

# Application of Medical Records Management Based on Big Data Technology

Jingwei Zhao, Ye Tao

University of Science and Technology Liaoning, Anshan, Liaoning, 114000, China

---

**Abstract:** Medical records are the key information resources of medical institutions. With the progress of medical technology and the deepening of informatization construction, their management level and utilization efficiency are directly related to the quality and efficiency of medical services. In today's big data era, the amount of data and information is growing explosively, and medical records are no exception. The traditional paper file management method has made it difficult to meet the storage, retrieval, and sharing needs of massive medical data. This paper discusses that the rapid development of big data technology provides new ideas and methods for medical file management, greatly improves the management efficiency of medical files, and also provides a solid foundation for the sharing of medical file information. However, the implementation process also faces challenges such as inconsistent data standards, privacy protection and security issues, and technical talent bottlenecks, which need to be further addressed.

**Keywords:** Big Data; Medical Records; Medical Record Sharing.

---

## 1. Introduction

A medical file is a record of medical information pertaining to the original resources. It encompasses not only the patient's condition, medical instruments, basic medical teaching, and the management and decision-making processes of medical institutions. It also includes the scientific research materials utilized by medical staff. These records hold significant value and importance in the context of medical, teaching, and research activities [1]. Paper medical records are distinctive and irreplaceable. Once lost or damaged, recovery is challenging. However, statistics indicate that 42.6% of hospitals have formal archiving procedures before the loss of files, while 35.8% of hospitals experience file loss due to the mobility of part-time staff and poor handover caused by the loss of files [2]. This demonstrates that there are significant issues in the management of medical files that require further attention and resolution.

## 2. Current Situation of Medical Records Management in China

Traditionally, paper medical records are the most accurate records of a patient's condition, and doctors may envision a patient's specific situation using medical records. However, a patient may have attended several institutions and have multiple medical records. Fragmented paper files are difficult to manage. And the patient's statement of his or her ailment may be incorrect. When paper medical files are lost, it can make it difficult for doctors to diagnose patients. Some tests must be repeated, which wastes the patient's money and reduces the effectiveness of medical care. Paper files occupy a significant amount of physical space in hospitals. When saving files, they must be manually classified and filed, which is not only inconvenient but also prone to error. The advent of electronic records has effectively addressed these issues. Compared to paper medical records, electronic medical records are far more convenient. Doctors may swiftly check up on a patient's case and obtain reliable information when diagnosing. Electronic files are also more efficient and

convenient to store, and they allow for faster and more accurate information transmission and sharing.

China's medical records management system is a hybrid of traditional paper-based record-keeping and information technology. However, in the current era of big data, the quantity of medical data has gradually increased. The data set comprises a multitude of information types, including patients' personal details, medical history, diagnostic test results, treatment plans, and other pertinent data. The sheer diversity and complexity of this information make it challenging to manage effectively. The traditional medical file system is no longer capable of adequately managing the vast quantities of data that are currently being generated. The current methods of managing medical records are inadequate to meet the demands of the exponentially increasing volume of data. The conventional storage devices and processing technologies are insufficient to cope with the vast amount of data, necessitating more efficient and intelligent storage and processing solutions.

The ongoing advancement of intelligent technology and the incremental adoption of medical informatics have prompted an increasing number of medical institutions to implement electronic medical record (EMR) systems, image storage and transmission systems (PACS), laboratory information systems (LIS), and other information technology solutions with the objective of achieving digital management of medical records. However, electronic documents are frequently dispersed across disparate information systems. The data is stored in a variety of formats, and the lack of uniform standards makes it challenging to retrieve and utilize the data. Furthermore, integrating such data to gain deeper insights and provide effective information for medical research is also a significant challenge. Additionally, the current mechanism for accessing medical records across hospitals is not fully optimized, which hinders cross-institutional data sharing. Big data technology offers a solution by enabling the storage of vast amounts of data, facilitating analysis and prediction, and providing visualization capabilities upon demand. It appears that the full integration of big data technology and archive management,

the establishment of archive data management workflows and mechanisms, is a necessity for effective hospital archive management, and it is also an inevitable consequence of the advancement of modern information technology [3].

### **3. Advantages of Medical Records Management Based on Big Data Technology**

#### **3.1. Improving Efficiency of Records Management**

Using big data technology, we can more easily store massive amounts of medical file data in a distributed manner, and we can integrate medical data from different sources and format them according to uniform standards. This not only reduces data redundancy but also ensures data consistency and readability. The subsequent management and analysis of the files by medical personnel is more convenient, thus improving the efficiency of data utilization. When it is necessary to search the archives, we can also use an efficient search engine to retrieve the required information from the massive data in a short period of time. This not only improves the efficiency of doctors in the diagnosis and treatment process but also reduces the waiting time of patients.

