Integrated Health Care System using Flutter "IHCS"

Students: Ahmed Mohamed, Ahmed Hegazy, Kareem Mostafa and Mostafa Hamido
Supervisor: Assoc. Prof. Emad S. Othman
Senior Member IEEE - Region 8, High Institute for
Computers and Information Systems, AL-Shorouk Academy,
Cairo – Egypt, PH- 0020-010-25830256. E-mail: emad_othman@sha.edu.eg

Abstract-In recent years, there has been considerable attention towards the development of ICT[1] in health care delivery known as 'E-Health' so, it is a collaboration between health professionals to provide complete treatment to patients and improve overall well-being.

In other way, the E-Health projects mainly aim to improve service delivery to people, the goal of this paper is to survey efforts and accomplishments performed on our E-Health system, assess their potential impact, and guide future implementations and evaluations.

In 'E-Health', the presented system uses EMR[2] to capture, organize, maintain, and retrieve patient's medical records. An EMR system consists of a comprehensive database used to store and access patient's healthcare information. The EMR has replaced the existing paper medical records as the primary source of information for healthcare purposes for all clinical, legal, and administrative purposes.

The proposed model allows the patient to specify the disease he/she has by a number of multiple choice questions about the symptoms, making it way easier to reach to the best specialized doctor nearby, and record the patient's medical history in a specific medical report that contains the patient had, has and will have in the near future of his/her life, Which make it easier for the doctor to identify the side effects of any medicine the patient used to take, ease of obtaining any of the analyzes and x-rays that the patient performed in the past, and enables the patient to reach the best radiology and analyzes center. Revolutionizing the medical information systems by providing a centralized database for all users.

The modle in the optimal future phase will link all governmental and private medical institutions together "such as the Ministry of Health, Blood Bank, Governmental Hospitals and Private Hospitals, etc." which makes it easier for the patient to obtain the care one's deserves and makes it easier for the state to predict the infection and pollution of certain areas.

Keywords: E-Health, Medical Record, Flutter, smartphones and Records Protection

1. Introduction:

IHCS is a system that designed to provide integrated health care services to the users, like detect disease, reservation, ambulance call, emergency services, and finding the medicine in pharmacies and make a medical record. Protection of records from destruction is an important task as they provide us evidence of legal status, ownership, accounts received, and the particulars of obligations required by the government agencies or private organisations. These records can be either electronic or in print forms and are critical because they contain information required to continue functioning during disasters or to re-establish operations after a calamity has ended. According to McDougall [1], it is estimated that there are more than 1500 businesses razed by fire in Australia every year. More than 70 per cent of

[1] Information and Communication Technology
[2] Electronic Medical Record

businesses whose paper records and computer programs were lost in fire resulted in the folding up of business after three years of the fire. A large quantity of vital records was destroyed in the USA due to the terrorist attack on 11 September 2001.

In the event of such disasters, if one uses electronic records, most of the records can be saved compared to paper records by maintaining backups at remote locations.

2. Statistical Analysis:

It is known that any study needs a sample, and the larger the sample size, the greater the effectiveness of the study to the degree of verification, we chose to use electronic records on smart phones for several reasons, including:

- According to Statista, the current number of smartphone users in the world today is 3.8 billion, and this means 48.33% of the world's population owns a smartphone.
- For 2020, the number of smartphone users in Egypt is estimated to reach 96 million, meaning that every person, whether educated or illiterate, has or He owns a smart phone, which enables us to reach every citizen and obtain a larger sample number to conduct medical research that benefits citizens and pharmaceutical companies [2-5].
- Another reason for using electronic records is that (paper records are easily destroyed due to various erosion factors such as moisture and others, and the difficulty of searching for information inside them and extracting what is useful to the researcher in them, and to obtain copies of them, you need special tools that do not Be available all the time when needed, and increasing the difficulty of translating paper records to obtain foreign consultations in critical cases that require it increases the reliability of using digital records because they are free from these negative notes mentioned above [6].

