A Community Public Health System Design based on HL7 Criterions

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Abstract

The platform integration study on hospital management information system with common interface had the data exchange and sharing on several information platform come true. The external study is to apply the results to bigger score and operating surroundings. The study about Computer-Based Patient Record (CPR) on Health Level Seven (HL7) combing the middleware is to achieve the uniform data and function so that we can exchange and share the medical information. After analysis of the data requirement between the hospital and the medical enterprise, the community medical platform was designed on the HL7 engine to satisfy the data communication and transmission. Combing the middleware the integration platform had the function of query and sharing.

Keywords: Community, Public health, Computer-Based patient, Health level seven

1. Introduction

The community medical information is important to the medical enterprises and patients. In order to make full use of the medical information, we want to set up a community medical platform to be used by hospitals, enterprises, the public medical institution and the patients.

The community medical information platform is not the requirement of the medical enterprises, also the people for health and the government for reform. The platform can provide the uniform interface to the people who want to query or manage information about the medical, the advices, the remedy or the example of case. On the platform the enterprise can get the information about the medicine. The doctor or the nurse can get the information about the patients that was set up before, and the hospital can manage the worker or query the information about the patients or the medicine, the government and department can get the statistics and set the policy and so on. All in all, by the integration platform, all the information can be used to the uttermost and will provide a convenient and quick and efficient way to manage and serve the medical information.

This paper are mainly based on the project of the author and the papers a platform integrated model study on common interface, a model study on community medical information incorporate and community healthcare platform integration study based on common interface, also the studies of the HMIS based on HL7 criterions. This paper mainly made the summary of the project and the papers, many contents can reference the papers above.

The thesis made a series of analysis of the process to set up the community medical information. On the bases of criterion that used in the medical and the method that realized the sharing of the hospital, we put forward the design of the information integration, set up a solution for the hospital fitting for that community medical information incorporated, made the design and applied to achieve the data on the HL7 criterion which was discussed in detailed. Then we introduced the middleware technology, designed the platform interface, and connected the various hospital information systems. At last we summarized the technology and process of the system.

2. Methods

2.1 Platform integration technology

The platform integration study on hospital management information system with common interface made the hospital have their own uniform platform to share and exchange data. The hospital and other medical institution had many versions of information systems, above all, the CPR was the main model of the platform. Specially, some hospitals had special information because of the different objects and majors. All the differences make it difficult to share the information whether the department in the hospital or the hospital with other hospital.

In order to solute the different, we start to design the integration platform from the data form and system structure. From the data that had complex forms and definitions about the medicine and medical information we define the uniform form on the HL7 criterion, from the system structure that existed difference among the hospitals we design the platform interface on the middleware technology. The HL7 criterion can put the data structure, semantic fields, regular rules and data form to a uniform platform, the middleware interface can put the various information systems together ignoring the specific function sentence and model.

By the community medical information incorporate we can easy exchange and query data without gap, we dedicate to set up a hospital layer integration where the department can share the data and then impose restrictions on the medical enterprise that wanted to add to the community medical system.

To guarantee the operate of the platform construction, the management unit need to be joined, forever, it is a long process and need to improve or update the information system step by step to reach the criterion of the international software criterion. Of course, we can draw support from the advanced technology of computer, such as the XML, middleware and web services and so on.

2.2 HL7 introduction

HL7 creates healthcare standards to enable interoperability systems which can facilitate the development of cost-effective, interoperable systems. HL7 message and documents move healthcare information in a standardized way to the point of patient care or information reuse which brings efficient communication to the different operators. HL7 creates standards for the exchange, management, and integration of electronic healthcare information which makes the development easy to write and update, even integration. HL7 creates standards that assist all healthcare stakeholders in moving information within and beyond the four walls of hospitals and clinics which abides by some regular rules. HL7 creates standards that assist in sharing public health information which makes the integration feasible.

In reality, HL7 develops specification, HL7 creates standards that help enable the electronic health record and creation of a National Health Information Network. The most widely used being a message standard that enables disparate healthcare applications to exchange key sets of clinical and administrative data that guarantees the exchange and query uniform. The HL7 Clinical Genomics model assists in using genomic data in conjunction with other clinical information that gives us a pipe to reach the integration directly.

2.3 Middleware introduction

Middleware are enabling technologies for the development, deployment, execution and interaction of applications. Middleware are considered as the system software or service program which are standing between the operating systems and applications. Middleware lie onto the operating system and manage the resources and communications. They have evolved from simple beginnings-hiding network details from applications-into sophisticated systems that handle many important functionalities for distributed applications so that they can provide support for distribution, heterogeneity and mobility, thus they can exchange message amount the different interfaces. The evolution of middleware has been influenced by numerous developments and standard efforts.

3. Results

3.1 Design of HL7 interface engine

The interface designs had introduced on the paper of studies of the HMIS based on HL7 criterions. Except that, there are two methods to reach the function of the interface engine on HL7, one is point to point communication that can achieve the mutual connection in different information system, the other is to set up the server on HL7 where the database can be stored as the central data platform, the latter is a general method for the large number of data and has the advantages of little models, good transplanting and reliability and so on.

