

Intelligent Patient Doctor Pharmacy system (PDP)

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Abstract- Providing efficient health care system for citizens is an essential requirement of any developing or developed countries. A key success in having a functioning good health system is connecting citizens with doctors and pharmacists which is part of having an electronic government (e-government). Technologies can easily deliver government services to citizens and empower citizen through access to information, or more efficient government management. Unfortunately this region (Kurdistan - Iraq) lacks a functioning e-government system for citizen health care, which hampers bringing the best possible services for the patients. Currently the patient's records are not held in a secure database system in which all the doctors, pharmacist can easily access the patient's records. Therefore, to solve this problem this e-government project computerizes the current health system in our region into an intelligent computer based system. This intelligent system is called "Intelligent Patient Doctor Pharmacy system (PDP)".

Index Terms- E Service, E Health, E Government, System Science.

I. INTRODUCTION

Electronic Government (E-Government) refers to the use of information technologies (IT) by government agencies such as hospitals that have the ability to transform relations with citizens and other arms of government. These technologies can easily deliver government services to citizens and empower citizen through access to information, or more efficient government management.

The resulting benefits can be less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions (Layne and Lee 2001). This region lacks a functioning e-government system especially for citizen health care, which creates problems as the patients records are not held in a secure database system in which all the doctors, pharmacist can easily access and get know about the patients more. Therefore, to solve this problem this e-government project computerizes the current health system in our region into an intelligent computer based system.

One of the essential requirements for citizens is having a good healthcare system for patients so as doctors and pharmacies. Despite requiring a significant amount of budget (Ballardini, Germagnoli, Pagani et al. 2004), healthcare system is a priority in every civilized and developed country and the government must put that into consideration. Kurdistan is a country which develops very fast, but when it comes to health care system; it needs a thorough improvement and in an urgent need for a fully functioning electronic system to serve patients, doctors and pharmacists.

In this project an intelligent electronic system has been created which is called "Intelligent Patient Doctor Pharmacy system (PDP)" (Figure 1). Intelligent PDP system is a system that makes a connection between patients, doctors and pharmacists in a way that they all can use the system. The patients could review their health status history such as the blood pressure or what kind of medications they have been taking.

For the doctors this intelligent PDP system is very useful and practical, the doctors can easily access the patients records by simply scanning their ID barcodes or entering the patients name with date of birth. Having the patient's medical history in front of them, the doctors can diagnose the patients and prescribe the right medication for the patients quicker and prevents any drugs contra indication or allergies, as the system will remind the doctors from the patient's allergic reactions to any types of medications.

This intelligent PDP system enable the pharmacists to double check the patients prescriptions before handing the medications over to the patients, in case a doctor mistakenly prescribed a wrong drug. The intelligent PDP system also arranges the time, date, schedule an appointment list for the patients according to the types of diseases and periodic visits to hospital especially for those who have chronic diseases.

So this intelligent PDP system not only getting rid of the old fashion health system In Kurdistan and gives it a system like the developed countries, but it also greatly serves the patients in our region with the doctors and pharmacists and builds a good inter-relation between the patients and doctors.

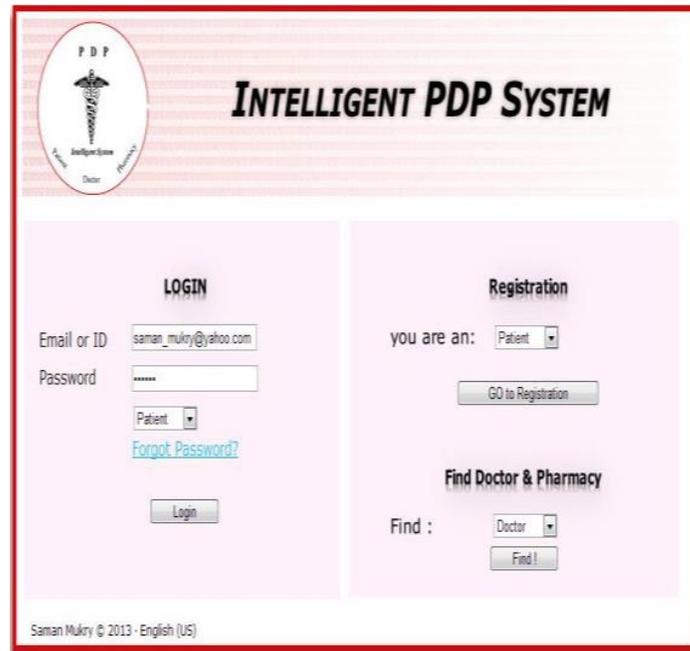


Figure 1 The interface of the Intelligent Patient Doctor Pharmacy system (PDP)

