Investigative Module to Eliminate EHR Redundancy

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Abstract: Even though there are many efforts that provide mechanisms to exchange EHR between different health organizations, but reach to online EHR system have faced many challenges. Duplication data is one of the most serious problems. This problem is happened when two different health organization try to update the specific patient's EHR. Inaccurate health information leads to the main reason of inaccurate diagnosis. Developing tool that eliminate duplication data is crucial to the success any systems. This module consist of the group of components that its role to check all flowing information to EHR database. This module called Investigative module which will play very important role in online EHR. The quantity of health information is increasing every day that health organizations have a huge and very sensitive data so that the investigative module should take care of its database size. In this paper we demonstrate investigative module and how it works. For simplistic, we neglect some issues such as security mechanisms.

Keywords: EHR; Electronic Health Record; Health information; HL7; EHR standardized; duplication data, online EHR , interoperability

I. INTRODUCTION

In these days, most of the clinics and hospitals have their own health systems and applications that maintain their patient electronic health records. However, when patient move from place to another, his/her can use coordinate care. if the hospital or clinic that hold his EHR has branches in this new location, then the patient information can exchange otherwise the patient will take his information on papers. The only health recorded can be exchange among their systems .However, if there is no branch for this hospital or clinics, there no way to exchange the patient information. Currently, when a patient moves to another place, he/she takes his/her health information in paper format.

This one of the main problem that faces health care sector in these days that there is no network or system allows different health information system to exchange health information. There are some efforts done in this trend, such as provide standard for data exchange. In this study, our goal is to highlight of currently challenging in health information system. We will go over the EHR and different framework; than we try to answer of the question do we need standardization of EHR or something else to reach interoperability between different health organizations? After, what are the benefits that can gather if the patient can access his record? Last, we propose our architecture that describe how can reach interoperability and how provide for patient to access his EHR.

The amount of health information that generated by health organizations is huge and very sensitive. The patients whenever visit any health provider; it creates for him record in its system in case first visit. If he is return patient, the health care provider gives him some papers to fill out that ask for any recently updated for the patient.in this point , we emphasis that even the health provider has modern EHR system it still using papers with his patient whenever comeback to make any treatment. filling out these papers take in average 20 minutes from patient ,and also it takes around another 10 minutes from the employee to input these

information to update the patient's records. Furth more, if the patient has medical record in other clinics such as a dental clinic, this information becomes isolated. In the result, the patient has spread health information. This unreachable information could cause less efficiency health service such as duplicate some services such as lab tests. "The adoption of interoperable EMR systems could produce efficiency and safety savings of $142-$371 billion" [1]. There is an urgent need to make interoperability between different widespread health systems .Therefore, this data required systems to manage it. But the patient might has seen by many health care providers, so the patient's EHR is spread in different health systems.

Improving the communications different between health care providers is very important in order to build integrated consistent EHR. The greatest benefit from this interoperability is significantly increased the efficiency of the health sector. Nowadays, the famous type of communications is internet and mobile communication via smart phone. Still the health sector so far to using these types of compunctions in their health systems.

In addition, still the patient, who is one of the very important stakeholders in health system, is not able to access his medical information. Access and manage the patient's medical information confined only by the health organization which has created these records. The question that is arises; who is own this information. This information is owned either patient himself or health organization which created this record for this patient.

II. ELECTRONIC HEALTH RECORD OVERVIEW

EHR (Electronic Health Records) are confidential and secure records about patient's care or treatment that a doctor or other health care provider, personal physician's office or hospital saves on a computer. If the healthcare provider uses Personal Electronic Medical Records, then the EHR of patient can be shared.

EHRs can help reduce the occurrence of medical errors, avoid duplicative testing and improve the overall quality of

care.EHRs allow providers to share updates about the condition of patient, treatment, testing procedures and information. The patient is treated by a medical provider in many cases that have been established as health care, and there are required to be recorded in the medical history of the patient. The most comprehensive collection of health of an individual is the HER [13]. This information may be stored by the individual particularly in circumstances where the person has not been consulted by a health professional for a period of time. Patient can include behavioral data on activities such as smoking, dietary habits and alcohol consumption, etc. [14]. In order to achieve the goal of EHR based-web access to basic medical records, and to promote the development and construction of the new medical reform in the area of medicinal health, the health care architecture are required to be present to support interoperability between electronic health records can become a regional medical information system [15].