#### **3.2. Promoting the Sharing of Medical Information**

The main challenges to healthcare information sharing include data heterogeneity, security, privacy protection, inconsistent technical standards, and the phenomenon of information silos. These issues greatly limit the effective flow and utilization of medical information. Most patients are unable to accurately describe their past medical history or symptoms, which is very inconvenient for doctors to treat patients who have visited different hospitals. Big data technology provides an effective solution to these problems. Through the establishment of a unified medical record information platform, medical record information sharing has become more convenient. For example, by adopting B/S architecture and adding ZigBee as a hybrid development of medical file platform, the sharing and exchange of file data of different medical institutions can be realized, and the overall efficiency of medical services can be improved [4]. This helps patients avoid repeated examinations during referrals and follow-ups. At the same time, doctors can have a more comprehensive understanding of the patient's medical history and treatment, and make a more accurate diagnosis. In addition, big data technology also supports real-time updating and synchronization of medical records. Doctors can check the latest information of patients at any time during the consultation process to ensure the timeliness and accuracy of medical decisions.

#### **3.3. Deep Analytics and Decision Support**

Once a substantial quantity of medical data has been integrated and processed, valuable insights can be derived from it through the application of machine learning and data mining algorithms. For example, association rule mining, cluster analysis, classification algorithms, and other techniques can be employed to examine the correlation between a particular disease and specific lifestyle habits and genetic factors. Furthermore, electronic medical records can be integrated with machine learning algorithms, such as

neural networks and decision trees, to construct predictive models for specific diseases. Such comprehensive analysis can also elucidate optimal treatment options for disparate patient populations, thereby facilitating the investigation of specific therapeutic regimens and the personalization of treatment. Subsequent to a patient's treatment, medical practitioners may also employ big data technology to monitor the utilization and efficacy of pharmaceuticals, thereby furnishing data support for drug development and clinical use.

#### **3.4. Promoting Medical Research and Development**

Following the creation of a comprehensive medical data collection, we have accumulated a considerable reservoir of medical information that will serve as a vital data source for furthering medical research and development. Based on the patient's condition, diagnosis, and therapy, the underlying cause of a specific disease will be investigated, and an appropriate treatment approach will be determined based on the presenting symptoms. The database can help doctors prescribe the right drug. Researchers can also detect previously unknown patterns of sickness and the efficacy of various medications, allowing them to conduct thorough research to discover new treatments and speed up medical advancement. Big data technologies can also help physicians track drug use and efficacy, as well as speed up the screening and development of novel treatments. From study to implementation, big data technology will speed up the growth of medical research, allowing for the future resolution of more complicated problems.

### **4. The Case of Medical Records Management Based on Big Data Technology in China**

China's medical archive management based on big data technology is in a rapid development stage and has made remarkable progress in recent years. Based on the technical characteristics of the Hadoop cloud platform, combined with the characteristics of cloud computing, Zhao Bao et al. used metadata to realize a series of operations such as storing, reading, writing and querying various types of hospital archive resources, and realized an effective solution for the comprehensive management of medical archives [5]. Gao Feng constructed a medical file information interaction and sharing platform based on big data analysis and information fusion, which greatly improved the sharing level and information interaction capability of medical files [6]. The practice of medical file information sharing between Shengjing Hospital of China Medical University, a large comprehensive tertiary hospital in China, and 73 regional alliance hospitals in the province has also strongly proved the feasibility and effectiveness of implementing medical file information sharing [7].

Electronic medical record sharing platform. An electronic medical record-sharing platform refers to a system that uses modern information technology to realize the interconnection and interoperability of electronic medical record information among different medical institutions, supporting doctors to access patients' electronic medical record information across institutions within the scope of authorization. With the continuous advancement of medical informatization construction, electronic medical record-sharing platforms have become an important means to improve the quality of

medical services and strengthen medical supervision. Nowadays, the construction and application of electronic medical record-sharing platforms in China have achieved certain results. For example, since 2015, Beijing has set up a project to promote regional electronic medical record-sharing access in 30 hospitals, which eventually aggregates heterogeneous electronic medical record information. Through this platform, these hospitals have realized the shared utilization of basic patient information, consultation records and other data, providing doctors with a more comprehensive and accurate basis for diagnosis and treatment.

