ISSN 2959-6157

A Review of Research on Hospital Electronic Medical Record Management System Based on Cloud Computing

Jingbai Zhang

Abstract:

With the increasing development of computer science, cloud computing has had a revolutionary impact on various industries. The application of cloud computing technology in the electronic medical record management system of hospitals is not only of great significance to improve the efficiency of medical information management, but also can effectively deal with the security challenges of medical record data. The article firstly provides an overview of cloud computing, then introduces the importance of hospital electronic medical record management system, and at the same time analyses the limitations and challenges of traditional electronic medical records, and secondly summarizes the key issues in the application of cloud computing in hospital electronic medical record management system.

Keywords: cloud computing; electronic medical records; management systems

1 Introduction

Over the past decades, advances in computer science have changed every aspect of the medical field. As an important part of medical informatisation, the hospital electronic medical record management system has an irreplaceable role to play in improving service efficiency, facilitating communication between doctors and patients, and reducing healthcare costs, etc. However, with the rapid growth of medical data and the wide application of electronic medical record systems, the traditional way of data management has gradually become overwhelming. The development of cloud computing technology provides a new solution to this problem and an innovative means to modernise the electronic medical record management system. Through an in-depth study of the application of cloud computing in hospital electronic medical record management systems, this paper will focus on the specific practices of cloud computing technology, including top-level design, the determination of cloud computing models, security and privacy protection, cloud sharing and cloud storage, and the simplification of business processes.

2 Characteristics and advantages of cloud computing

2.1 Characteristics of cloud computing

In today's increasingly developed world of big data and artificial intelligence, cloud computing has a significant role in the efficient use and flexible scheduling of resources. Cloud computing is a mode of providing computing resources and services to users through the Internet, and users can flexibly obtain and use resources according to their needs. As far as today's cloud computing technology is concerned, it has the following three characteristics: (1) the use of cost-effective servers, under the premise of cost savings, the use of multiple servers to analyse and deal with the problem of the ability to be greatly improved. The nodes between the servers usually use Gigabit Ethernet for fast transmission. (2) Cloud computing maximises the effective use of resources and synchronises the development of the underlying architecture with the functionality of the application. It improves the development efficiency, simplifies the development difficulty, makes full use of resources, and saves time. (3) There is an unavoidable node failure problem[1] .

2.2 Advantages

2.2.1 Multi-platform access:

Cloud computing can be accessed over the network, and users can access cloud services anytime, anywhere using a variety of devices such as computers, tablets, smartphones, etc., which improves work efficiency and convenience.

2.2.2 High security:

the security of cloud computing is mainly reflected in two aspects: on the one hand, cloud computing can provide users with a reliable data storage centre, users do not have to worry about the loss or theft of data, and to protect the user's data from viruses; on the other hand, the operation and maintenance of the cloud computing is carried out by professional personnel and teams with knowledge and technology of computer science, so as to ensure the stability of the business and avoid the blind operation[2] .

2.2.3 Large storage capacity:

an important application in cloud computing is cloud storage, which controls and provides data storage access to a large number of heterogeneous storage devices in the network with software through network technology, distributed file systems, clustering applications and other features[3] .

2.2.4 Virtualisation technology:

Through virtualisation technology, cloud computing enables pooling of resources for management and access, improving resource utilisation. For example, virtualising multiple Internet computers into a single computer allows this new virtual computer to have higher performance.

3 The current situation of traditional electronic medical record management and its problem analysis

3.1 Status of traditional electronic medical record management

In order to keep up with the development of the times, every modern hospital needs a complete set of information systems, of which Electronic Medical Records (EMR) is the most important part. Electronic Medical Records (EMR) is also known as Computerised Patient Record System or Computer-Based Patient Record (CPR). Electronic medical records record the patient's diagnostic information, including treatment, examination and other personal information, is an important basis for doctors to make diagnosis and treatment judgement on the patient.

At the early stage of the development of electronic medical records, the basic embedded word-based, only to achieve in the form of paper medical records to electronic medical records, but due to the different writing habits of each doctor, it is difficult to make the same description of the same condition, resulting in data statistics is more difficult; Structured Electronic Medical Records: the framework of the electronic medical record design, through the point of selecting the detailed information to be entered, such as pulse, blood glucose, blood lipids, and other data. However, for information that requires a large and detailed description, such as medical history, although there are specifications, they can only regulate the content of the medical record, making it difficult to carry out structured design.[4] The following are some examples of how to structure a medical record.

3.2 Problems with traditional electronic medical record management

3.2.1 Difficulty of data integration

Nowadays, more and more patients go to hospitals, hospitals need to store more and more complex information, the traditional electronic medical record management system can no longer fully cope with the storage and integration of huge amounts of data, so that hospitals face serious difficulties and challenges in the management of electronic medical records. Firstly, the various departments of the hospital do not adopt the same set of management system, which makes patients ask for consultation and participate in the consultation process in different departments, objectively resulting in the discrete and atomisation of patient information; secondly, there are patients who are transferred to other hospitals in the course of treatment, but at present, there is still no region-wide and nationwide EHR management system, which makes it difficult to realise the integration of the patient's EHRs on a wide scale, resulting in Patients have to do the whole body examination again after transferring to a new hospital, which reduces the treatment efficiency, increases the cost of medical treatment, wastes certain resources, and is not conducive to the long-term sustainable treatment of patients.[5] .