All the method can be implemented by the HL7 engine or HL7 ready, the HL7 engine maintains the old system and introduces the new interface which can exchange the data form to criterion form, by engine the system

enables to communicate with other models in the different information system and exchange and query data. The HL7 ready objects to develop new models adding in the old system which uses the criterion to regular the data form from the beginning. With this the model and the function can communicate with each other without gap and make the immediate communicate through the surrounding.

3.2 Design of CPR middleware

The middleware have the function of integration, we can get the immediate data query in the hospital data centre by the CPR, the data centre can integrate the application from the hospitals to the management department, such as the government server. In the server, we can set up an exchange mechanism to connect the different hospital platform or by special work logic to realize the change. By the middleware the community integration can fit for all platforms designed even to update or extern the platform or application.

In the processing of the integration of CPR data centre, we can share the data or the devices of the hospital with the same platform. To the different platform we can change the form to uniform on HL7 criterion. After the sharing or exchange, we can integrate the data into the data centre, that is the server lying in the management department. The crucial technology is the apply integration design of middleware, there are two methods satisfied, one is point to point mutual communicate, the other is the middleware.

In the distributed network, message middleware can communicate reliable among several threads by the synchronization or the asynchronization. In reality, the synchronization need superior network and devices, so we apply the asynchronization to fit for the platform, meanwhile, it has good fault-tolerance. To some special model demanding the superior immediate, we make special model so that it can send the changing message to middleware model that will handle the data source by the server.

3.3 The community health system design based on HL7

We get the community integration platform combing the international and civil researches on the incorporate, by the middleware and distribution database we put the management department and the hospital together to satisfy the community medical information system requirements. By the system the patient can query and share the electronic records through the networks. In reality, we divide the implementation into partition, one is the management department that sets up the data centre for the whole community medical information system, the other is the hospitals that add to the system by the HL7 interface.

The specific process just like this: the public heath department set up the CPR database system which was developed by the HL7 ready as the data centre stored many data from the hospital, such as the patient, the medicine or the disease information. The data form had been changed to criterion form by HL7 engine. The specific work can reference the platform integration study on hospital management information system with common interface.

3.4 The community health system design based on middleware

The main design and process of the community integration platform based on middleware aimed to achieve the data without difference in different system. The process was designed thus: the application program sent query request to the CPR data centre, the centre accepted the message and went to ask to search the database then gave the results if the source was found, then sent the results to the application program which transform the data to the information what the user need. Otherwise, the sources had not been sent to the centre.

In the community medical information incorporate, the function of the CPR data centre undertook the main operation to exchange and share information. The aim of the community medical information system is to set up the model that store different data from sub-model. The CPR based on the middleware had the function of accessing sharing data and keeping the centre data accordance. The accessing satisfied the requirement to get the information from different data sources, the accordance guaranteed the data identical to the patients or the operators.

4. Discussion

The aim of the community medical is to set up a series of records of the patient about the healthy that convenient to query and remedy. In the process of the remedy, the patients can get the whole and accurate information that had been built before for the diagnose and remedy at anywhere and anytime. The community medical models also help the public health departments, medical research centers and medical health management units make good decision.

The community medical incorporate make full use of the information of hospitals and patients. In the hospital all the operators and department share the information from their own information system based on the HL7 engine

interface, especially in the sub-department they can share the data by the data centre or centre database that was established by the local area network or the virtual private network. The internet platform is a structure of client and server, the specific process is described thus: the sub-department sent the request to the community system, then the request was sent to CPR centre by internet, the centre accepted the message to make research on the centre or other department data sources, then returned the results to the sub-department. The data sharing between hospitals was similar, the difference of operation and process was the unit that accepted the message not the hospital data centre but the medical enterprise data centre.

The data transmission was not same to the data sharing that was got by the uniform platform interface with the uniform data form, the data safety was important in the transmission, we apply the encryption for the user name, user id, and table data in the database. Meanwhile we combine the encryption used in the HL7 with the data transmission.

5. Conclusions

With the changing medical score and work requirement, the medical information system that applied in the medical units brings many new requirements. When the application objects to the Web and service, the community medical application becomes more and more important and indispensable. The application needs integrate all platforms into a uniform platform which gave us many challenges and difficulties especially in different software surroundings.

The project enclosed the HL7 criterion and middleware to design the uniform platform to satisfy the requirement. The advantage of the HL7 is the uniform define of data form and interface engine which is easy to update and modify the model to fit for other program. The middleware made use of the advantage of technology to set up the uniform interface not to consider the realization, just the design.

The network is an important guarantee to communicate between several medical units serving the data storing and query by the distributed data management, meanwhile the middleware also guaranteed the results accordance in the operation. In order to get superior distributed affair response and operation we used the concurrency mechanism and multi-thread mechanism, how to guarantee the better concurrent is the subsequent study of our project group.

Of course, the best method to share the information is set up the immediate mutual system, the mutual operation between the hospitals will promptly, immediately and accurately achieve the access of the data. The subsequent work of our study will put emphasis on the advanced computer technology to design the superior application.

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