3. The Concept of Electronic Records?

Electronic records (ERs) are either born digitally or converted from paper records using a scanner. ERs may be a combination of text, graphics, data, audio, pictorial, or other information representation in digital form that is created, modified, maintained, archived, retrieved, or distributed by a computer system. ERs are not just a collection of data but also the consequences of an event. Besides, records need to provide evidence of the content and structure of the document; the context of its creation is present and accessible. ERs can be created Buy a handful of a lot of executable codes and selected text boxes that represents the actual data of the doctors in the system to make it easily comprehensible for them understand and use the system with no issues what so ever ERs are part of an organisation’s memory that is invaluable to the current and future functioning of an organisation or a corporate body. To consider ERs as formal records with intrinsic value, these must go through stringent information management policies. For the sake of reliability and authenticity, ERs must adequately capture and describe the actions these represent. The record should not only preserve the ‘content’ but also the ‘context’. Therefore, Scientists have indicated that now most of the archival repositories are undergoing transition from paper to electronic format. Archival institutions worldwide have plans to protect the integrity and ways to retrieve archival value of the ERs.

4. Problem Statement and Motivation:

The weakness of healthcare services that provided to patients. It is slow, old, and not easy to obtain for example: emergency services and ambulance services. There is no centralized database for patient’s health history like a medical record for each one of them or database that can connect hospitals with pharmacies or blood bank [7].

The appearance of many efforts that try to make digital transformation to the health care services and the appearance of many of epidemics that

required from us to have a better alternative to make health care services easier and faster.
IHCS provides an extensive service that allows you to contact with doctors, hospitals, pharmacies, laboratories, and blood bank. It also allows to have a medical record that would contain all your medical history. And other services like check the existence of specified medicine or ambulance call [8-9].

5. System Architecture:

Existing Systems:

There is no existing system that introduce all the system functions but there are applications that provide some services like finding a doctor or check medicine in pharmacies as shown in Figure 1.

S.No	Name of the ERMS	Company name and address	System's features	URL
1.	OmniMD	Integrated Systems Management, Inc 303 South Broadway, Suite 101 Tarrytown, NY 10591	The leading edge solutions for practicing physicians and clinics for complete practice world flow.	http://www.omnimd.com/html/pOveview.html
2.	SequelMed EHR (Electronic Health Records)	Sequel Systems, Inc. 255 Broadhollow Rd, Suite #205E Melville, NY 11747	It is an integrated solution and all-in-one system inclusive of practice management (SequelMed EPM), document management (SequelMed EDM) and medical records (SequelMed EMR) solutions that capture and manages episodic and longitudinal health record information by facilitating comprehensive workflow tasking related to all components with the health record with appropriate timeliness and effective delivery of healthcare services.	http://www.sequelmed.com/
3.	MedicsElite	Advanced Data Systems Corporation,255 West Spring, Valley Avenue, Maywood, NJ 07607	The Ultimate Medical Management Software Provider of Practice Management, Electronic Medical Records (EMR) and Radiology Information System, (RIS) software solutions, currently serving over 30.000 physicians and healthcare providers in every medical specially and practice size.	http://www.adsc.com/
4.	PowerMed	PowerMed Corporation Phone:207.772.3920 48 Free Street Portland Maine04101	PowerMed Solo is a single user, non-networkable, subscription based version of PowerMed Practice Suite, and includes EMR, Billing and Scheduling with additional specialty modules that can be configured by the end user.	http://www.powermed.com/

Figure 1 . List of Existing EMR systems

And more like:

- Vezeta
- Shefaa
- WebTeb

Pros and cons:

They all provide a specific function like finding a doctor or ordering drugs or providing ways to make electronics records (not just medical ones) all these functions are fast, simple, easy to use

and costs 0 for the users (in some systems not all)

They all don't meet all the user needs but help with a specific (one or more) of the user's needs.

Proposed System:

The proposed system can overcome the drawbacks of the existing systems. The system combine all existing system's functions in on app that is easy to use and more new functions that meet all user's needs by connecting all the medical community in one single system and move to a new way of the medical services in the country.

Software Implementation:

Flutter is a new open-source framework created by Google that assists in developing native Android as well as iOS apps with one codebase. It is more than just a framework as it is a full software development kit that has everything you require for building cross-platform apps. We will discuss some of the advantages and disadvantages of the framework.

EMR software is not a one-size-fits-all solution for any medical provider. There are several types of EMR software, and it is up to individual providers to consider the best functions for their needs. An EMR can revolutionize the storage and access of medical information in meaningful ways, especially when the optimal software is selected [10].

i. High Performance

Numerous factors impact the performance of an app, including CPU usage, frame number per second, average response time, request number per second, and more. Flutter offers a consistent 60fps, which is the rate at which contemporary screens display a smooth and clear picture.
That makes the system reports made in fast and easy way and be sent faster.
Digital correction and modification facilitate the currency of writing, automatic filling of duplicate data, and the speed of displaying and providing data to interested parties or the sender.

ii. Accessibility and Internationalization

As a result of advocating for inclusivity and diversity, Google offers integrated opportunities to make apps that can be accessed by a broad spectrum of users. Normally, when you need your app to operate in different regions and languages, you want to get your code ready for localized content, which is usually created later. This process is referred to as internationalization. Flutter for mobile development natively offers widgets that are based on the Dart into package, which makes this process more straightforward. It now supports 24 languages, but also units of measure, layout options, currencies, and dates.