In addition, many hospitals try to use big data technology for medical data management. Peking Union Medical College Hospital, "oriented to clinical needs and realizing data interconnection", used massive data to build a cloud platform to integrate data from information systems of different departments, including business data warehouse, data integration warehouse, HIS business platform, PACS imaging platform, etc., to achieve standardization and centralized management of data. Shanghai Ruijin Hospital has developed a clinical decision support system (CDSS) using big data technology. This system combines machine learning algorithms to provide personalized diagnosis and treatment suggestions based on patients' medical record data, which is more in line with the actual situation of patients and also improves the diagnosis and treatment efficiency of doctors.

## 5. Challenges

### 5.1. Unharmonized Data Standards and Norms

Currently, there are major differences in the format, coding and storage standards for medical records data among different medical institutions, leading to difficulties in data sharing. The lack of unified data standards and norms restricts the cross-institutional sharing and utilization of medical file information. If the problem is to be solved, it is necessary to develop uniform rules through standardization to ensure that data between different medical institutions can be seamlessly connected and exchanged, and to improve the efficiency of data sharing and utilization.

### 5.2. Privacy and Security

While the advent of big data technology has provided an effective solution to the challenge of preserving paper records, it has also introduced new and significant security concerns. Medical files contain information that is both personally identifiable and proprietary to medical organizations. Furthermore, medical files possess not only the characteristics inherent to general files, but also a distinct professionalism, exclusivity, and confidentiality [8]. It is therefore essential to guarantee the confidentiality, security, and protection of sensitive information when sharing data. Currently, the use of data encryption, access control, audit trails and other technical measures can ensure the security and integrity of data during transmission and storage. Furthermore, the establishment of a robust data security management system and emergency plan is vital to enhance the capacity to respond to security incidents.

### 5.3. Technology and Talent Bottlenecks

The implementation of big data technology necessitates a substantial degree of technical assistance and the presence of a highly skilled workforce. In recent years, the development of big data technology in China has been rapid. Despite the establishment of specialties in this field at numerous colleges

and universities, the medical records management sector requires professionals with a diverse skill set, including expertise in archives management, medical knowledge, and information technology. Consequently, there is still a dearth of professionals who possess a comprehensive understanding of big data technology and its applications in the medical field. These individuals are unable to effectively utilize big data technology in the context of medical file digitization. To address this issue, medical institutions must adopt advanced file management technology and digitalization. They must also strive to enhance the professionalization and informatization level of medical file management by assembling and nurturing a team of professionals with expertise in diverse fields, including medicine, file management, and information technology.

## 6. Conclusion

The combination of big data technology and medical file management introduces new ideas and methods for the digitization of medical files. Compared with traditional paper files, medical file management based on big data technology offers several advantages, including improved file management efficiency, reduced management costs, easier information sharing, and enhanced data security. However, the process of digitizing and digitalizing medical records still faces various challenges. These challenges include non-uniform data standards, privacy protection, security issues, and limitations in technical and human resources. Moving forward, it is crucial to gradually implement big data technology in medical records management by establishing uniform data standards and specifications, enhancing privacy protection and security measures, and improving technology and workforce training. This will facilitate regional medical information sharing and further enhance the effectiveness of medical records management.

## References

- [1] Guo Ying. Exploration of Countermeasures to Promote Information Sharing Service of Qinghai Medical Archives under the Background of Big Data [J]. Qinghai Social Science, 2015, (06):200-204.
- [2] Jiang Qiang. Current Situation and Strategy of Hospital File Management Based on Big Data Platform [J]. Lantai World, 2019, (S1):194-195.
- [3] Liu Peng. Research on the application of big data technology in hospital file management [J]. Lantai World, 2023, (11):90-92.
- [4] Qin Zhanxia, Dong Wanting. The program of building an interactive sharing platform of medical file information with big data analysis [J]. Shandong Archives, 2022, (01):15-17.
- [5] Zhao Bao, Ren Huipeng. Construction of medical file sharing system under Hadoop cloud platform [J]. China Medical Records, 2016, 17(11):47-50.
- [6] Gao Feng. Construction of interactive sharing platform for medical file information based on big data analysis [J]. China Digital Medicine, 2019, 14(02):46-48+73.
- [7] Zhao Liqing, Zhhao Qun, Zhhang Chengpu, et al. Practical Research on Promoting Information Sharing of Medical Records in the Information Age [J]. Lantai world, 2013, (11):37-38.
- [8] Gan Qian, Li Yangxin, Hu Ying, et al. Theoretical considerations on information resource sharing of medical records [J]. Lantai World, 2012, (17):6-7.