II. THE TRADITIONAL SYSTEM

The old traditional system is a paper based system, in which a patient meets a doctor in a clinic or hospital and all the information about the patients are written on paper and kept as hard copy files, so every patient has their own file which is kept in the clinic. This has its disadvantages, as each time the patient visits the doctor, in order for the doctor to read about previous conditions of the patient before examining him or her, the patient's file must be found among all other files of other patients which take time. Hard copy files of patient's information are also at high risk for getting damaged or lost in case of fire and flooding.

If the patient want to change the doctor and see another specialists in this case the new doctor don't have the patient's folder so he will have to ask the patient about his or her previous conditions and illnesses, what drugs the patient has been taken and if the patient has any chronic disease....etc which is hard for uneducated patients to describe all those information which may have serious consequences. Most patients don't keep or find their older descriptions, previous X-rays and test results.

This is not very easy and comforting for the patient and the doctor because the patient will either have to bring all old papers or remember his old cases and memorizes the drug names he has taken which is not easy for him. After the doctor see the patient and analyze the disease he will start writing the description on paper for the patient to take to the pharmacy. When the patient go to the pharmacy the pharmacist take the description paper and read the name of the drugs then look for the drug to find and sell to the patient.

In this traditional system papers may be lost by the patients or by some fire accidents in the clinics or other accidents, if the

papers and files are lost there is no way of getting them back and reuse them again ,all information will be lost as well. If a mistake occurs by the doctor or the pharmacist that may harm the patient no one can prove that the mistake is made because it's all written on paper and papers might be lost.

III. PDP SYSTEM

This system is much easier and much more helpful for all patients, doctors and pharmacist. When a patient go to see a doctor, either his own old doctor or a new doctor who doesn't know anything about the patient's old cases ,the doctor can see all the patient's information and previous illnesses and chronic diseases just by entering the patient ID or using the patient's personal card if they have one.

In that case the patient don't need to bring old paper descriptions, Xrays with him, and the doctor wouldn't have to ask the patient about previous diseases because its all written down in the patient's profile. After the doctor analyses the diseases he can easily write the description on the computer by just selecting the disease names and also selecting the needed drug for the patient.

When the patient go to the pharmacy the pharmacist also can see the patient's information just by entering the patient ID ,then they can see what drugs has been described for the patient and can easily find the drug because the system includes drug locations so that the pharmacist know which drug located in which shelf so they don't spend time looking for it. PDP system is also very strongly secure since all patients, doctors and pharmacists have their own username and passwords so no-one can modify their information.