3.2.2 Inefficient information sharing

On the one hand, the basic templates of electronic medical record systems are different, and there is competition among various suppliers of electronic medical record systems, and professional departments carry out planning and design, but the actual real service work will have many complex factors, resulting in the existence of different characteristics of the basic modules of electronic medical records among hospitals; on the other hand, it is very difficult to arrive at uniformly formulated specifications for electronic medical record systems. For example, in clinical practice, different doctors or specialists are independent in their diagnosis and treatment of diseases, and sometimes the treatment is carried out in different ways. [6] Each hospital has its own set of electronic medical records. Each hospital has its own set of electronic medical record management system, and there is no unified planning among hospitals to formulate a standardised information management scheme, which causes inconsistencies in the information on the relationship of patients' medical records recorded by various hospitals, inconsistencies in terminology, and other difficulties, so that the role of the electronic medical record is not given full play to in the process of medical treatment, which affects the efficiency of treatment.

3.2.3 Low data security

With the development of the Internet, people's personal information has become more and more transparent, in this regard, the control of Internet platforms has not achieved satisfactory results, and the formatted governance scheme has increasingly tended to capitalise on the emergence of the use of the Internet to obtain patients' personal information, using big data to recommend the appropriate advertisements to patients, and violating the

rights and interests of patients. As many hospitals' HIS systems use only account passwords for the verification method of patient identity, with simple encryption for the storage of backend data, but the fact is that the backend related data are transparent, which can easily lead to the leakage of patients' information. At the same time, electronic medical records also have the characteristics of information and carrier separation, so not only to ensure the security of the data, but also to ensure the security of the carrier, which puts forward more requirements for the maintenance of its security.

3.2.4 High demand for mass storage

At this stage, in order to cope with the storage of a large amount of data and to strengthen the construction of hospital informatisation, hospitals have introduced technologies such as HIS, GIS, LIS and PACS. These systems alleviate the problem of storing massive information to a certain extent, but due to the different modes of these management systems and the different operation methods, the unified management of massive electronic medical records cannot be implemented. Even though some hospitals have additionally added peripheral storage devices to expand the original storage system, the problem of insufficient storage space still often occurs.

4 An Exploration of the Application of Cloud Computing in Hospital Electronic Medical Record Management

4.1 Top-level design and unified planning

In order to standardise the hospital electronic medical record management system and make it more comprehensive, scientific, efficient, secure and scalable, the system planning and design should be deployed in a unified manner and the top-level design and overall layout should be strengthened. In the design, reference should be made to the theory of document life cycle.

The overall operation of the hospital is studied in detail, the business workflow of each department is analysed, and the overall framework of the electronic medical record management system is structured. The top-level design adheres to the concept of top-down strategic planning, which is the centralised embodiment and concretisation of the document life cycle theory, document continuum theory, synergy theory, whole process management ideology and front-end control ideology.[7] The design of the The top-level design of cloud computing-based electronic medical record management system needs to give full play to the advantages of cloud computing, to ensure its efficient control in archiving and preservation, front-end management and whole-process management, in particular, to achieve the effective transformation of data between the medical record and the medical case, so that the two are consistent and unified, and to achieve a high degree of integration in the generation and management of medical records and the call and storage of medical records.[8] The medical records should be generated, managed, recalled and stored in a highly integrated manner.

4.2 Choosing the right cloud service model

Overall, the main organisational models in cloud computing can be divided into three, namely: public cloud model, private cloud, and hybrid cloud. The core of public cloud is that the ownership of infrastructure belongs to the cloud service provider, and the cloud computing service is open to the public, and qualified people or organisations can rent and use cloud resources, and its advantages are lower cost, convenient and easy to expand, without maintenance; the core of private cloud is that the cloud resources are only for a certain user to use, and other people don't have the right to access them, so its security and confidentiality are stronger than that of public cloud; and hybrid cloud is an application model between public and private clouds, on the one hand, users use private cloud locally to process most of their business and store their information. Hybrid cloud is an application model between public cloud and private cloud, on the one hand, users use private cloud locally to handle most of the business and store critical data, on the other hand, users use public cloud service to cope with the network resource demand in the peak period. This investigation mainly focuses on the selection of hybrid cloud as the cloud service model for cloud computing-based hospital electronic medical record management system. Hybrid cloud well integrates the advantages of public and private cloud, which has the security and privacy of the private cloud model as well as the advantages of low cost and convenience of the public cloud model. Usually, cloud computing services are divided into three levels: PaaS (Platform as a Service), IaaS (Infrastructure as a Service) and SaaS (Software as a Service). Medical units can deploy PaaS, IaaS, and SaaS on the public cloud, and deploy the detailed data of EHRs on the private cloud, which can save money and reduce maintenance costs while protecting the privacy and security of the EHRs[9] .

