GENERATION OF CDA/XML SCHEMA FROM DICOM IMAGES USING HL7 STANDARD

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ABSTRACT

In earlier times the communication between doctor and patient used to be complex task, giving a right treatment to patient was time consuming as doctors could not get details of patient case until and unless full diagnosis was done. EHR came as solution to resolve these problems by enabling the clinicians to store data in electronic form making it globally accessible and easily shareable among different organizations. The main objective of this paper is to produce a set of specifications that allows free communication and exchange of data between medical software applications in order to eliminate or reduce incompatibility among different applications and to convert the standard patient data to XML/HL7 messaging using CDA for interoperability of HIS.

Communication among different EHR’s is carried out by HL7 standard, who aims to provide interoperability among different systems.

Keywords: HL7, EHR, HIS, CDA

1. INTRODUCTION

Responsibility of electronically recording patient health information lies in hands of EHR which is interoperable in different health care settings. Following areas are focused-demographics, progress, note, medicines, vital sign, past medical history, lab data and radio reports. So it rules out monitoring of paper storage and possibility of medical errors. Introducing EHR in hospitals improved the communication issues and resulted in long life storage of patients data for better and effective diagnosis and treatment.

In a hospital there are different software applications running, developed by various companies, so there arises a need of uniform standard for providing communication between them. An hl7 standard comes as a solution to this problem. HI7 standard is used to exchange data between these different applications running at different platforms. Use of HL7 standard proves to be beneficiary as it enables the user to access and process any required information independently at any time.
1.1 HL7 STANDARD

A standard and framework with worldwide acceptance known for its capabilities like exchange, integration, sharing and retrieval of electronic health information constitute HL7 standards.

It is based on the data obtained from medical and clinical sites and is approved by ANSI. HL7 Standard aims to provide interoperability that improve patient care, reduce ambiguity, optimize workflow and to enhance knowledge among various stake holders, healthcare providers and various government agencies.

1.2 STANDARDS OF HL7

1.2.1 PACS

Picture Archiving and Communication system is an integrated computer system that provide storage and retrieval of digital images and eliminates the need to manually store, retrieve or transfer those images. PACS is mainly used in large number of hospitals in their radiology department. In medical arena PACS is known to handle different images from different modalities like CT, X-ray, tomography, X-ray etc. Its main purpose is to replace hard film copies with digital images that can be used and seen by several different medical professionals and different medical automation systems simultaneously. The standard format for PACS is DICOM, accepting any image that is in DICOM format. Before PACS, the systems did not have any standardized image format due to which image retrieval and matching was difficult task and vendors could not share information among others to enhance their knowledge and for better diagnosis.

1.2.2 Imaging Standards / DICOM

Universal standard for Medical Images is formed by DICOM. whether its MRI, X ray, CT or Ultrasound all support DICOM format. A study is conducted with help of multiple images obtained from multiple devices, such a study contains sets of pre and post contrast CT scan images.

Each acquisition is named series, which further consists of slices, which is a DICOM information object. Thereafter user learns about patient, the date of study from the folder created and finally is restored to a proper place. For every information object, IOD tells contained information and mode of storage.

1.3 HOSPITAL INFORMATION SYSTEM (HIS)

For managing administration, financial and clinical aspects , a comprehensive system is formulated for integrating information. It targets on providing best patient care and administration assistance through electronic data. For the sake of better and efficient decision making, clinical and administration information is completed into single system. Thus HIS simplifies workflow, managing daily task and overall administration becomes efficient. To prevent any confusion each patient has unique id. The software keeps the record of medicine purchased, medical equipments and infrastructure. The system is known for its flexibility and multiple capabilities. Thus smoother management and administration function is possible using such software.

1.4 HL7- CDA

HL7 popular for creating health care messaging standards also has huge contribution in representing clinical document , it got ANSI approval in November 2008. It is a standard for giving specification regarding structure and semantics of clinical documents. It addresses
common and large narrative clinical notes. Being a part of HL7 version 3 family it gets its semantic content from HL7 reference Information Model. CDA is derived from the HL7 Reference Information Model (RIM). Targets of CDA are providing standards for exchange, management, delivery and evaluation of health care services. So it proves to be of great help for people unfamiliar with HL7 version 3. It provided a big breakthrough in clinical field by providing standardization of clinical notes covering history, physical, discharge summaries and progress notes. Deeper layer of architecture would be discovered in near future. Reasons for its success include the flexibility of the standard and its ability to encompass all clinical documents.

2. MATERIAL AND METHODOLOGY

The development of PACS (Picture Archiving and Communication Systems): PACS network is constructed which consists of a central PACS server that provides storage for database containing the images and is capable of storing images from various modalities (CT, X-Ray, MRI, Ultrasounds etc) in DICOM format and multiple clients have access to those centrally stored images. They can retrieve and display these images on medical imaging software named as DICOM viewer or these images are converted into other image formats like Jpeg, png eliminating the need of using an additional software that is DICOM viewer and acts as GUI. The server and the clients communicate by using the DICOM protocol.

To interface two different formats HL7 and DICOM, HL7 CDA is used. It focuses on content of clinical documents, which are persistent and human readable. CDA is XML based standard and make use of this markup language for providing clinical documents. HL7 CDA does not define how EHR’s communicate with each other, for this CDA documents are transmitted to HL7 message designed for transfer of clinical document.

![Fig 1. Process of generating CDA document](image-url)
3. PROCEDURE

The research work started with collection of DICOM images. For managing these images a PACS server was created. Further images were categorized on the basis of their modalities, orientation and database file of information retrieved from images was maintained. At last the standard data was converted into XML/HL7 format using CDA.

4. CONCLUSION

An ideal system has been created in which all DICOM images from different modalities can be stored and this very system brings all doctors from different departments (neurology, cardiologist, etc) to work together for better study and results. The research concluded that the HL7 v3 CDA R2 could provide a more scalable interoperable solution. HL7 v3 CDA has been successfully implemented worldwide. Any clinical systems working with HL7 standard can send a patient’s information summary to the EHR through the message gateway, which will translate this HL7 to CCR and send it to the EHR profile associated with the patient. In case if patient decides to visit another hospital, one which has no previous record for that person, the same EHR profile can be accessed by the new hospital system to get all the records of particular patient stored by previous clinical systems.

5. REFERENCES

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