Easy access to data through several ways including smartphones and computers (Web), and you can change the language for previous reports, which makes it easier to send it to many entities even outside Egypt to help in intractable cases, and the presence of several languages to explain and interpret the written, and provide a direct history and account of the date and number of days and currencies and other calculations that the individual will not perform again and will be carried out by the program in an auto way.

iii. Immediate Updates

Flutter's architecture has been engraved with hot reload function to allow for instant updates without the need for plugins. With hot reloading, you can view updates in real time. If you experience an error as you run the code, the framework allows you to fix it immediately and to carry on without having to restart it.

Returning to normal programming where it takes many minutes for deployment can be a problem. Hot reload improves your productivity, allows for experimentation without lengthy delays, and assists with fast iterations.

The ease and speed of making adjustments and updates and the speed of showing them to the user and the speed of the effect of changes that

the user makes on the program, which makes it faster and easier to use than the patient and doctor interface, which gives comfort and more time to more important tasks such as detecting the patient or examining it in a deeper way which increases the doctor's productivity from the number of cases.

iv. Mild Learning Curve

If learning Dart is simple, then familiarizing yourself with this tool will be easier. Many people with little coding knowledge can develop prototypes and apps with the framework. Also, you don't need any mobile development experience to use it. Moreover, Google is popular for developing well-structured and detailed documentation, which is something that React Native has an issue doing.

Facilitate programming for the programmer, edit and add future modifications that we talked about in advance.

v. Custom and Ready-made Widgets for Quick UI Coding

This tool uses ready-designed widgets. With these building blocks, the tool assists you in creating a user interface. While many approaches utilize different objects like controllers, views, and layout, this framework features a unified and consistent object model. Every object in this tool is a widget, including fonts, buttons, and paddings. You can combine widgets to form layouts, and you can decide to utilize widgets on any customization level.

Widgets in this framework are arranged in trees, which assists in rendering. But they can lead to excessive sophistication of the complete structure. Big applications can need as many as ten layers of code to form a basic object. Hence adequate planning of the structure is needed in advance.

Create an easy environment for users (doctor, patient, labs, etc.)

Create a flexible environment that can be controlled and harnessed, to meet the requirements of different and diverse users, and modifications can be added based on the wishes of users to facilitate the process of using the program.

6. SYSTEM FUNCTIONS:

1. Find Doctors:

This System provides an easy way to find doctors that are nearby to your location and provide another option to find doctor by his specialist field.as shown in Figure 2.

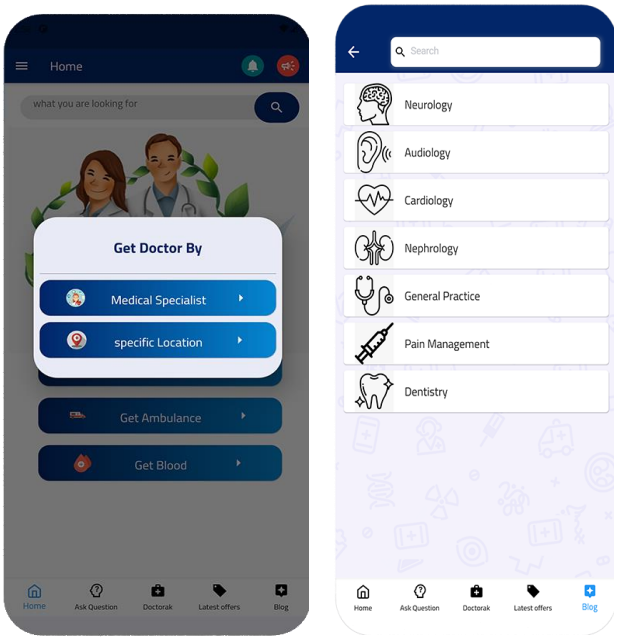


Figure 2. Finding Doctor Screen

2. Medicine Checker:

By just a button click you can check if a medicine is existing in near pharmacies or not, as show in Figure 3.