Electronic Health Records aimed to provide centralized integration and resource sharing of patient medical records; EHRs can really allow the patient to be properly treated by the physical or surgeon. Medical information at any time can be retrieved with the patient's treatment updated status [16]. EHR supports a multi-layered health care system, medical service providers from different cities and states can share information. Knowledge of electronic health records is that the latest clinical evidence, clinical guidelines, clinical pathways are combined to provide patients with more effective, individualized, medical services; intelligent electronic health records for medical research to provide more accurate and reliable clinical data, to promote the new discovery of medical knowledge [17].

Electronic health records are important for an implementation and the evidence development. The clinical informatics is helpful in providing the different structured data that further gives different mechanisms for the improvement of electronic health records. Informatics enabled electronic health records help in answering the comparative questions of the administrative databases. The informatics enabled electronic health records and research records are linked with each other so that the information of the patient can be provided. In addition, the information received by the database can be used for evaluation, hypothesis generation, assessment and care [18].

Defiantly, there are exist health systems that provide a kind of standardized of information exchange [2]. Canada health info way's interoperable EHR and also provide diagnostic imaging services and other services [2]. Australia's personal controlled Electronic health record [3]. However, healthcare has not implemented of any modern IT such as international or national EHR that has widely access feature. "Health information technology (health IT) has the potential to significantly increase the efficiency of the health sector by helping providers manage information" [4]. .

III. ONLINE EHR

An Integrated Care EHR [ISO/TC215 2003] is defined as: "a repository of information regarding the health of the subject of care in a computer processable form, stored and transmitted securely, and accessible by multiple authorized users. It has a commonly agreed logical information model which is independent of EHR systems. Its primary purpose is the support of continuing, efficient and quality integrated

healthcare, and it contains information which is retrospective, concurrent and prospective". However, there are main concerns when any systems go to the internet. Maintaining health information on a web requires privacy, security, ability to exchange information with other systems under certain conditions [6]. EHR standard become is the crucial step to allow different health care system to exchange EHRs. But also information Health architecture is the main step to organize how EHRs will be exchanged between different health care systems. Above all, for achieving the interoperability in health sector we need architecture that describes how the interoperability will be done and needing EHR standardized..

IV. EHR STANDARDIZED

There are many efforts have been established toward creating standard of EHR. First of all, the standard provides the ability for exchanging EHRs between various systems smoothly. In addition, the standard ensures that all systems have same semantic understanding for each EHRs fields. Definitely, there many health systems have been created, before any standard of EHR emerged.

These systems have created by various health care providers, and they do not need change or modify their system foreseeable future. But they need to use the standardized EHR whenever need to communicate with other health systems. For that, the importance of standardized EHR considered as common unified language between different health systems. The standard will be used for transfer EHR for a patient between health organizations, send laboratory test requests, send prescriptions, or any other health or medical transactions between health care stakeholders. HL7 is one of the famous standards that have been used nowadays. For example, Mayo Clinic in Rochester ,Minnesota processed 660 million HL7 messages a day [7]. HL7 deduced of the previous studies and researches, and the experiences of health experts and medical research centers.

V. HL7

HL7 specification contains many series standards, and it describes how can exchange information and management integration of medical health information [8][9]. Reference Information Model (RIM) describes the general framework to setup EHR as a complete domain. Domain Message Information Model (DMIM) originated from HL7, and it describes the relations between classes.

