Studies of the HMIS Based on HL7 Criterions

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Abstract

In order to apply the common platform to exchange data and keep correspondence in hospital management information system (HMIS), the electronic medical record system (EMR) scheme based on health level seven (HL7) criterion is applied to the platform design. By the analysis of the complex data and questions of HMIS, the scheme is to set up the equal platform for the different hospital system. On the base of the old version and system, the platform implements the data requirement by the common interface designed on the HL7. The structure and model design are also discussed in detailed, including the structs and functions. The application meets the requirements of different hospital information systems to achieve the complex data by the uniform platform.

keywords: Hospital management information system, Health level seven, Electronic medical records

1. Introduction

Hospitals run better with the management information system which can improve the manage and efficiency, the doctors and the nurses serve easier and better with the system, also, the patients feel better from the service and the technology. Obviously, everyone benefited from the HMIS have found the advantages of the computer system. Meanwhile, the operators who use the system to manage information from the HMIS found some questions that hinder the thorough application, for example, the data exchange between the HMIS, the data sharing among the system and the operation form different internet.

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 region medical information incorporate and regional healthcare platform integration study based on common interface. This paper mainly made the summary of the project and the papers, many contents can reference the papers above.

The platform integration study is to achieve the data sharing and exchange between the hospital information systems, mainly between the EMR and other HMIS. In this paper we put forward a platform integration solution on hospital management information system with common interface which can meet the requirement of the study, based on the barriers we analyze the current surroundings of the hospital and the information system which can get the requirement of the study, then make the analysis of the feasibility, subsequent make the common interface structure design of the EMR on HL7 criterion, highlighted on the function and the model fit for the common interface platform. With the solution we can get the data from the whole hospital with different privileges

Because the special objects of hospital, the devices that were introduced from different enterprises taking along various software, which made the inconformity among the software, including the data and the operation. To make the inconformity disappear and improve the quality of service, we develop the scheme to satisfy the data exchange and sharing.

The general method of the study is to re-develop the software using the standard the model, that is, from the single model, with the Object-Oriented thinking and other computer development criterion, for example, the XML language to fit for the complex data expression, make the uniform data or scheme changes. This method cost lot and discard the old system that was familiar with the doctor, the nurse, the manager and the operator, moreover, it disrupts the general operation of the hospital and the custom scheme of the worker.

Another method fitting for the small hospital is to update the software that the hospital had, that is, by the model add to the old system or change a small segment based on the HL7 criterion. This method must modify the source code of the software which can bring risk to the hospital and software enterprise, moreover, it can bring the change on the system itself, for example, the bug or the error or the redundancy.

Besides above, there are other method that can meet the satisfaction, such as common table or data area which made the strict regular to use and get the uniform information among similar system.

Of course, we can select the right scheme after the current surrounding of the hospital, including the economy, the time, the score or the level of the information.

2. Methods

2.1 The Introduction of the HMIS

The hospital has the EMR and other hospital information system, including the special image system, such as the Picture Archiving and Communication System. There are one or two sub-region using the system, the network structure is mainly the general client and server model, some functions will display in the form of web which communicate with the users in other region and system. The general model manages the worker in the hospital, the medicine in the hospital and the people who get remedy in the hospital.

The thesis is to achieve the integration among the EMR and other hospital system thoroughly not disturbing the work of the hospital. The bigger score and the quantity of the hospital made the integration platform difficult to meet the requirement, so we will develop the platform with several methods, we will consider the operators who were familiar with the old platform, also the modify that offered the function of the interface with the special devices and the medical information criterion which will satisfy the requirement of the system update.

2.2 The introduction of HL7

HL7 creates standards to help information systems within and across healthcare organizations communicate with each other. In a nutshell-when implemented-utilizing a standard implementation enables inter-operability of healthcare information. HL7 creates standards for the exchange, management, and integration of electronic healthcare information.

HL7 communicates with message among the models, the messages can be expressed by the fields or the objects. HL7 commutation provides two pipes to exchange the data, one is HL7 engine, the other is HL7 ready. The former is object to the old system continued to use, it imports the engine interface to make the old system have the ability to communicate with other system developed by the HL7 criterion. The latter is object to develop the new program, it uses the HL7 criterion to integrate the platform of different application that provides the standard the input and output. Using the HL7 criterion can make specification of the clinical application and the medical information form, meanwhile, it can provide the standard interface of hospital information system and support the code criterion.

2.3 System analysis

Combining the technology solutions for different structures with the hospital current surrounding, we apply the HL7 engine to meet the hospital requirement that can save the fund. This method modifies the data form not the inner process of system which will not bring difference to the operators and the managers. In the technology, we all adopt the method from up to down to modify the model so that it can exchange data feasible.

To the specific model, we consider the communication between the extern interface and the inner interface by the single model design appending to the common interface, so that it can be realized by the socket model or common model, moreover, the communication sending or accepting data from the extern to inner can be realized by the HL7 engine exchange. By this method, the HMIS is close to the HL7 standard model more and more.

