

Survey of Health Information Systems

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Abstract— Health information systems refer to any system that captures, stores, manages or transmits information related to the health of individuals or the activities of organizations that work within the health sector. The unintended medical errors are a big threat to patient safety. Therefore, there is a challenge of delivering safe healthcare is important. An attempt to meet these demands, healthcare systems have increasingly focusing at deploying information knowledge to scale resources, to decrease queues, to minimize or avoid the errors, and to give modern facilities in remote communities. The computer-aided tools are not vital for interpreting patient specific data in order to determine the most suitable therapy from the diagnosis. In order to make decision making on treatment and diagnosis for individual perspective, all the relevant health information of the patient needs to be available and transparently accessible to them regardless of the location.

Keywords—Health information systems, Electronic Health Records, Electronic medical records, Personal health Records

I. INTRODUCTION

It was designed to meet the goal to computerize all medical records to improve the quality of our health care while lowering its costs by reducing the need to repeat expensive medical tests. Though it just won't save billions of dollars and thousands of jobs, it will save lives by reducing the deadly but preventable medical errors that pervade our health care system [1]. "Electronic health records (EHR) can be defined as a longitudinal collection of electronic health information about individual patients and populations [2]. It includes data such as contact information, medical history and insurance information, family history, records of hospitalizations, list of medications taken or currently prescribed, and allergies which can all be shared with various hospitals or doctors' offices if necessary. Since EHRs are designed to make it easier to share and use a patient's health care record, it will be easier for providers

to be better at managing a patient's care. Moreover, benefits of EHR systems that have been identified include reducing medical errors, improving quality of care, conserving physician time, sharing patient information among healthcare practitioners, and workflow efficiency [3]. Health Information Systems are systems for the collection and processing of data from various sources, and using the information for policy making and management of health services. Health information systems can be categorized into three different groups—electronic medical records, electronic health records, and personal health records. Currently, there are many types of open source health information systems in use. Open source health information systems give many health care providers the opportunity to use electronic health records without having to incur large costs. Also, they are able to make modifications to the software in order to suit their needs. An electronic medical record is an electronic record of a patient's health information that

can be created, gathered, and managed by doctors and their staff within one healthcare organization where as an electronic health record is an electronic record of a patient's health information that adheres to national standards. It can also be created and managed by doctors and their staff across more than one health care organization. A personal health record is an electronic record of an individual's health information that, in similarity with the electronic health record has to conform to national standards but is controlled by that individual [4]. In this paper, some existing open source health information systems will be surveyed and analyzed in terms of their functionality, implementation technology used and also whether or not they have security features in place which would satisfy the HIPAA security rule.

II. ELECTRONIC MEDICAL RECORDS

A. Clear Health

Sub Clear Health was a web-based open-source practice management and electronic medical records (EMR) system written in the PHP programming. Clear Health offers three products with the base product being the only open source product offered. It is intended for individuals and small practices to set up by them. The features of Clear Health include Electronic Medical Records (EMR), medical billing, medical accounts receivable, scheduling, and access control functions. Clear Health was designed with security features. The security was implemented using the PHPGacl (PHP General Access Control Lists) toolkit [5]. The PHPGacl is a PHP based access control list script that allows powerful permission to be added to software applications. Through the use of the toolkit role based access control can be implemented. Some security features include the fact that the admin section will often not be displayed. The admin section allows you to configure it so that it can be customized to meet the needs of your office or practice. Also each user, once created in Clear Health, is assigned a security role. The roles determine what menu

or sections that particular user has access to. There is also a timer which allows for automatic logoff which is also a security feature [6].

B. Caisis

Caisis is a web-based cancer data management system which is primarily used by researchers as a tool to manage their patient data. Its functionality allows for the integration of customized electronic medical records. As the number of people using the database and the requirements needed expanded, a search was held to find a commercially available database that would meet their requirements. Since a number of systems were reviewed and none could meet some of their most basic requirements: cost effectiveness in terms of both ownership and maintenance, straightforward administration by a small group, and the flexibility and expandability to meet the evolving needs of a research oriented hospital, a team from the hospital was created and became in charge of developing the open source system[7]. Today, the system is free to download and install under the GPL. Caisis is currently in use by institutions throughout various countries.

