Research on the Application Effect of Artificial Intelligence Electronic Medical Record Quality Control Technology

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Abstract: This study aims to explore the application effect of artificial intelligence electronic medical record quality control technology in the medical field. Through comparative experiments and questionnaire surveys, this article analyzes the role of AI technology in improving medical record quality, saving doctors' workload, and improving patient satisfaction. The results indicate that the application of AI technology in the quality control of electronic medical records has significant effects and can make positive contributions to the improvement of medical service quality and medical efficiency.

1. Introduction

With the development and improvement of hospital information technology, medical and health data has entered the era of "big data". Electronic medical records are the main carrier of medical information and the core of medical big data. It records the entire process of patients from hospitalization to discharge, including the occurrence, development, and outcome of the disease, providing a large amount of information for hospital management and research work. In 2018, the National Health Commission issued a notice on promoting the informationization construction of medical institutions with a focus on electronic medical records, clarifying the need to fully utilize the informationization function of electronic medical records, promote the improvement of medical management level, and the construction of smart hospitals. At the same time, it also put forward higher requirements for the data quality of electronic medical records. However, in real life, due to various reasons, there are errors, invalidity, incompleteness, inconsistency, heterogeneity, and other issues in electronic medical records. The lack of relevant quantitative evaluation and management methods greatly hinders their secondary development and application. This project combines artificial intelligence with statistical methods, focusing on the two main categories of electronic medical records: structured and unstructured data, and exploring corresponding quality control methods and technologies, laying the foundation for building high-quality medical databases.

2. Quality control of structured electronic medical records

For structured data, it is usually necessary to set some quality controls during the acquisition process, such as medical record homepage data, examination data, etc., which have relatively high quality. By evaluating the data quality, problem finding data can be found, and useful data can be obtained. [1]

2.1. Methods for evaluating the quality of multidimensional data

This project takes structured data as the research object, and establishes a multi-dimensional data quality evaluation index system by studying its data integrity, standardization, logicality, and accuracy. On this basis, a new evaluation method was proposed, which is to establish a new evaluation method and improve it. If mandatory requirements such as gender are not met, it will be considered lacking and the information will be incomplete. Normativeness refers to the definition of "admission condition" as "1. critical, 2. urgent, 3. general" in the assignment dictionary on the homepage of the medical record. However, in actual medical records, in addition to 1-3, there are

other Arabic numerals, or other words and characters that are not standardized. Logicality refers to the logical relationship between relevant data, including lack of logic and logical errors, such as inconsistent temporal representations of the same symptoms in the patient's main complaint and current medical records. Accuracy refers to the authenticity and reliability of data, which needs to be retrospectively verified. However, extreme values of indicators can also be used to assist in judgment, such as demographic indicators, lifestyle descriptions, etc., which should be within a reasonable numerical range and judged according to the actual meaning of each indicator, such as high or low height, young pregnancy age, daily smoking, and high daily alcohol consumption, Both can be treated as suspicious values for subsequent verification and cleaning. [2]

2.2. Data cleaning

On this basis, locate the problematic data and clean it up accordingly to achieve control over data quality. In response to issues such as missing data, anomalies, or inconsistent logic, this project plans to use Natural Language Processing (NLP) technology to conduct semantic analysis and extraction of medical texts in electronic medical records, obtain possible filling values for missing data, test the logical relationships and accuracy between variables, and standardize important indicators such as patient admission status and blood transfusion markers. For materials that cannot be compensated or corrected, they should be marked. For longitudinal follow-up data with multiple records, if there is a missing record, statistical methods such as multiple filling (MI) can be used to fill in the missing mechanism and proportion.

2.3. Application Cases

This study conducted a structured data quality evaluation on more than 30000 inpatients from a tertiary hospital. The results showed that the hospital's medical record homepage data had good integrity and logical consistency, with integrity and logical consistency rates exceeding 99%. The level of standardization needs to be improved, with a standardization level of approximately 86%. And it can correctly identify and locate fault data, laying the foundation for data cleaning. The preliminary experimental results of this project indicate that the multidimensional data quality evaluation method can quickly and effectively identify problems in the medical record homepage data, and achieve quantitative monitoring of data quality. [3]

3. Quality control of unorganized medical record data

The data in electronic medical records accounts for over 80%, which poses certain difficulties for data processing and utilization. So, for this part of the data, we need to post structure it before purifying it to achieve control over data quality.

3.1. Multi level natural language processing for post structuring text data

Post structured processing of electronic medical records is currently the best method. By processing text information through segmentation, integration, extraction, and standardization, this information is transformed into information that can be understood and analyzed by computers, thereby achieving machine readable purposes. Research a multi-level natural language processing method based on text content features and contextual semantic relevance for different types of medical records (patient complaints, medical records, etc.) to achieve accurate and rich structured data after documents. This method analyzes entities, attributes, relationships, and other information in text and converts them into highly granular post structured data.

3.2. Establish a data quality control system

The above steps are all post processing of collected data in the process. To control quality from the source of collection, we have developed an integrated quality control system and automatically verify and control the content of medical records when they are generated, thus achieving the goal of monitoring quality at the source of data collection. We realized the structuring of medical texts, evaluated the quality of medical records, and analyzed the quality of medical records.

3.3. Project Application

At present, a tertiary hospital in China is conducting experiments and evaluations on unstructured electronic medical record data quality control methods, mainly including hospitalization, discharge, disease course, surgery, nursing, and other aspects. Before quality control, hospital medical records could be written according to standardized time, frequency, and completeness. However, there was also a lack of connotation in medical records and a high degree of arbitrariness in writing. Medical records could reflect changes in patients' conditions, and the core value of the diagnosis and treatment process also needed to be improved. And an automatic quality control program has been set up in the medical record writing interface, which can accurately identify problems such as duplicate cases, inconsistent content, and inconsistent time. With the help of medical knowledge maps, through textual information such as patient signs, symptoms, examinations, and tests recorded in medical records, problems such as inconsistent signs and diagnoses, lack of corresponding examination results, and lack of corresponding treatment plans can be found. Experiments have shown that the use of quality control technology can effectively improve the common quality issues in medical records and enhance the intrinsic quality of medical records; In the future, the scope of quality management in medical records can be expanded by setting more quality management standards.

4. Conclusion

The results of this study indicate that the application of AI technology in electronic medical record quality control has significant effects. Doctors have a high level of satisfaction with AI technology, believing that it helps improve medical record quality, save workload, and enhance patient satisfaction. This may be because AI technology can automatically process and verify a large amount of medical record data, helping doctors obtain patient information more quickly and accurately. At the same time, AI technology can also provide intelligent auxiliary diagnosis and treatment suggestions for doctors, further improving the quality of medical services. This study shows that the application effect of artificial intelligence electronic medical record quality control technology in the medical field is significant. In the future, with the continuous development and optimization of AI technology, we have reason to believe that it will play a greater role in the quality control of electronic medical records and make greater contributions to the development of the medical industry. Therefore, we suggest that medical institutions should pay more attention to and apply AI technology to improve the level of medical services and work efficiency. Although this study has achieved certain results, there are still many issues worth further exploration. For example, how to optimize the performance of AI electronic medical record quality control systems to improve their accuracy and stability? How to integrate more medical knowledge and experience into AI technology to improve doctors' diagnostic and therapeutic abilities? These are important directions for future research. In addition, we also need to conduct long-term follow-up surveys with more doctors and patients to evaluate the effectiveness of AI technology in different situations.

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