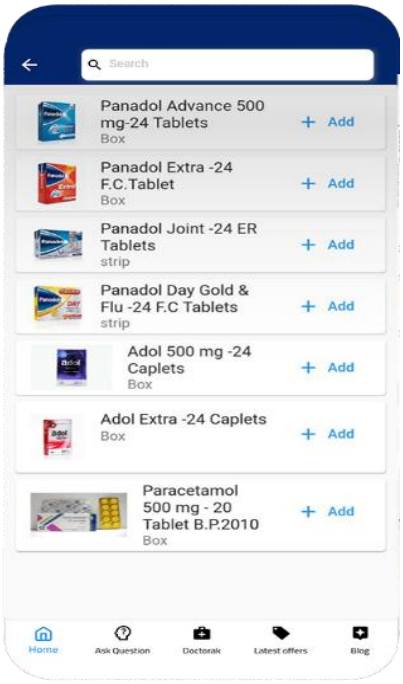


Figure 3. Medicine Checker Screen

3. Emergency Service:

This system helps the user to call ambulance and message it and send his location by just one click in the emergency button .as show in Figure 3.

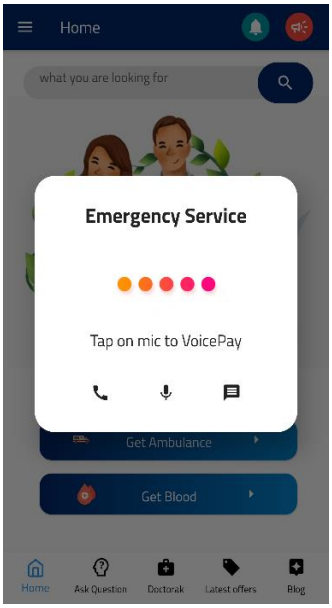


Figure 4. Emergency Service

4. Medical Report:

Every patient will have a fully digital medical history that is helpful in many ways whether to doctors or patients or pharmaceutical companies or Ministry of Health as show in Figure 5.

Figure 5. Medical Record Screen

5. Blood Donation:

A completely database for blood that make it easy to find what we need from blood or search for a blood donator as shown in Figure 6.

Figure 6. Blood Donation Screen

6. Infection Detection:

With a simple AI this system provides an ability to detect if a specific area is infected with a specific infection for example (covid 19) by using its DB as shown in Figure 6.

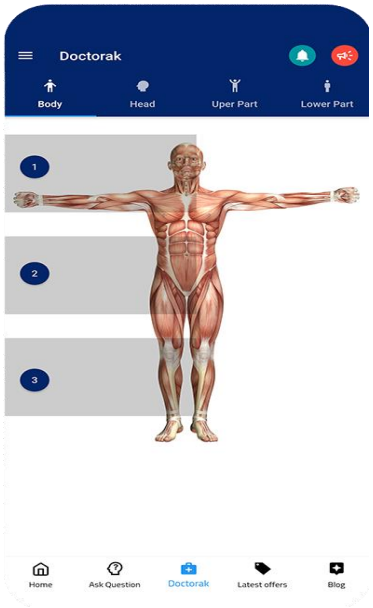


Figure 7. Infection Detection

7. Ambulance Tracker:

Patient can track an ambulance while it is coming to him through a simple UI and google maps services as shown in Figure7.

