

# Medical Big Data: Both an Opportunity and a Challenge for Chinese Pharmaceutical Innovation

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**Abstract:** Medical big data, adopted as a public health database, whereby pharmaceutical professionals have been having easier access to multiple viewpoints and enormous amounts of medical data in a dynamic and intuitive presentation during pharmaceutical R&D (research and development), has brought more opportunities for pharmaceutical innovation. However, there are currently few platforms in China for exchanging and linking medical big data. By using an examination of the current scenario based on opportunities and challenges, we suggest the essential foundations and prospective advantages of medical big data in this paper. We also present viable solutions through developing an assessment system, protecting intellectual property rights, and encouraging professional development in the fields of technology and medicine to halt or even reverse China's fragmented and inadequate medical wisdom system.

**Keywords:** Medical Big Data; Public Health; Pharmaceutical Innovation

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## 1. Introduction

China's public health information construction is progressing in the big data era, and the emergence of medical big data is both an objective fact and a potential future development path. In the field of public health, China continues to struggle with both infectious and chronic diseases, and pharmaceutical innovation is a breakthrough in the treatment of severe diseases, particularly now that the covid-19 situation is still unstable. An interconnected and information-sharing medical big data platform will undoubtedly considerably accelerate pharmaceutical innovation because it needs enormous volumes of medical data as a scientific foundation. Based on the analysis of the current situation of medical big data in China, this paper explains how medical big data can provide new opportunities for pharmaceutical innovation through theoretical illustrations and case studies. In order to better support pharmaceutical innovation, it also analyzes the issues China's medical big data platforms now face and suggests development paths.

## 2. Big data and public health

According to IBM, "the Big Data era's data continuously produced by a variety of industries every day exhibits Volume, Velocity, Variety, Value, and Veracity." The medical sector exhibits these similar characteristics. China has amassed a sizable amount of data resources in the public health sector, including clinical data, personal health electronic reports, and medical laboratory data. This has occurred as a result of the progressive expansion of the medical market and the ongoing development of medical technology. These data offer fresh approaches to addressing issues in public health. Due to the necessity for epidemic prevention and control as well as medical research, medical big data has especially helped innovation in healthcare service models and medical technology since the emergence of the covid-19.

## 3. Medical big data: a new opportunity for pharmaceutical innovation

It is worth noting that pharmaceutical innovation represents a solution to the problem of public health. Medical big data provides new opportunities for pharmaceutical innovation.

Theoretically speaking, as scholars such as Yao Xuefang, and Ding Jinxi state, "Innovative drug research and development has the typical characteristics of accumulated innovation: high investment, high risk, long cycle, high added value, and high technology. The pharmaceutical industry incorporates advanced technical tools from various fields, and the development and manufacturing of medications demand the incorporation of the most recent theoretical advancements and instruments from several fields[1]." In other words, R&D (research and development) professionals must thus consult, study, assess, and compile millions of pages of

material to produce each new medicine. With the support of medical big data, the use of data and information for pharmaceutical R&D is no longer limited to traditional literature searches but can be analyzed through multiple perspectives and massive amounts of data in a dynamic and intuitive presentation to help R&D personnel discover the direction of pharmaceutical innovation, exclude failed experimental protocols and compare the efficacy of related drugs. As a result, the cycle of pharmaceutical innovation will be shortened, and the success rate of pharmaceutical development will rise.

Practically speaking, there are already typical medical big data platforms in China that support pharmaceutical innovation in various aspects, including pharmaceutical development, project development, and market registration. For example, in China, the widely used pharmaceutical data platforms Pharnexcloud ( <https://pharnexcloud.com> ) and YAOZH (<https://www.yaozh.com>) integrate global pharmaceutical data resources and provide services not only for pharmaceutical development but also for the pharmaceutical formulation, pharmaceutical investment, and marketing simultaneously.

## **4. Ways to create an interconnected and information-sharing medical big data platform**

Medical Big Data is both an opportunity and a challenge for Chinese pharmaceutical innovation. Yu Xiaopeng, Yang Chuanjia, and Yang Jing have pointed out that: “The sharing of medical big data in China has made great progress, and various medical big data systems have emerged one after another. However, in general, China’s medical data sharing is still at a relatively low level, and the value of medical data itself has not been fully played[2].” China must create a more open information platform for sharing and connecting medical data. To support pharmaceutical innovation, reduce the dual burden of infectious and chronic diseases, and address public health issues, deeper use of medical big data is required.