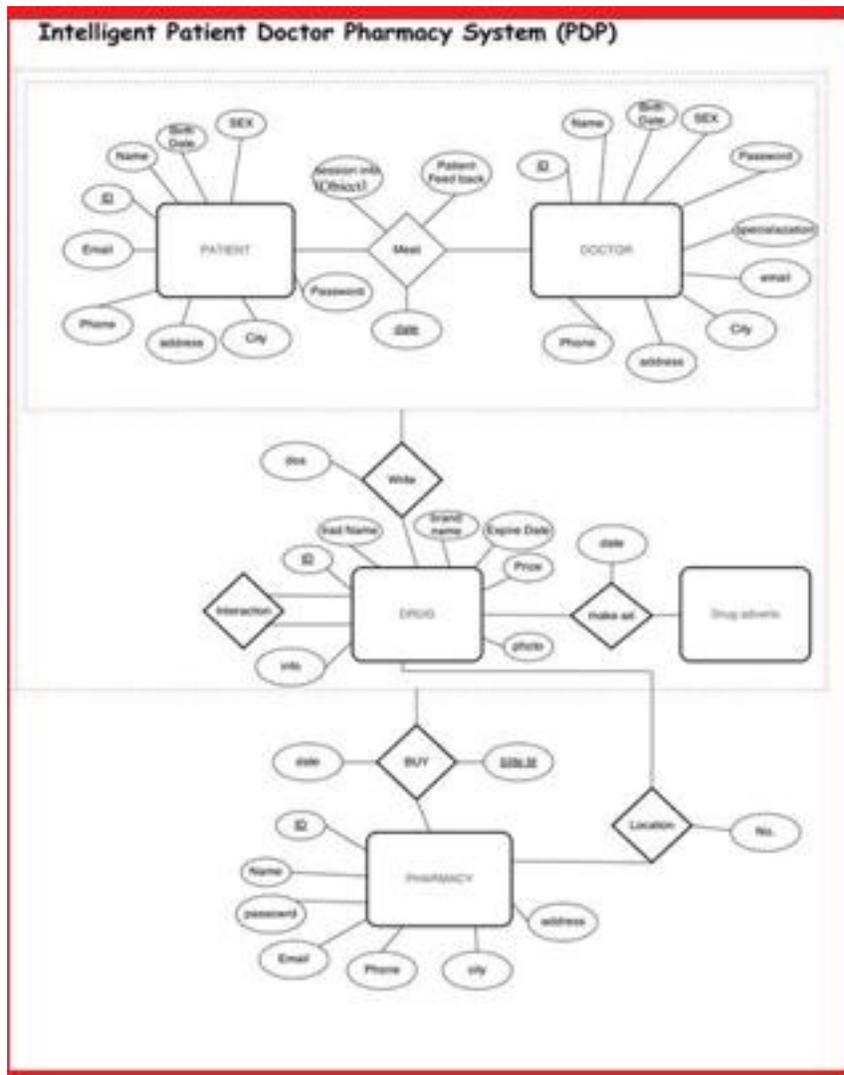


Figure 2 The Entity relationships Diagram

The first Entity is the(Patient)table that contain the attributes(ID, Name, BirthDate, Sex, Email, Phone, Address, City and password) where the patient insert their own information for creating their account and password.

And then there is the(doctor)table that contain the attributes(ID, Name, Birthdate, Sex, Email, Phone, Address, City and password) same as the patient but the doctor entity contain another attribute that patients don't have which is(specialization). There is a many-to-many relationship between Doctor and Patient where the patient can meet one or more doctors and a doctor can meet one or more patients, this relationship is drawn under the table(Meet)that contain the Date attribute which is the date when the doctor meet the patient, it also contain the attribute(session info)where the doctor can write notes and info about that session, and there is the attribute(Patient Feedback)where the patient can make a feedback about the doctor and choose if their health is good or not good after that session. And then we have the (Drug) table that has the attributes (ID, Price, Photo, Trade name, brand name, expire date, info about the drug).

There is a one-to-one relation called(Interaction)which contain the drugs that are risky if they are described together for

one patient, the system don't let the doctor describe those drugs together. There is an entity called (Drug advertisement) where anyone using the system can click and see drug advertisements and information about the drugs, this entity make a many-to-many relation with the drug table.

There is an aggregation relation between the (Meet and Drug) tables under name (write) where the doctor can write drugs to the patient. And then we have the (pharmacy)table that contain attributes (ID, Name, Email, Password, phone, city, address) where the pharmacist create their own profile.

There are two relations related to pharmacy table, both are many-to-many relations, both are related to Drug table. One is for the location of the drugs in the pharmacy shop so that the pharmacist can easily find where the drugs are located and in which shell they are, the (location) table contain number which means number of the shells in the shop. The other one is (buy) entity where the pharmacy sell drugs, there are the attributes date and the blit_ID .

IV. METHODOLOGY AND WORK FOLLOW

For building this system we first went to see some doctors and pharmacies to see how they work and how the doctors write descriptions for the patients and how pharmacies take the description and give the drugs to patients. We took all the requirements needed to create the database so we drew the ER diagram according to the requirements; the ER is the backbone of our system which contain all the relations needed.

After drawing the ER Diagram we coded it using (MySQL), and then started designing the database including all the relations and creating the forms needed using java language by creating a connection between java and MySQL to give the database a simple design that everyone can use and understand while using. Then we started creating a website using (HTML & PHP) languages. The website contains two main forms as the home page which are (login and registration), so that when a person (patient, doctor, pharmacy) open the website they can first register then login later anytime the need to.

The registration form contains three boxes for each of (patient, doctor, pharmacy). When the patient click on the patient box another form opens that the patient insert their information like (ID, name, disease,...). We also have the doctor and the pharmacy boxes in this form where they can also register and insert their own information. After the registration process each of the patients, doctors and pharmacists can login into the system using their ID's and passwords which they have created and have one by now.

