

Integration and application of medical data under the background of hospital informatization

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Abstract. Medical data are of great importance to people's life, social production and development, and national construction, and they have attracted much attention around the world. In nowadays with continuous development of science and medical technologies, the application scenarios and scale of medical and health data keep expanding in a relatively fast manner; however, there are still many problems requiring to be solved. In this paper, through analyzing the integration and application of data in the medical information system, the problems about the integration of medical data under the background of hospital informatization are explored, and the specific solutions with respect to the integration and application of medical data are proposed, so as to provide a reference for the related researchers.

Keywords. Hospital, informatization, medical data

1. Introduction

In daily operation of the hospital, medical information and operation information are stored in the medical information system. Such data are extremely important for diagnosis and treatment of diseases, as well as medical research. In the actual development, however, most staffs in medical institutions only make use of the relevant data in a relatively simple manner, and they fail to analyze and study the collected data in the process of actual application. Therefore, the implied law of data cannot be obtained [1], making it unable to make scientific treatment decisions for follow-up diagnosis and treatment of actual cases timely and effectively. Under this circumstance, data integration and mining should be constantly improved, to better apply the data in medical practice. Based on the analysis of abundant medical data, various therapeutic schemes can be determined, which can effectively provide services for doctors in decision making and scientific research, and help them to diagnose and treat the diseases, and perform in-depth research on the diseases.

2. Specific application of medical data integration in medical information system under the background of hospital informatization

In the process of continuous development of information and scientific technologies, data integration refers to a process creating more features and applications through sharing or merging more application data. The logic is to implement data integration through sharing or merging of data. At present, there are about three kinds of data warehouse design models, namely the logic model, conceptual model, and physical model. As for the logic model, it is mainly reflected as follows in the practical application process: The related entities of data warehouse can be realized logically. As a matter of fact, this relational schema is a correlation chart corresponding to each entity. The implementation process of logic model mainly depends on the physical model, during which, data storage structure, index strategy, data storage, and allocation optimization are generally involved. Conceptual model mainly refers to the objective-subjective mapping, for serving a specific goal.

2.1 Integration of medical insurance information

The integration of hospital data focuses on the establishment of a medical insurance data warehouse, which involves the following concepts: ETL, OLAP and data warehouse model. In the process of integrating medical insurance information, the following design tasks should be completed: ETL design, data mart design and data warehouse design. The design of data warehouse in the medical insurance information system mainly consists of the design of the logic model and physical model [2]. As for the design of the physical model, the main idea is to continuously strengthen the data storage function of the data warehouse and enhance the performance of data. As for the design of the logic model, it is necessary to focus on the insured, and objectively reflect their information and accounts; meanwhile, it is also necessary to reflect the relationship between institutions, the insured and the types of insurance. During the design of data mart, in view of the abundant data in data warehouse of the medical insurance information management system, OLAP processing can be directly performed or the data mining technology can be introduced, which would greatly improve the efficiency during actual operation. During the application of data warehouse-related technologies, IBM Informix Dynamic Server V9.4 For Unix has been put into practical use, with the server of HP RP8420, operating system of HP-UX, network storage system of EMC CX500, and system analysis tool of Cognos OLAP.

2.2 Data integration of Chinese medicine and Western medicine

The integration of such data mainly refers to the structural system established based on the integration of the relevant data collected from traditional Chinese or Western medicine. In the theory system of traditional Chinese medicine (TCM), there are mainly the following types of data: TCM theory, TCM methods, TCM drugs, and TCM prescriptions [3]. In the theory system of Western medicine, the types of data mainly include: A series of diagnosis and treatment data in the fields of pathology, radiology, biochemistry, imaging, and immunization. In the process of integrating the data of traditional Chinese medicine and Western medicine, as for the integration of data of different types and disciplines, as well as their storage in the data center, different medical institutions apply different methods to process the data of the corresponding types and disciplines [4]. The method to deal with the above problem is to transform the data structure in various medical institutions, which means that different data structures can be transformed into the format of XSD, thus forming a complete mapping of data. Then, Web can be used to submit the XML files of each medical institution generated during operation to the related medical data structure center based on information technology. Therefore, the data from different medical structures can be exchanged and integrated in the data center [5]. The relatively unified XSD in various medical institutions can help to realize automatic processing and submission of data, thus achieving automatic integration of data in the data center.

3. Problems during integration of medical data under the background of hospital informatization

In the medical and health industry, in order to effectively enhance and improve the medical management, diagnosis and treatment level, major hospitals across China are accelerating the informatization construction. Abundant case data are saved in various steps and procedures such as registration, archiving, imaging and prescription management, which, however, are relatively scattered and fragmentary in systems of various departments. Therefore, during the actual application, the useful data can be collected from the hospital information system through continuous mining of data, so as to make full use of their roles and value [6]. However, during the hospital informatization in China, different hospitals adopt different information system architectures and data processing modes, which have resulted in great differences in data collection, storage and exchange. Therefore, it is unable to share the medical data. Different developers of medical management systems adopted in different hospitals show different levels of software development; in addition, the related departments have formed no unified standard for the application and development of software systems, making the medical institutions fail to realize the compatibility of data and information in the process of information management, and also making hospital information fail to be shared. Therefore, in the field of medicine, there is no corresponding standardized management in the healthcare system.

In the field of healthcare, information standardization is the basis and premise for the sharing of medical information. In various local hospitals in China, however, there is still no unified standard between the services and information data, which leads to repeated and independent development during the actual development and application, causing a great waste of resources. In China's medical and health system, it is hard to share information resources, and single data may be recorded repeatedly in multiple systems; however, data are different in specific properties. Therefore, in the process of information transmission, there would be conflicts of information [7]. The diversity and multi-source heterogeneity of information and data may lead to distortion of medical data in China, thus affecting the use of various types of data in hospitals. In order to effectively resolve this problem, the multi-source heterogeneous data integration system should be effectively used to transform and integrate various data in the hospital, thus providing guarantee for the effective use of information and data.