4.3 Construction of electronic medical record management platform under cloud computing

For the management of a large number of electronic medical records, the establishment of an electronic medical record management platform is crucial. Before, electronic medical record management was mainly carried out in the C/S and B/S modes, but with the development of cloud computing, it is the cloud platform that is currently the most important to achieve electronic medical record management. Wu Qiongya proposes to divide the platform mainly into user access layer, application layer, service

layer, infrastructure layer, and access to resources through pay-as-you-go metering, in order to achieve the use of low-cost enhancement of resource utilisation, and to make the management of electronic medical records more concise and efficient[10] Chai believes that all medical activities should be carried out in the same way. Chai Zhenhua believes that the information source of all medical activities should be open and the data can be accessed through the network; all the operations such as data authority review, data calculation, data analysis, and unified processing of data format should not be visible to the users, and be completed uniformly in the cloud platform.[11] The cloud platform is the most important platform for healthcare professionals. Borrowing this platform, the workload of medical staff will be greatly reduced, and the hospital's management costs for medical records will also decline, which is conducive to promoting the development of hospitals.

4.4 Simplify the management process and improve management efficiency

For cloud-based electronic medical record management system, having a set of concise management business processes can make management more efficient. As the traditional electronic medical record file management is a linear operation in chronological order, including collection, identification, filing, organisation, utilisation and many other business contents, making the operation cumbersome and difficult. Therefore, Liu Beans Qun proposed the use of cloud computing technology to help hospitals link linear records together, uploading data to the cloud in chronological order from the registration, recording, consultation, and standards of the electronic medical record, and then using cloud technology to dispose of the information that crosses and duplicates each other, to ensure a good data convergence[5] . Ma Chunhua also pointed out that cloud data standards can be introduced to achieve metadata storage of electronic medical records with the help of cloud technology, load data into the cloud in a timely manner, and then do a good job of classification management through automated processing to enhance the accuracy of information processing services.[12] The data can then be classified and managed through automated processing to enhance the accuracy of information processing services.

5 Conclusion

Electronic medical records are important information data in the process of patients' medical treatment, and good management of electronic medical records makes the hospital's business more concise and efficient, and optimises the patient's medical process. With the help of cloud computing technology to unify the combination of data, effectively deal with the traditional electronic medical records problems, and promote the hospital to the electronic medical records more scientific and systematic management. At present, hospitals should put cloud computing technology into the use of electronic medical record management as soon as possible.

References

[1]ZHU Jang-Hua. Electronic medical record management system based on cloud computing [J]. Electronic Technology and Software Engineering, 2018, (15): 145.

[2]Shi Junfeng,Li Guangdu. Exploration of electronic medical record management in cloud computing environment [J]. Journal of Medical Informatics, 2015, 36 (01): 19-22+27.

[3]Su Shaosheng. Design and implementation of electronic medical record document management system in Zhongshan People's Hospital [D]. University of Electronic Science and Technology, 2013.

[4]Zhang Di. Analysis and reflection on the current situation of electronic medical record data application [J]. Digital Technology and Application, 2021, 39 (01): 44-46. DOI:10.19695/j.cnki.cn12-1369.2021.01.14.

[5]Liu, Beans Q. Design of electronic medical record management system based on cloud computing technology [J]. Wireless Internet Technology, 2022, 19 (03): 61-62.

[6]SHI Feng,ZHANG Li,WEI Haijian. Research on the Development and Utilisation of Cloud Sharing Platform for Hospital Electronic Medical Record Files [J]. Lantai Internal and External, 2023, (17): 7-9.

[7]SHI Junfeng,LI Xiqian,BI Jianxin. A preliminary study of integrated management of electronic medical records in cloud computing environment [J]. China Hospital Management, 2015, 35 (02): 44-46.

[8]Xiang Chong,Chen Cheng. Design of Integrated Management System for Electronic Medical Records in Cloud Computing Environment [J]. Electronic Technology and Software Engineering, 2020, (21): 136-137.

[9]Gong, S.. Electronic medical record file management based on cloud computing [J]. China Medical Records, 2017, 18 (03): 38-40.

[10]Wu Qiongya. Construction of hospital information technology platform with cloud computing technology [J]. Changjiang Information and Communication, 2023, 36 (09): 83-85.

[11]Chai Z. Design of electronic medical record information management system under cloud computing platform [J]. Modern Industrial Economy and Informatisation, 2015, 5 (05): 93-95. doi:10.16525/j.cnki.14-1362/n.2015.05.022.

[12]Ma Chunhua. An analysis of the application of big data technology in hospital electronic medical record information management system [J]. Digital Communication World, 2023, (05): 110-112.