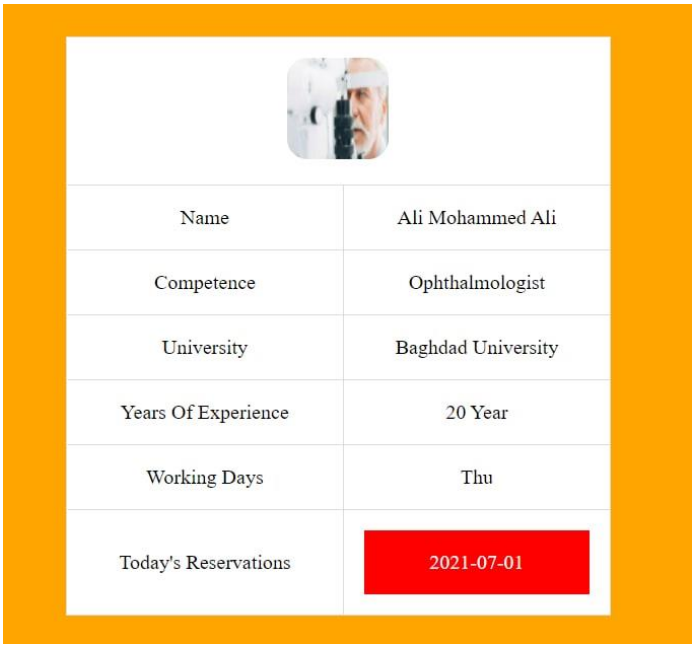
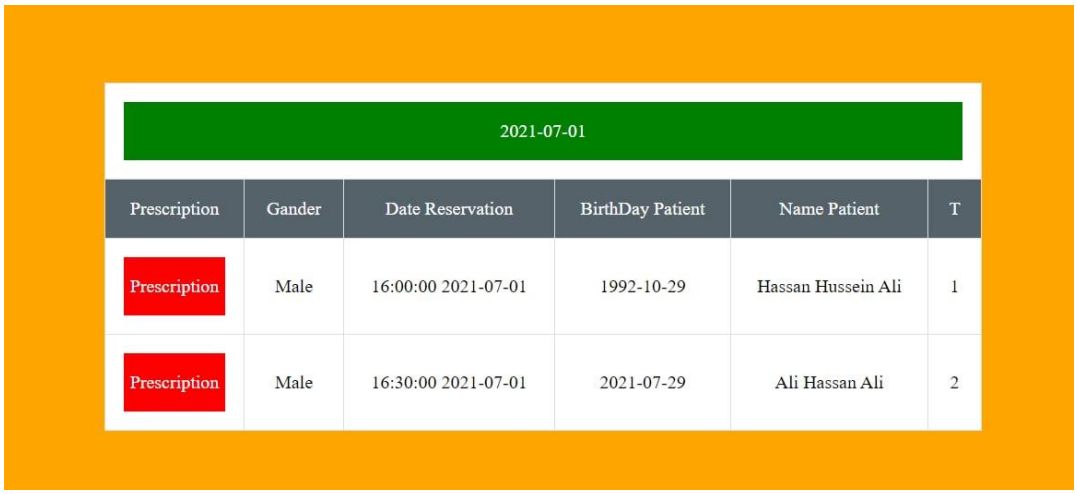


Fig. 22. Date of booking with the doctor

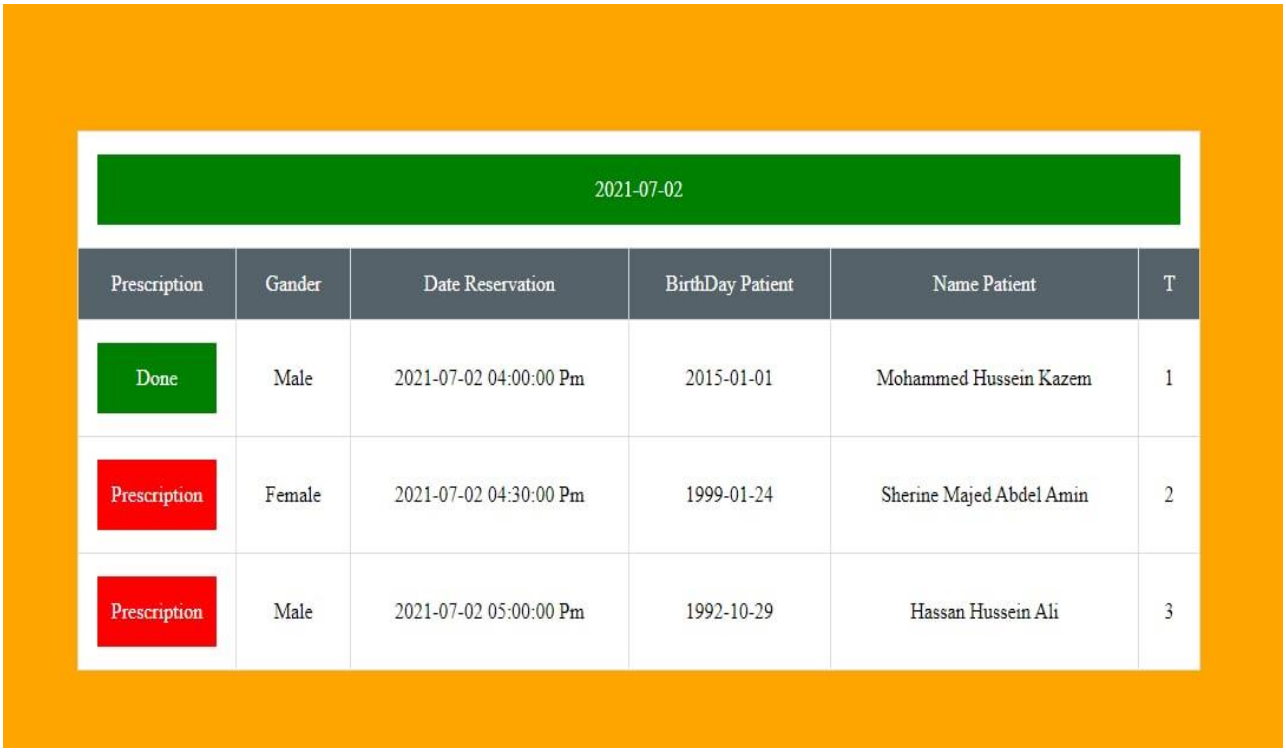
Figure 23 shows a list of patients who have been diagnosed their disease states and write treatment for them. While figure 24 shows that the process of treatment for the certain patient has been completed. Whereas Figure 25. depicts the patient's prescription which involves the number of treatments from 1 to 8.