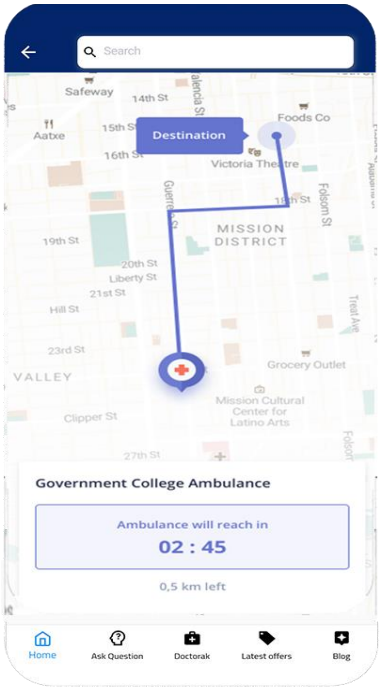
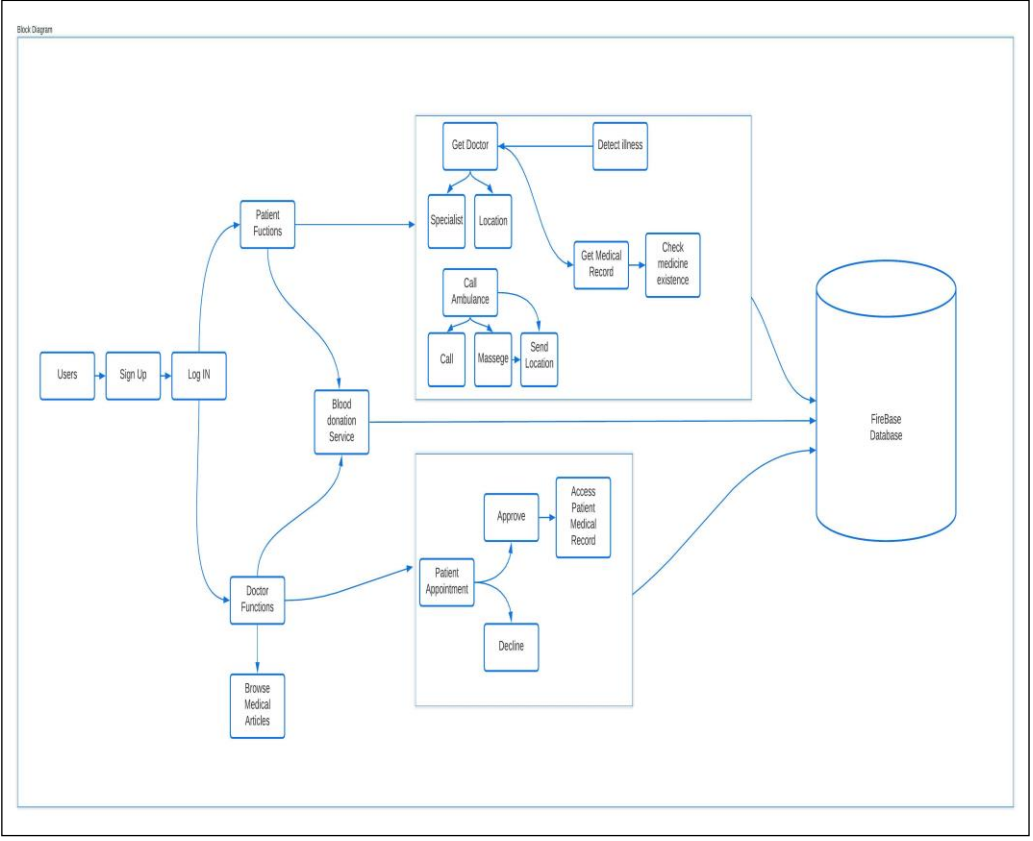


Figure 8. Ambulance Tracker Screen

Figure 9. A block diagram of the proposed model

RESULTS:



New technological capabilities have expanded medical care in creative ways. One area that has benefited from advances in communication and data technology is the storage of medical records. Before EMRs or electronic medical records, doctors and nurses kept records as print copies in secure storage facilities. EMRs allow clinicians and support staff to access their information in new and enhanced ways that were previously not possible. A block diagram of the presented model is shown in Figure 8.

The implementation of the system it succeeded in the beta version, the send and retrieve of the data from and to database was fast and secure, the E-Health system works on the ideal and the logic, it was designed with. The modules of EMR based upon API calling, the system worked on the expected lines with the basic feature that were initially proposed. The system also provides enough promise for the future as it is highly customizable and new features can be added any time without disturbing the working of current features.

The effectiveness of the proposed app is measured by test it in a small data from a small number of users (as it is still in the development phase) the connection between users was simple and fast the performance of the app was seamless the number of users at the beta version are in increase (we try to marketing for the app).

CONCLUSIONS AND FUTURE WORK:

In this paper, introduced the idea and rationale behind the Health Care System, the flaws in the current system and the way of resolving those flaws and laid out the system architecture of the presented Health Care System.

Electronic medical records are a rapidly-changing area of technology. For many physicians and healthcare providers, EMRs represent a means to improve the quality of their medical care. EMRs allow both doctors and patients to access records with ease and efficiency.

Many modules are of open-source systems and have customized those modules according to the presented system. This helps get the best performance from the system in terms of space time complexity.

E-Health not only provide a means of organizational efficiency but provide a safer way to care for patients and the required means to meet regulatory standards. The implementation process is an important step to consider when adopting an EHR in healthcare organizations.

In the future the presented model will work to make a 3D module that allow the patient to detect exactly what he/she is suffering from by going into a 3D body.

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