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# Implementation of Electronic Health Record Using Attribute Based Encryption

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**Abstract:** For healthcare professionals to deliver optimal care, patient information needs to be collected, shared, synthesized into knowledge, and used to make informed decisions. The Clinical Document Architecture developed by HL7 is a core document standard to ensure such health information exchange, and propagation of this document format is critical for exchange of information's. Unfortunately, hospitals are reluctant to adopt EHR system due to its deployment cost except in a few countries. A problem arises even when more hospitals start using the PHR structured CDA document format because the data scattered in different documents in different hospitals are hard to manage. In this paper, we describe our CDA document generation and integration using Attribute Based Encryption technique based on cloud computing. Our CDA document integration systems integrate multiple CDA documents and encrypt the data according to the usage and privacy of the documents depending upon the attributes. The data can be viewed, analysed, downloaded by the doctor and the patient in chronological order. Our system of CDA document generation and integration is based on data mining and stored in cloud computing.

**Index Terms:** CDA, Cloud computing, Health information exchange, HL7.

## I. INTRODUCTION

Healthcare industry being the largest and fastest growing industry, in all the top countries it consumes at most 10% of GDP. It plays a major role in the country's economy, but the biggest problem it faces is the exchange of information between different hospitals. Around 30% of the healthcare spending is wasted on the maintenance of the records and billing since there is no effective technique used for integration of the data. Standardization of all the medical records into a single platform is one of the best ways to maintain the records. In our system we have implemented EHR in such a way that the platform is both patient and doctor friendly. Various authentication measures are used to provide security to the patient's documents. Using an Attribute Based Encryption technique for implementing the EHR an secured and effective way of exchange of information can be brought out.

## II. GLOBAL EHR MARKET

According to the recent report of Transparency Market Research and as per the report of CAGR, the healthcare market will place around US\$ 25.98 billion in the year 2020 and will turn digital. Continuous efforts are taken by the public and private healthcare in United Kingdom and United States to achieve 100% digitized in maintenance of patients records. The implementation policies in 2 different countries are listed below:

France – In 2000 implemented a act called Universal Health Coverage in which all the citizens should access their health in through this act. National insurance are established along with the act. The present rate of adoption of EHR in France is around 72%.

Russia – In 2009 Medical Care System implemented about 10 to 14% EHR in their country. To provide a secure reliable fast healthcare maintenance the Russian vendors started a business. In 2011 nine hospitals successfully adopted EHR completely in their hospitals.

The contribution of Brazil in the global market rate is around 16% and china around 37% but India has a very low rate which is only 5%.The current challenges in the EHR adoption includes legacy system, cost, policy, funding, standards, computer legacy, coordination, infrastructure and privacy concerns.

## III. MODULE DESCRIPTION

A. Login Various users that are permitted to access include

- 1) Main admin
- 2) Hospital admin
- 3) Doctor
- 4) Patient

- 5) Nurse
- 6) Lab technician

**B. Registration** The various user registration processes are listed below

The patient registration details are collected mainly to know the medical history and have a good management of the database, they give individual password to every user and finally we can store the information in cloud database. The doctor registration details are collected to enable the patient to search for different doctors depending upon their ailments. The worker registration details are collected by the admin of their hospital where workers such as nurse, lab technicians can register themselves and their access is limited within certain parameters.

**View Information:** The user (patient) can view his medical information such as history, pharmacy information, and lab results. This information's are stored by nurse, doctor and the lab technician respectively.

**Booking:** The various booking options available are:

The user can book his appointment with the doctor he wishes to consult with using his unique ID provided by the admin. The appointment will be confirmed by the doctor or the nurse based or depending upon the nearest appointment date available. The user can book rooms for the accommodation in case of serious illness according to his preference. The type of room in which he wishes to stay can be specified.

**Payment:** During the discharge of the patient the payment can be made in total for all the expenses which includes the medicines, lab tests, consultation fee and accommodation cost can be paid and a bill is issued as a proof.

**Blog:** There are two different blogs where the users can comment and share information.

According to the various diseases of different patients the doctor can upload videos and the information of a particular disease that concerns the particular patient. The user will able to view the videos and information uploaded by his doctor for his disease and can gain more knowledge regarding his ailment.

**IV. METHODOLOGY**

The various methods and techniques used in this system to implement PHR includes Encryption technique as Attribute Based Encryption, Blowfish for security, Apache Tomcat server for designing the WebPages, Java Servlet is for sending requests and accepting response , Net Beans is the platform where the java server runs , MySQL is used for storing the data.

**Encryption:** Wikipedia describes in cryptography, encryption is the process of encoding a data in such a way that only authorized parties can access it.

**Attribute Based Encryption:** Attribute-based encryption is such a type of encryption in which the secret key of a user and the cipher text are dependent upon attributes. In this encryption model the data gets decrypted only if the cipher key matches the existing attributes.