C. Open MRS

Open MRS (Open Medical Record System), an open source medical record system platform was designed to be used for any individuals who need to establish a medical record system. Currently, there is only a portal for medical providers but the developers of Open MRS are working to establish a personally controlled health record portal that will allow individuals to be in charge of their personal health record. It would be owned and available to be managed by the patient. Information that is stored in Open MRS is easy to summarize and analyze. It has the ability to store all diagnosis, tests, procedures, drugs and other general questions and potential answers. Since it is a client-server application, it can work in an environment where multiple client computers are

used to access the same information on a server [10]. It can be used to keep track of the usage of patient records by Open MRS users[12]. Features of Open MRS include the central concept dictionary, security, privilege-based access and a patient repository. The central concept dictionary provides definitions of all data that are defined in a centralized dictionary. The security features of the application are based on user authentication. User roles and permission systems are based on what privileges a user is given access to. The patient repository allows for the creation and maintenance of patient data which includes the demographics of each patient, encounter data, and orders.

III. ELECTRONIC HEALTH RECORDS

Two electronic health records are Open EMR and Tolven.

A. OpenEMR

OpenEMR is an electronic health records and medical practice management application that can run on Windows, Linux, Mac OS X, as well as many other platforms. They thought they could give the software away for free and charge for support. Initially, they decided to call it Medical Practice Professional. Features of OpenEMR include patient demographics and scheduling, electronic medical records, medical billing, and security. OpenEMR allows information such as the name, date of birth, sex, and primary provider to be tracked for each patient. These demographics help to distinguish each patient from the next as a form of identification. The patient scheduling feature of Open EMR allows for a patient's scheduling data, as well as their patient and physician data to be shared among different practices and facilities. This feature also provides patients with notifications about their appointments through email and sms text messages. Electronic medical records provide an electronic record of a patient's medical history. Through the use of this feature a patient's medical history can be stored, retrieved and modified. OpenEMR, through its medical billing feature, support paper claims, insurance eligibility queries, insurance tracking, and accounts receivable.

B. Tolven

Tolven is an open source electronic record that utilizes the GNU-LPGL license. It is web-based and the Web browser is its primary tool for user interaction. PostgreSQL is the database used by Tolven which is also an open source product; the LDAP server is what Tolven users to hold identifying and demographical information about the user. The application server uses the LDAP server to authenticate users. Tolven is equipped with two user interfaces. The eCHR, electronic clinical health record is for physicians and other healthcare providers. It allows them to securely access healthcare information relating to an individual patient in a structured and easily accessible way [20]. The ePHR, electronic personal health record, allows patients to share personal health information regarding themselves and their loved ones in a protected way.

IV. PERSONAL HEALTH RECORDS

So far we have seen OSCAR, Open EMR, and Open MRS have personal health records as part of their functionality. In this section, we will discuss a health information system that is completely a personal health record.

C. Indivo

Indivo is a type of personally controlled health record that is open source and web based. It allows the patient to own and manage all their medical records that pertain to their medical history, essentially creating their own personal health record. The patients in turn, are able to provide their doctors with all pertinent medical information regarding their health quite easily.

V. CONCLUSION

There are several types of open source health information systems that are available for use by physicians and hospitals. Most of the health information systems are web-based. They are Clear Health, Caisis, Open EMR, Indivo, OSCAR, and Tolven. Clear Health,

Open EMR, and OSCAR include features that would be essential to a doctor's office. These features include medical billing, scheduling, electronic medical records, and security features designed to ensure HIPAA compliance. Tolven, OSCAR, and OpenEMR have designed features within their systems that would give administrators the option of allowing patients to be in charge of their own medical records. Furthermore, Open MRS is in the process of establishing a patient portal that will also allow patients to control their medical records. Indivo gives patients total control of their medical records by allowing them to control who has access to their records. Each on the systems reviewed have security features in place. The features include access controls, encryption, and one system OSCAR boasts security technology that is utilized by the banking industry.

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