It uses visual notation such as UML to express these relationships. Mapping is one of the base steps for exchange data between different systems. HL7 provides mapping mechanism by using XML technology. Clinical Document Architecture (CDA) using XML for exchange information between different health systems. "CDA is extensively used in the national infrastructure of the National Health Service (NHS) in England and is specified in the US federal government 'meaningful use' criteria for the Electronic Health Record"[8]. The other two components of HL7 are Personal Healthcare Monitoring Report (PHMR) and Care Document (CCD). These components show how communication is done by using CCD templates for electronic home data. This one of the amazing feature of HL7 that allow for getting information from electronic devices which are used by patient at home. However, the

quality of data is very important. The HL7 does not provide the mechanism for missing information or mismatch data that came from different health systems for same patient. So that any standard should take into accounts intelligent analysis and self-discover for any mismatch or non-coherent information. The standard is not for only providing semantic interoperability between different health systems but also for improving quality. Overall, the health information architecture is needed for improving quality and EHR standardized is very important part of this architecture so that EHR work as standard messages between various health-systems. The main contribution for this architecture reduces the e-Iatrogenic risk by adding investigative module. "E-Iatrogenesis, defined as ―patient harm caused at least in part by the application of health Information technology"[11].

VI. E INVESTIGATIVE MODULE

This investigative module is not base any specific data structure. each data has essential information such as origin name , origin IP , date , number of fields , type of file , destination IP , destination patient name and IP , etc. This module reads all data that going to online patient EHR, then stored it in temp data stores called data repository. Whenever the module is receive data by this module, the module read this data and searched in its data repository. This search uses only some keys such as health organization ID and date. If this data does not match any repository data, the module permits this data to go and module store copy of it on data repository.

The reason for copying new data on data- repository is providing ability-detection for any coming data that may be passed through this module. The investigative delete the old data that stored in its repository. However, this temporary database has size limitation. Every stored-record has period exceed more one week ; the repository considers tagged it as old data then the module will automatically launch a tool called cleaner collector. However, Investigative module divided the data into three types. First of all, the genuine data that is not similar for any previous stored records. The module will permit to this data to go the main database. Suspicious data, this data, have a kind of similarity with other recent records so it needs more detection. Duplicated data, module will block it. However, the investigative module will store all data even suspicious or duplicated. Data Storage permission getaway based on 1st level, and 2nd level will create all kind of storage that module needed. First if data genuine, the getaway will store this data on genuine temp repository and send it to the destination database. Otherwise will not send this data to any database and store this data on its temp repositories called suspicious temp repository and duplicated temp repository.

VII. CONCLUSION

Investigative module is very important tool that deny any duplicated records for same a patient. The problem is sometimes same data came from different sources. This information may give inaccurate information about the patient. In addition, these duplicate data create a lack of confidence in the health system. There for, the investigative module work as semantic data model that read each file and by use inferred meaningfully so that can recognize the duplication. Investigative module l has own database, so any

files that go through systems; it takes a copy from it. After a while, investigative module lunch clear collector that check all records date, and it delete all old records. Clear collector keeps the size of temp database reasonable. Actually, the delete processing just removes the old data from temp database to temp deleted database. The clear collector will check also the temp database, as well. This module is crucial to maintain the original database with any duplication data.
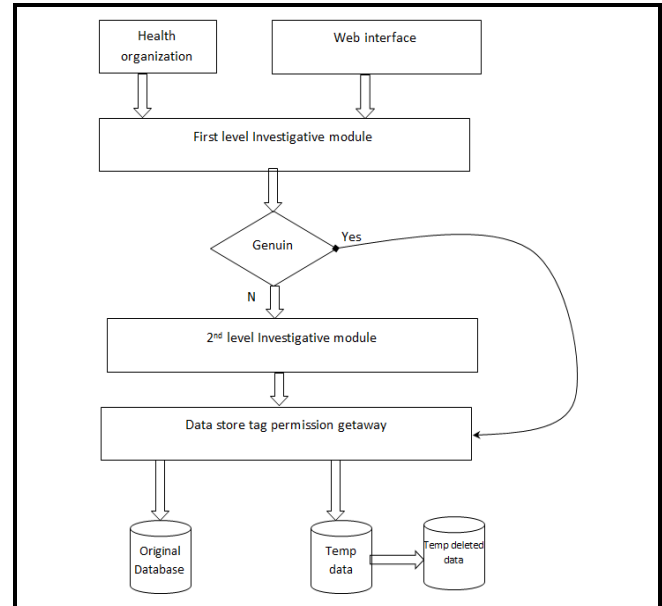

Figure 1. Investigative module processing.

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