The Opportunities, Challenges and Ethical Thinking of Medical Big Data

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**Abstract.** The rise of medical big data has brought opportunities for accurate medical services and disease prediction, which can alleviate the contradiction caused by China's high quality medical resources shortage and medical development imbalance. However, the ethical issues such as the leakage of health privacy cannot be ignored. As a socialist country China insists on achieving basic medical health service public welfare, medical big data can serve the national health career only by carrying out the people-oriented concept, adhering to the socialist core values, establishing an effective management system and improving the laws and ethics system.

**Introduction**

Big data technology is designed to extract the value from large-scale and diverse data by high-volume capture, discovery and analysis. In the medical field, a large number of routine medical data generated during clinical diagnosis, research and management, quantitative data of personal signs and activities recorded by mobile Internet and genomic data constitute medical big data [1]. As a developing country with a large population, the health care industry of china is not only a major livelihood issue, but also related to national security and social stability. Big data has brought new ways to alleviate the contradiction caused by the shortage of high-quality medical resources and the imbalance of medical development in China, but it also brings about non-ignorable problems such as the disclosure of citizens' health privacy. It must be rationally planned and cautiously coped with risks to make medical big data serve the socialist medical career better.

**Development Opportunities for Medical Big Data**

The core of big data applications is analysis, and the primary aspect of medical care is diagnosis. Big data can greatly improve the analysis and diagnosis ability of medics, thus brings about a new means for medical innovation to provide accurate and intelligent medical services for the public.

Promote the transformation of conventional medicine towards precise and intelligent medical medicine. Most of the current medical methods ignore the characteristics of the disease and the environmental conditions of patients, are based on the average model of disease, which not only waste limited medical resources, but also makes the moral and medical level of medics questioned [2]. Data mining technology can be used to analyze and diagnose patients in a smaller and more precise range [3], thus provides patients with personalized and precise treatment. With the help of genetic identification, medics can find out most of the information of the whole life when one is born. The “China Precision Medical Plan,” officially launched in 2016 is dedicated to develop a personalized and precise treatment for patient based on genetic information and patient characteristics.

Improve disease prediction capabilities and establish a national health monitoring system. Through the patient's continuous electronic medical record, with the help of digital medical equipment medics can solve the misdiagnosis caused by inaccurate and incomplete medical history, and further establish a disease warning for key patients. In terms of epidemiological predictions, such as the “Google Flu Trends” developed in 2007 is based on the concept of information epidemiology. Although just a flash in the pan, it shows us a new method of epidemiological prediction. Analyzing of the individual
medical history data and the real-time physical signs of the groups makes individual disease prevention and early warning of group infectious diseases possible [4].

**The Practical Challenge of Medical Big Data**

Under the current medical conditions in China, medical big data faces some practical challenges before it plays a role.

The quality of medical data is not up to the standard, and the whole medical data is in a state of information isolation. The quantity is far from enough for data analysis, and there is no standardized medical big data standard in the medical industry. In medical institutions, they maintain their own data standards and the data of different medical institutions cannot be recognized by each other, which not only seriously hinders the utilization of medical data, but also makes it difficult for big data analysis to obtain objective prediction to guide medical practice with such non-standard and incomplete data.

Big data technology is not practical and still has some defects [5], which is prone to over-fitting and other problems. The application of big data technology is in a state of black box, and even the designer cannot explain why such prediction is made by the algorithm, that may lead to serious consequences in the medical industry.

Medical big data lacks application guidance and needs effective supervision. The call for developing medical big data in the medical industry is high, but there is no clear direction to solve practical problems. Medical big data’s value is greatly reduced because of the lack of interdisciplinary talents, medical knowledge and big data technologies cannot be deeply integrated. Furthermore, Laws, regulations and management for medical big data are also not perfect, has not form effective supervision. There have been cases like transmission of Chinese human genetic resources abroad without permission.