2021-07-01

Prescription	Gander	Date Reservation	BirthDay Patient	Name Patient	T
Prescription	Male	16:00:00 2021-07-01	1992-10-29	Hassan Hussein Ali	1
Prescription	Male	16:30:00 2021-07-01	2021-07-29	Ali Hassan Ali	2

Fig. 23. List of patients' reservations



2021-07-02

Prescription	Gander	Date Reservation	BirthDay Patient	Name Patient	T
Done	Male	2021-07-02 04:00:00 Pm	2015-01-01	Mohammed Hussein Kazem	1
Prescription	Female	2021-07-02 04:30:00 Pm	1999-01-24	Sherine Majed Abdel Amin	2
Prescription	Male	2021-07-02 05:00:00 Pm	1992-10-29	Hassan Hussein Ali	3

Fig. 24. Treatment has been completed for the patient

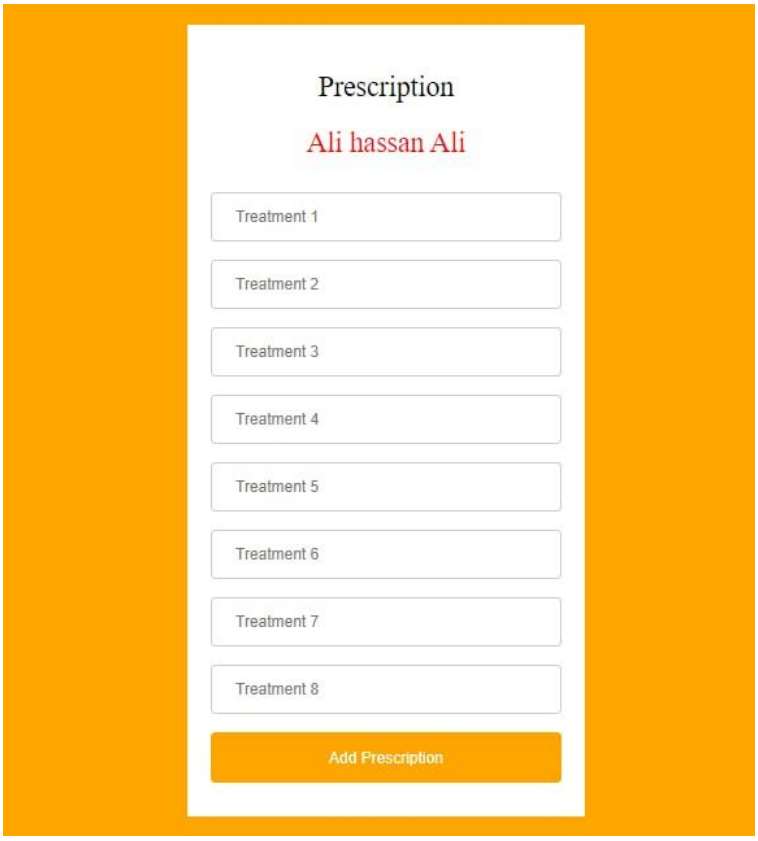


Fig. 25. Prescription for patient

7 CONCLUSION AND FUTURE WORKS

A health-care system has been implemented in this study for using Electronic Patient and Private Health care information system (DARMS) to replace manual labor. This paper has been designed and built a data based system that is promised to treat patients legally and correctly. The objective of this work was to schedule physicians visits through the internet. Patients have ability to access into the system database where they can submit their information in order to schedule an appointment with a specialist doctor. whereas the physician can access to the system to display patients' records for diagnosing their conditions, and write the required medical prescription. This system is effective for patient healthcare providers by reducing healthcare costs and time.