In the login form there is a combo box where you can choose whether you are a patient or a doctor or a pharmacist, if you are a patient then you choose (patient) and enter your ID and password then the patient form opens for you where you can see all your information and you can also change your password from there.

The patient can also create their own card from this form to print and carry it each time they visit a doctor or a pharmacy, the card contain the full information about the patient so that the doctor can see and know about all the former or current diseases of the patient. There is also all the old dates where the patient has visited a doctor and the drugs they have taken from pharmacy saved in this form, so the doctor can see all these information immediately after inserting the patient ID in his computer or just by using the patient's personal card which contain the patients ID using a barcode machine.

In this patient form the doctor can put a sign like a star on each disease of the patient to tell if the patient has healed from the disease by the drugs described or not, this way the doctor himself or another doctor can see if the patient has healed from a former disease at a later time. This also gives a rating to the doctor according to the stars put on diseases because this ensure that this specific doctor has made right diagnosis and described right drugs to the patients and tells how many patients he has helped to heal.

So there is a feedback for the doctors according to this rating. If you are a doctor you will choose (doctor) then enter your username and password, just like patients doctors can also see their own information and can change their passwords from this form, but the doctor form has a software that they can download unlike the patients which is a free software that contain text fields where they can enter patients ID's when a patient

visits them to see their full information or by using patient's personal cards.

Doctors can also describe medicine for the patients from this software that already contain the name of the drugs. The doctor will also insert the amount of drug to be taken by that patient. As soon as the doctor chooses the drug for the patient, the drug name and amount is automatically saved in the patient's personal card. If you are a pharmacist you can login into the system the same way of the patients and doctors, then the pharmacist form opens for you.

The pharmacist can also see all the information about himself and can also change his password. Same as doctors the pharmacist can also download free software from this form and work on it. The pharmacist can also insert a patient's ID to see their information and the drugs that have been described for the patient to sell it to them. The pharmacist can also insert the period of the drugs to be taken by the patient. The pharmacist can also insert name of drugs.

There are also interaction drugs, interaction drugs means two drugs that should never be given to a patient together at once because it cause serious problems on patient's health and are dangerous. In case a doctor or a pharmacist forget about this and try to describe it for the patient the system don't let such thing happen and gives warning to the doctor or the pharmacist immediately reminding them of the danger of the situation by setting up an alarm, that way no mistakes will be made.

V. RESULT

To test this system a program to generate data is developed. The system is applied on the output of the program to create a case study. The system will divide the data on several doctors and pharmacies. It is capable to save time, increase efficiency and performance of the relations, works and flows between Patients, Doctors and Pharmacies. It's a correct data storage, fast to reach data, reliable usage, secure to keep data and lower cost of usage. The system will achieve the best possible support of patient care, outcome and administration by presenting data where needed. Intelligent PDP provide a common source of information about a patient's health history which it helps doctors by decisions. This research will help our region to develop in this area.

VI. DISCUSSION AND CONCLUSION

E-government is one of the civilized nation's features, and practicing technology for citizens' health care is greatly speeding up the delivery of the health services for the patients. A key success in having a functioning good health system is connecting citizens with doctors and pharmacists which is part of having an electronic government (e-government).

Our region lacks a functioning e-government system for citizen health care, which hampers bringing the best possible services for the patients. Currently the patient's records are not held in a secure database system instead the records kept in hard copy files which are at risk of getting lost in case of flood or fire. Every now and then mistakes happen in giving wrong drugs to patients which could be solved with an intelligent system.

Therefore, to solve this problem this e-government project computerizes the current health system in our region into an intelligent computer based system. This intelligent system is called "Intelligent Patient Doctor Pharmacy system (PDP)".

The PDP system connects patients with doctors and pharmacists in a easy way and all the citizens information are kept in a safe governmental database. This PDP system enables the patients to review their health history such as the blood pressure, blood sugar levels or what kind of medications they have been taking....etc. The doctors can easily access the patient's records which help in diagnosing the patients quicker and avoid any contraindicated medication in case of allergic reactions. The pharmacists could also double check the patient's prescriptions before handing the medications over to the patients, to avoid any possible wrong medication. The intelligent PDP system also arranges the time, date, schedule an appointment list for the patients.

In conclusion, the intelligent PDP system is serving patients in Kurdistan region and delivers the best possible health care services for them. As well as facilitating the doctors and pharmacists work, it prevents prescribing wrong medications for patients, achieving more accurate diagnosis and keeping the citizens information in a safe database, which is easily accessible and safe from getting lost.

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