**Prominent Ethical Issues in Medical Big Data**

Medical big data, in the process of development, inevitably causes some human social ethical problems because of the lack of practical experience and legal constraints. It will hinder the development when reaches a certain stage even cause social chaos.

The mainstay and responsibility of medical treatment are not clear. The application of big data can greatly reduce the face-to-face contact between medics and patients in the health care industry. Medics can only see the digitized results of examination, but fail to feel the suffering of patients, which will weaken the humanism spirit of medics and then cause the lack of medical ethics [6]. Also patients cannot feel the medical skills and care from medics, only a diagnosis and treatment from the big data algorithm, and the sanctity of life-saving will be greatly reduced. Using diagnosis and treatment from the medical big data algorithm as the final decision will blur the division of responsibilities of medical accident, which will injure the already tense relationship between medics and patients. Medics as a subsidiary of big data algorithms reduced to be a tool to take a scalpel, not only lose the sacredness but also the value of the existence of profession.

Individual and group’s health information and medical privacy could be leaked. Disclosure of one’s health information, especially genetic information, will have a serious impact on one’s family, work and life, and maybe evolve into genetic discrimination [7]. B-ultrasound’s using for gender identification on newborn babies in the era of birth control has caused the imbalance between the male and female population in China, the leakage of genetic information of newborn babies will not only impact the population structure of china, but also aggravate social abortion and other phenomena challenging the social ethics of human beings. In the age of big data, the disclosure of individual health privacy will also lead to the disclosure of group privacy, its impact on social stability cannot be ignored.

The ownership to medical data is unclear and the parties lack the right to know and dispose of. When data is Shared or transferred, there is no secondary authorization mechanism to control the collection and destruction of medical data. Individual valueless data will become valuable after big
data analysis, although the ownership of the data is still disputed, but in fact it is completely controlled by third party organizations for data collection.

Coping Strategies

In order to solve the practical challenges and ethical issues of medical big data, it is necessary to adopt a multi-pronged approach through socialist core value guidance, institutional and ethical construction, and professional personnel training, and adopt various measures to comprehensive social governance to solve these problems.

Firmly establish a people-oriented application concept and adhere to the socialist core value orientation. Medics should be in a dominant position in the medical system, and patients should be in a main position. On one hand, it is necessary to carry out education on socialist core values among medics, rectify medical ethics, strengthen ethics education, advocate dedication and friendship, and guide the correct value orientation of medics. On the other hand, it is necessary to integrate health care into the rule of law, to create equal opportunities for medical treatment, to maintain a harmonious relationship between doctors and patients, to serve a prosperous and harmonious country, and to build an equal and rule-based society.

Establish a unified medical big data management organization and coordinate the development of medical big data as a whole. It is necessary to establish a unified medical big data management organization to conduct unified management and unified authorization sharing of medical data across the country. Formulate and publish national standards for medical big data, and steadily promote the construction of a medical big data platform nationwide. Develop a strict confidentiality system, use mature information security technology to strictly protect citizens' health and privacy [8], and coordinate social organizations to conduct strict technical and ethical review of medical big data to be applied.

Establish a national-level medical big data application demonstration base, formulate and improve relevant laws, regulations systems. Focusing on solving the outstanding problems of health care in China, concentrating on superior resources and exploring the establishment of a national-level medical big data demonstration base to point out the direction for the application of medical big data. In the construction, explore the application of big data to medical practice, and the application will be extended to the whole country after the application is mature. In the process of building the demonstration base, ethics discussion and legal publicity are widely carried out, through the wide participation of the public, experts, scholars and medical personnel to improve the awareness of medical big data ethics and the awareness of information security of the public. Guide the construction of ethics and legal system with practice, and put the construction of medical big data on the right track.

Summary and Consideration

Although medical big data is faced with many challenges and ethical problems, medical big data will greatly contribute value to alleviating the shortage of high-quality medical resources, promoting the improvement of the national health level, and realizing intelligent medical treatment by adhering to the people-oriented concept and correct value orientation, establishing a positive and effective management system, improving the legal system, strengthening personnel training and ethical education.

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