Lastly, this proposed system needs to some future improvements which by adding further functionality to Doctors Appointment Reservation Management System: Improving navigation of web, and establishment of a pathological analysis section capable of displaying the results of medical examinations to the specialist doctor.

REFERENCES

[1] W. Li et al., “A comprehensive survey on machine learning-based big data analytics for IoT-enabled smart healthcare system,” Mob. Networks Appl., pp. 1–19, 2021.
[2] D. Agniel, I. S. Kohane, and G. M. Weber, “Biases in electronic health record data due to processes within the healthcare system: retrospective observational study,” Bmj, vol. 361, 2018.
[3] C. Wendt, L. Frisina, and H. Rothgang, “Healthcare system types: a conceptual framework for comparison,” Soc. Policy Adm., vol. 43, no. 1, pp. 70–90, 2009.
[4] S. K. Dixit and M. Sambasivan, “A review of the Australian healthcare system: A policy perspective,” SAGE open Med., vol. 6, p. 2050312118769211, 2018.
[5] N. Reibling, M. Ariaans, and C. Wendt, “Worlds of healthcare: a healthcare system typology of OECD countries,” Health Policy (New. York)., vol. 123, no. 7, pp. 611–620, 2019.
[6] S. Dash, S. K. Shakyawar, M. Sharma, and S. Kaushik, “Big data in healthcare: management, analysis and future prospects,” J. Big Data, vol. 6, no. 1, pp. 1–25, 2019.

[7] L. Gottlieb, C. Fichtenberg, H. Alderwick, and N. Adler, “Social determinants of health: what’sa healthcare system to do?,” J. Healthc. Manag., vol. 64, no. 4, pp. 243–257, 2019.
[8] R. B. Banziger, A. Basukoski, and T. Chaussalet, “Discovering Business Processes in CRM Systems by leveraging unstructured text data,” in 2018 IEEE 20th International Conference on High Performance Computing and Communications; IEEE 16th International Conference on Smart City; IEEE 4th International Conference on Data Science and Systems (HPCC/SmartCity/DSS), 2018, pp. 1571–1577.
[9] S. Li, X. Wu, Y. Zhou, and X. Liu, “A study on the evaluation of implementation level of lean construction in two Chinese firms,” Renew. Sustain. Energy Rev., vol. 71, pp. 846–851, 2017.
[10] Z. Yan, N. Duan, J. Bao, P. Chen, M. Zhou, and Z. Li, “Response selection from unstructured documents for human-computer conversation systems,” Knowledge-Based Syst., vol. 142, pp. 149–159, 2018.
[11] P. J. Fowler, K. Wright, K. E. Marcal, E. Ballard, and P. S. Hovmand, “Capability traps impeding homeless services: A community-based system dynamics evaluation,” J. Soc. Serv. Res., vol. 45, no. 3, pp. 348–359, 2019.
[12] H. Xiong, H. Zhang, X. Dong, L. Meng, and W. Zhao, “DFDVis: A Visual Analytics System for Understanding the Semantics of Data Flow Diagram,” in International Conference of Pioneering Computer Scientists, Engineers and Educators, 2017, pp. 660–673.
[13] E. M. T. Abdalameer, “Pet Health Care System,” J. kerbala Univ., vol. 14, no. 3, 2016.
[14] H. Zhang, W. Liu, H. Xiong, and X. Dong, “Analyzing data flow diagrams by combination of formal methods and visualization techniques,” J. Vis. Lang. Comput., vol. 48, pp. 41–51, 2018.
[15] J. K. Elrod and J. L. Fortenberry, “The hub-and-spoke organization design: an avenue for serving patients well,” BMC Health Serv. Res., vol. 17, no. 1, pp. 25–33, 2017.
[16] G. M. Hastig and M. S. Sodhi, “Blockchain for supply chain traceability: Business requirements and critical success factors,” Prod. Oper. Manag., vol. 29, no. 4, pp. 935–954, 2020.
[17] E. Mohammed Thabit Abd Alameer and Z. Hasan Nasralla, “Electronic Patient Record Management System (EPRMS),” J. kerbala Univ., vol. 9, no. 1, pp. 293–303, 2013.
[18] J. C. Muñoz-Carpio, M. Cowling, and J. Birt, “Framework to enhance teaching and learning in system analysis and unified modelling language,” in 2018 IEEE International Conference on Teaching, Assessment, and Learning for Engineering (TALE), 2018, pp. 91–98.
[19] J. Siebert et al., “Construction of a quality model for machine learning systems,” Softw. Qual. J., pp. 1–29, 2021.
[20] R. Zhang et al., “Virtual traffic lights: System design and implementation,” in 2018 IEEE 88th Vehicular Technology Conference (VTC-Fall), 2018, pp. 1–5.
[21] L. Jacobson and J. R. G. Booch, “The unified modeling language reference manual,” 2021.
[22] M. M. Martín-Lopo, J. Boal, and Á. Sánchez-Miralles, “A literature review of IoT energy platforms aimed at end users,” Comput. Networks, vol. 171, p. 107101, 2020.