2.4 System design

The theory that implemented the exchange on HL7 is to design thus: at first, we change the data form to standard form on the grammar and regular of HL7 criterion in different information system, then send the data by standard protocol, such as File Transport Protocol, Transmission Control Protocol and Internet Protocol and so on, the acceptor answers the sending and test and verify the messages, after the verify the messages will be sent to application layer, which will be analyzed by the protocol and change it to the form that application layer can identify. From the theory and design we can transform all the data to the standard form by the HL7 engine.

Above all, the function and the model design can support the theory. We designed the integration platform into three parts, one was interface engine design between the EMR and HL7, the other was the messages transmission among the information systems, another was interface engine design between the EMR/ HL7 and information systems. The definition of HL7 has the advantage of interface layer to hospital information system which can make it easier to modify the old interface on HL7 criterion. All the form and message observe the same protocol that guarantee the data exchange and connect without any gap.

Of course, the design also included the HL7 ready method which was the re-develop of the software, so it does not matter to realize the exchange data and mutual communication, just to considering the parameter of the function.

3. Results

3.1 System operations

The successful software update or transplantability need a large number of testing and debugging, sometimes the error and the exception will be thrown in the running of the reality. In order to continue the operating of the hospital with the system, we prepared the direct change method, the parallel change method and the test point interim method for the update of the old software version.

In the integration platform design, we use the test point interim method to accord with the clinical information system for the immediate data requirement, the parallel change methods to accord with the Picture Archiving and Communication System on account of the special data requirement, the mix method of above to accord with the common model for the interface data exchange and the direct change method to accord with other model in the EMR and HMIS by continuous test.

3.2 System data structure

The difficult of the platform integration is the complex data form of the hospital, the medicine data especially the Chinese medicine, the specification and the instruction of the doctor have complex label or sign in the HMIS, similar to the expression of the EMR and the remedy process in the clinical information system. The civil medical criterion has the different meanings by creating the data structure to exchange the data connecting to the international criterion. We put forward the division of the data expression into structured and half-structured knowledge. The structured data were defined by the HL7 criterions, the half-structured data were mapped to structured data combination by the mapping function, especially the picture and the file. In the mapping, in order to avoid the different meanings in the various system we apply the biunique relation to map regarded the EMR interface engine as the principal line, the patient information as key point.

3.3 System results

With a view to the software language and the version, the integration platform applies the common interface to connect to the exchange model with the .net language which is easy to connect in one platform. In view of the various platform and independent of the system, we design the EMR data centre as the main platform under which the data complete the exchange and identify, thus the other information system can send EMR data to the data centre, after changing by the HL7 interface engine to be the standard form, subsequently the data centre accepts and analyzes the HL7 message which was saved in the data centre finally and other process just as this.

In the central server, the hospital can't make immediate report and query by the internet of all the data, it will be more and more requests by the common interface with the application of the design. We apply the three-layer structures to implement the interface engine of EMR based on HL7, also the expression layer, the operation layer and the data layer. In the expression layer we just define the interface function including the parameter with the object-oriented and the operation and logic is out of considering. In the operation and logic layer we implement the interface function by the definition considering the real data stored in the database. In the data layer we are only care of the database operating. The logic layer is an application server and the user interface order will be applied to operate the data layer by it.

In the process of the user interface, we can get the standard model and parameter defined by the object-oriented by the HL7 engine as long as the operator adds the data to their original windows. In order to use and modify the model, we put the parameter into the configure file to realize the reusing and independence, meanwhile, the write and read of the database can be processed by the parallel mechanism and distributed operating, also the multi-thread.

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4. Discussion

4.1 Data communications

In order to get the service of immediate query and data sharing by the data exchange in the EMR, we design the dynamic information query model by the local area network except the static query in the old system. Besides we will update the data in the server at regular time, just to guarantee the exchange between the EMR data centre and the HMIS. Considering the amount of the data communication and the network speed, we set the data uploading in the spare time at regular time which can't make the query immediate exchange. The update at regular time satisfies the sharing requirement because the work flow is familiar, the data stored in respective database. With the common platform we provide part of data from the database to the data centre to satisfy the requirement of dynamic query.

In the distributed database we apply the snapshot technology to achieve the Data synchronism which can copy the data immediately and not move data, it can update the source data and the object data at the same time. The Data synchronism also can be applied to data backup, data test and the data recovery.

4.2 System program

We define the interface using the inherit mechanism. The design of the interface can be classify into common interface and the general interface, the former can be realized by the extend method with the design the common attribute and function, the latter can be realized by the HL7 engine design. The function can be realized by the interface definition, the parameter design of the user defined function can reference the design of the HL7 criterion with the XML application.

5. Conclusion

The information and sharing level of the hospital is the crucial factor to improve the medical quality and the nursing quality. Making full use of the current system to share data is not coalesced with each other among the information system, but integrated to a uniform platform to share information. By the standard EMR interface and the uniform platform we can share the medical resource to the uttermost.

The design of platform integration on HMIS with common interface satisfied the requirement of the hospital. The deficiency is the scope where the data communication and exchange were limited into the hospital and update or query at regular time, not the immediate function.

It is a long course to achieve the immediate query and exchange in the whole medical system and enterprises, it will be designed and planned not only the data form, hospital type, data quantity and many other factors, for example, the data safety, immediate transmission and so on. We will deepen the work to meet the requirement in the subsequent study.

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