**Blowfish:** Blowfish as a symmetric-key cipher, takes a variable length key 32bits to 448 bits included in a large number of cipher suites and encryption products used for encryption purposes. It is a general purpose algorithm that comes into existence as a alternative for DES. This is an open domain and anyone can use it for free. Used for both domestic and exportable.

**Net Beans:** Net Beans is a development software platform that allows applications to be developed from modules which is written in Java. The modules in the Net Beans software are a set of software components used for the development purpose.

**V. RESULTS AND ANALYSIS**

**Contact US**

State

City

Hospital Name	Mobile	City	Mail ID
KMCH Hospital	8594736346	coimbatore	kmch@gmail.com

Fig. 1 Find hospitals details like Mobile number and mail id

Hospital ID	Hospital Name	Address	Mobile	E-Mail ID
2	SRI RAMAKRISHNA	Sidapudur, COIMBATORE	9042205101	ramakrishna@sonustrust.org
3	VG	Muthupalayam, COIMBATORE	04222642071	vghospital@vt.net
4	KMCH	Avinashi Road, COIMBATORE	8220283322	getvel@kmch.com
5	GANGA	SaBabaColony, COIMBATORE	422451444	sr@ganga.com
6	VUJYA	Vadapalani, CHENNAI	04466646600	hospital@vijaya.com
7	FORTIS MALAR	Adyar, CHENNAI	044289222	malar@fortishealth.com
8	APOLLO	Perungudi, CHENNAI	04424961111	apollo@apolohospital.com
9	MIOT	Manapakkam, CHENNAI	0442002200	hp@miothospital.com
10	SIMS	Vadapalani, CHENNAI	04443211455	health@simshospital.com

Fig. 2 List of Hospitals in a state

**LOGIN**

**Username \***

**Password \***

Fig. 3 Login page for all the users including doctor, nurse, lab assistants

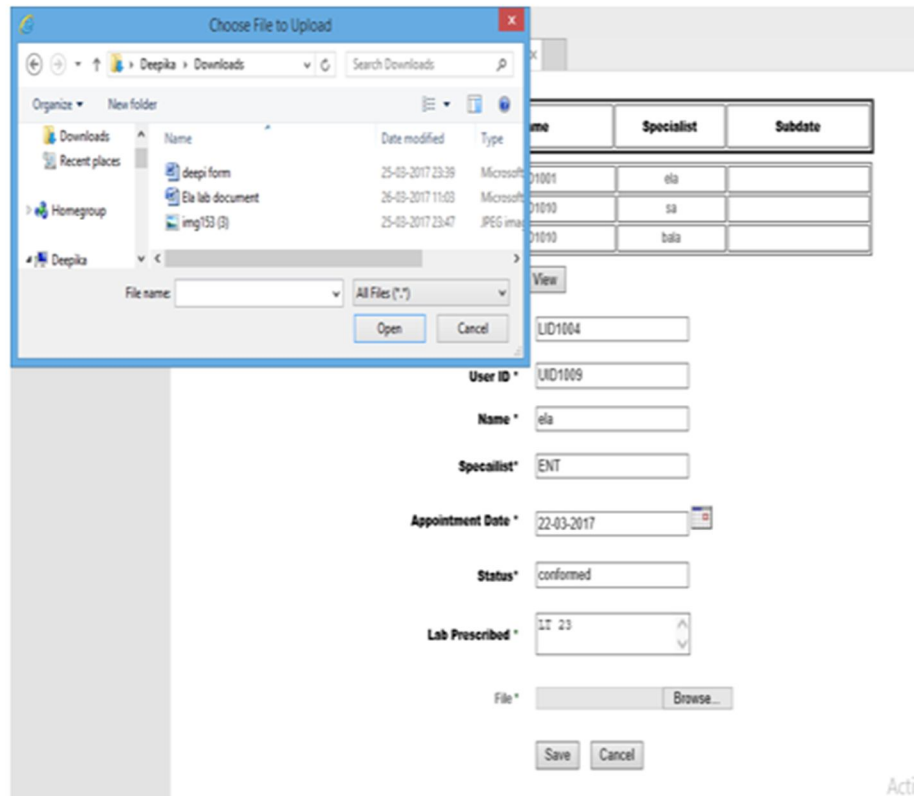


Fig.4 Lab Assistant sending lab results to the patient

## VI. CONCLUSIONS

Since the adoption of EHR in a wide nation is impossible until national policies comes into exists. The reason for not adopting the EHR system in the hospitals is the cost, security and the loss of information. Our cloud based EHR system provides a secured and advantages over the other systems. The future scope in the EHR implementation is to ensure a secured access by providing a face recognition system. Advanced implementation can be done by introducing a Finger print Sensor and connecting Adhaar Card to the EHR and providing the access by matching the eye retinal. Though EHR is hard to achieve at least the history and the data of their patients can be integrated as PHR in all hospitals.

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