### **4.1 Establish a medical data evaluation and regulatory mechanism**

Incorrect data can obstruct drug developers and hinder the process of developing new drugs, which is why pharmaceutical innovation needs strict data accuracy. There is no established mechanism for evaluating and regulating data. And many data are submitted to big data platforms without professional evaluation, making their validity and accuracy impossible to be guaranteed. Gao Feng, Shi Jian, and Dong Xiaojian make the suggestion in their essay on the state and future outlook for digital medical record management systems “The standardization of the entered data is a requirement to enable information exchange. A single and standardized information format needs to be created and used to simplify information transmission within institutions and even worldwide[3].” For big data medical platforms, a universal standard should be set to standardize the format and evaluate the accuracy of the entered data.

### **4.2 Protect medical data property rights**

Data information related to pharmaceutical innovation is sometimes extremely specialized and frequently concerns core medical technology and even patient privacy. Although medical big data platforms require complete and diverse data, hospitals tend to refuse to share complete and authentic medical data because of a lack of data intellectual property protection. Once the data is made public, there is a risk of data property rights being violated if there is no system in place to protect them. Researchers are also concerned about the property rights of secondary development data in the process of developing new drugs.

At the BOE Global Innovation Partnership Conference, Lu Qingjun, director of the National Health Commission's Telemedicine Management Training Centre, stated that “The sharing of medical data must be based on respecting the intellectual property rights and data usage rights. Without intellectual property rights for raw data, secondary development data, and future data, data application and data interconnection will be bottlenecks.” Uniform standards for defining property rights for medical data should be set to ensure that medical data is truly shared.

### **4.3 Increase the training of related talents and promote related technological innovation**

According to Yan Xin, Ding Peng, and Liu Zhihong, “Due to a lack of data mining tools or incorrectly drawn findings from the usage of data mining techniques, big data may have a negative impact on scientific study. These disturbances can be gradually resolved by strengthening the development of big data mining techniques and talent training[4].” Public Health in China claims that: “China has a shortage of complex talents with multiple backgrounds in medicine, public health, and informatics[5].” To make up for this shortage, it is not advisable to only shift the responsibility for talent development to schools since the knowledge and technologies in the field of pharmaceutical innovation are being updated at such a quick rate that school training programs can no longer satisfy the needs of the market. The shortage of skills and expertise can be compensated for by developing multi-faceted

collaborations. For example, long-term collaboration between pharmaceutical companies and academic research centers will not only promote pharmaceutical innovation but also facilitate the long-term development of innovative talents.

## 5. Conclusion

In the current state of urgent global public health challenges, China has sufficient incentive for pharmaceutical innovation, but the shortage of pharmaceutical innovation expertise is a major obstacle. The emergence of medical big data platforms can partially alleviate these deficiencies. Big data is both an opportunity and a challenge for pharmaceutical innovation in China. Considering the rise of big data, creating an interconnected, information-sharing big data platform and effectively utilizing the value of big data are crucial to fostering pharmaceutical innovation.

China's current medical big data platforms still have loopholes and are mostly operated by internet-based small and medium-sized enterprises, which cannot maximize the potential of medical big data. Based on China's national conditions, building an interconnected medical big data platform requires the long-term cooperation of multiple forces such as government, enterprises, regulatory bodies, and universities.

For pharmaceutical innovation, the primary function of medical big data platforms is to provide the data support needed for pharmaceutical development as well as post-development services such as patent application, marketing, and evaluation. In conclusion, these platforms aim to provide an online virtual environment that is conducive to pharmaceutical innovation. A strong medical data evaluation and regulatory mechanism and a property rights system of medical data are necessary for pharmaceutical innovation, and even the evaluation and protection of data should precede its distribution and secondary use.

China's public health has traditionally suffered from a severe talent and technological gap, and in the big data era, it is even more critical to have inventive and sophisticated skills and cutting-edge technology. It won't be simple to change this situation; it will take sustained efforts and the participation of many parties.

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