4. Architecture of medical data platform under the background of hospital informatization

4.1 Data source layer of the platform

During the research on architecture and development of the information data platform, the data source layer is at the bottom layer, which is the base layer of the data platform. In the process of continuous improvement and deepening of medical information technologies, various information systems have been extended. However, in the actual application, the sharing and utilization rate of information cannot be improved, which, under normal circumstances, may easily form isolated data islands [8]. Through sorting and statistics of the related data systems, the data platform can greatly improve the efficiency of data utilization. As for a data system platform, the data source layer mainly consists of clinical knowledge library data and clinical information system data. In terms of the application of clinical information system data, the Electronic Medical Record (EMR), Laboratory Information System (LIS), and Hospital Information System (HIS) are directly connected to the clinical data center. With the clinical knowledge library, the users can get access to medicine specifications, guidelines, English literatures and data related to clinical pathways.

4.2 Data acquisition layer of the platform

Under the background of informatization, the platform mainly collects data by means of backup and recovery, and performs desensitization of the backup data according to the HIPAA protocol. Data desensitization is mainly used to

replace the sensitive information in the data, and the data after desensitization can be uploaded to the hospital's cloud data platform, which, in the actual operation process, has its own firewall, flow controller and bastion host, as well as network equipment and a full set of security protection devices.

4.3 Data processing layer of the platform

The core of the platform data system is data processing, which mainly consists of data cleaning, data mapping, data comparison and structured processing. Data cleaning refers to conversion and cleaning of the format of a single line or field of data based on the established data standard. Data mapping refers to the reconstruction of the diagnosis and treatment model of patients after breaking up the data in each business system. Data comparison refers to the mapping of data dictionaries of the hospital to a unified data dictionary one by one, which involves more divisions and departments, and consists of examination type comparison, department comparison, and diagnosis type comparison, and so on [9]. In practical application, structured processing mainly makes use of the medical language to input natural language into the hospital data system, which is then applied for data query, storage, statistical analysis and data mining.

5. Effective measures for integration and application of medical data under the background of hospital informatization

In the daily operation of the hospital and the process of diagnosis and treatment, medical diagnosis, research and management are flexible, and the operation involves an abundance of data and information. Therefore, under the background of informatization, the technologies and tools used in practical application should be able to integrate the data, and also analyze and integrate the information [10]. The analysis on data can effectively resolve the problems about the design and integration of different information systems, as well as the problems about diagnostic data, unstructured text, omics data and computing function. The functional analysis can enable text analysis and various data processing functions such as machine learning. Therefore, the problems about data integration and application can be resolved by the following schemes.

5.1 Resolving the problems about the interface of different information systems with the dynamic interface technology

In terms of the processing of problems about the data information interface, different services and data should be coupled. Dynamic interface technology can provide a dynamic scripting technique, and offer variations on dynamic scripting in the process of evolution. This technology intends to perform interactive processing of interface data during practical application in the hospital [11]. In the practical operation, dynamic interface service consists of the asynchronous mode and synchronous mode, and its major task is to update and extract the relevant data. As for medical data generated by different information data systems, after the accumulation of abundant data, they can be collected, transmitted and processed with the respective management systems, and saved in the specified database [12].

In the big data system, the databases of various subsystems are completely independent and isolated from each other. The mutual access between subsystems can be realized by interface definition. If it is necessary to call the data of a subsystem, the internal data can be called through transferring of the related parameters. During practical application, cross-system convergence and data usability can be guaranteed [13]. Accessing data in each subsystem is performed with the object of data, rather than the database to access. Therefore, there would be no multiple databases in practical application. When accessing different databases, it is generally completed by data application service, based on which, the related interfaces of different databases can be autonomously called and accessed.

5.2 Sharing of data involving scientific research, clinical quality supervision and regionalization with the standard data integration platform

During practical operation of the hospital, it is necessary to gradually realize digital management of diagnosis and treatment, and medical resources, as well as the doctors and patients, mainly involving: The digitalization of visits, examination of patients, prescription and treatment, which can achieve closed-loop management of medical orders, and whole-process digital management of labor, material, and financial costs, as well as the loss of equipment in the process of treatment. The admission, registration, hospitalization, discharge and reexamination can be followed up, and digital services can be realized in each step of diagnosis [14].

Digital management in the process of hospital operation can enable the patients to directly make an appointment in the outpatient department of the hospital, which can effectively avoid rushing about between different departments. The one-stop processing can make the procedures for medical treatment more scientific and reasonable. It can also be used to make an appointment for the examination of patients, thus realizing efficient allocation and operation of equipment and personnel. The information collection system of the hospital involves abundant medical contents, mainly including medical services, clinical consultation services, medical imaging services, and hospital operation and management. During operation of the hospital, there are multiple departments, such as outpatient, inpatient, and emergency departments, involving the services such as registration, charging, and pharmacy [15]. Different departments are

responsible for different services and functions, but the integration of information of these services can effectively improve the operation efficiency and quality of the hospital. Therefore, informatization management can be further implemented, and the environment and procedures of the hospital can be optimized.

6. Conclusion

In the new era of development, with the constant development and improvement of information technology, various business and models are constantly developed, creating a huge impact on the healthcare industry. It is the development and research direction of the medical and healthcare industry in the future to explore the new technologies and models of information data in the medical and healthcare undertakings.

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