



OHDSI + Privacy Computing Practice in Shanghai Medical College of Fudan University

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Background

With the further development of global medical informatization, the medical industry has accumulated a large amount of health data, reaching EB and even ZB level. Since these health data exist in various medical institutions, it is impossible to circulate them in an orderly manner. The integration of "AI + Healthcare" is becoming an important promoter for accelerating the digital and intelligent evolution of medical technology. Health data is especially important for clinical research, and multi-center research institutions always have better medical research efficiency, It can bring together health data from multiple parties in an orderly and secure manner to better serve clinical research, which can achieve greater advantages in data volume and dimension with the use of multi-party data fusion and collaboration, and then can also explore and utilize the value of data more deeply and comprehensively.

Shanghai Medical College, Fudan University will seize the historic opportunity to be included in the pilot construction of high-level local universities in Shanghai, and further expand its advantages and make up for shortcomings. Using the integration of "AI + Healthcare", we will innovate in the field of clinical scientific research, actively promote multi-center research cooperation, build a multi-party data collaboration model, and jointly promote the research progress of clinical medicine. It will promote interdisciplinary cooperation, scientific research innovation and integrated innovation to accelerate the overall development of medical disciplines. It will mend its pace to build a top domestic and world-class medical school to make new important contributions to the improvement of people's health and the construction of healthy China and healthy Shanghai.

Methods

Determine the quality management content of multi-center clinical research medical data, and confirm the multi-center clinical research medical data collection process and quality control content through literature review and expert consultation. On the basis of the investigation of the medical data quality management system of a single institution, a standard framework for the construction of a multi-center medical data platform was constructed, and a multi-center clinical research data quality management system was established from multiple dimensions such as operating procedures, information collection, and quality control.

Based on the core technologies of privacy computing (federated learning, secure sandbox, multi-party secure computing, etc.), the privacy computing engine is used to ensure the safe flow of data. Referring to the experience of multi-center clinical research projects and guided by the **OMOP CDM** model, a multi-center clinical research approach is proposed, which closely combines the project lead and participating units, Bringing together multi-party research data on the platform for joint application in research can increase the dimension and breadth of clinical research data, and relies on the project to build a data platform Cooperation in the cultivation of medical talents and the research and promotion of new technologies. This project builds a scientific research data collaboration platform, improves data collection and governance capabilities, According to the cooperation mode of the OHDSI model, create a unified medical terminology system, accelerate the process of medical data circulation and application, and empower clinical research cooperation and medical data sharing with advanced technology. creates a data security sharing mechanism, and improves the integration of data resources, so as to promote the pilot construction of relevant high-level local universities in the "Clinical Interdisciplinary Research Institute of Fudan Shanghai Medical College" related projects. Provide relevant platform support for "building multiple high-level multi-center clinical medical research projects".

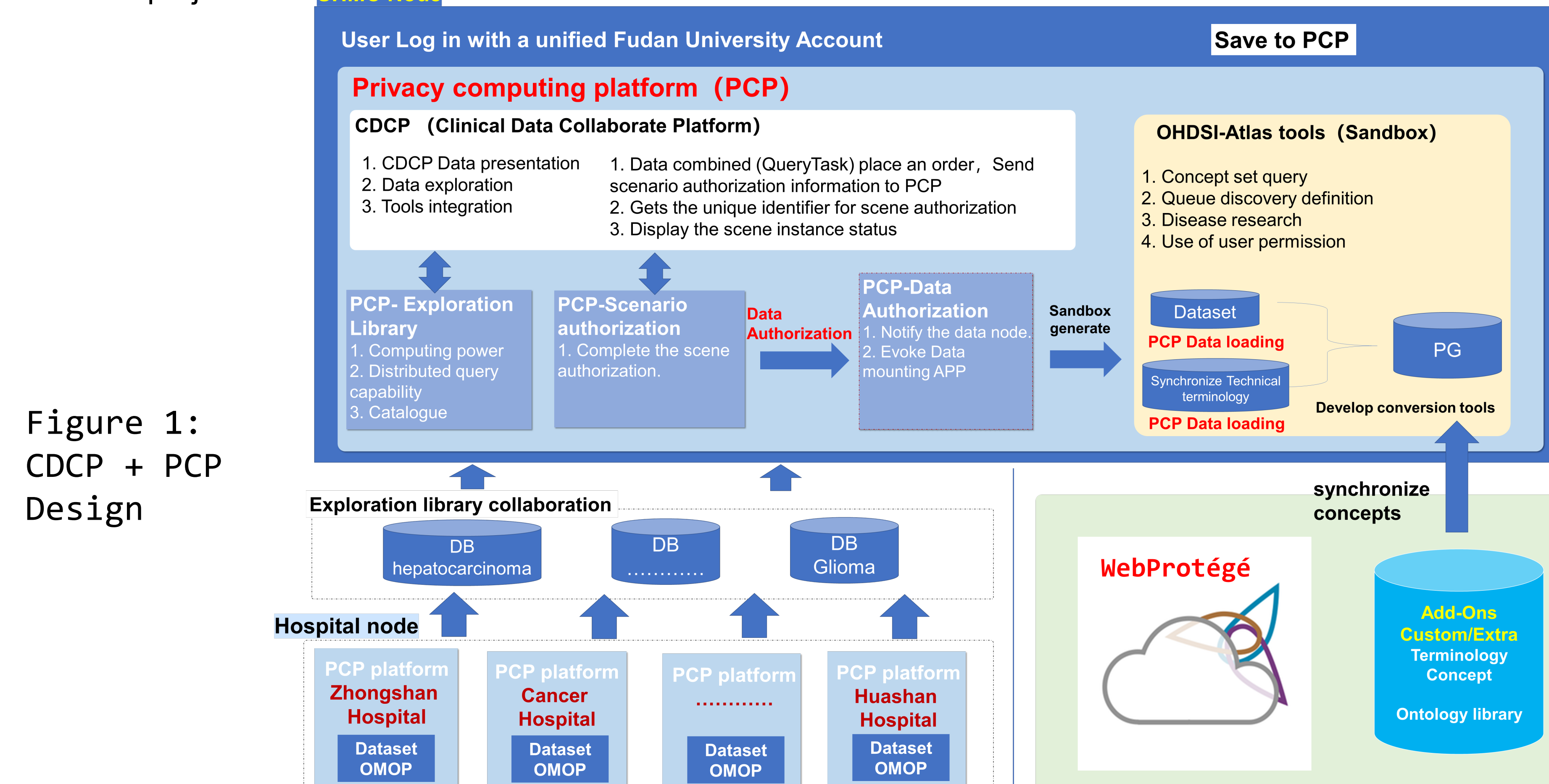
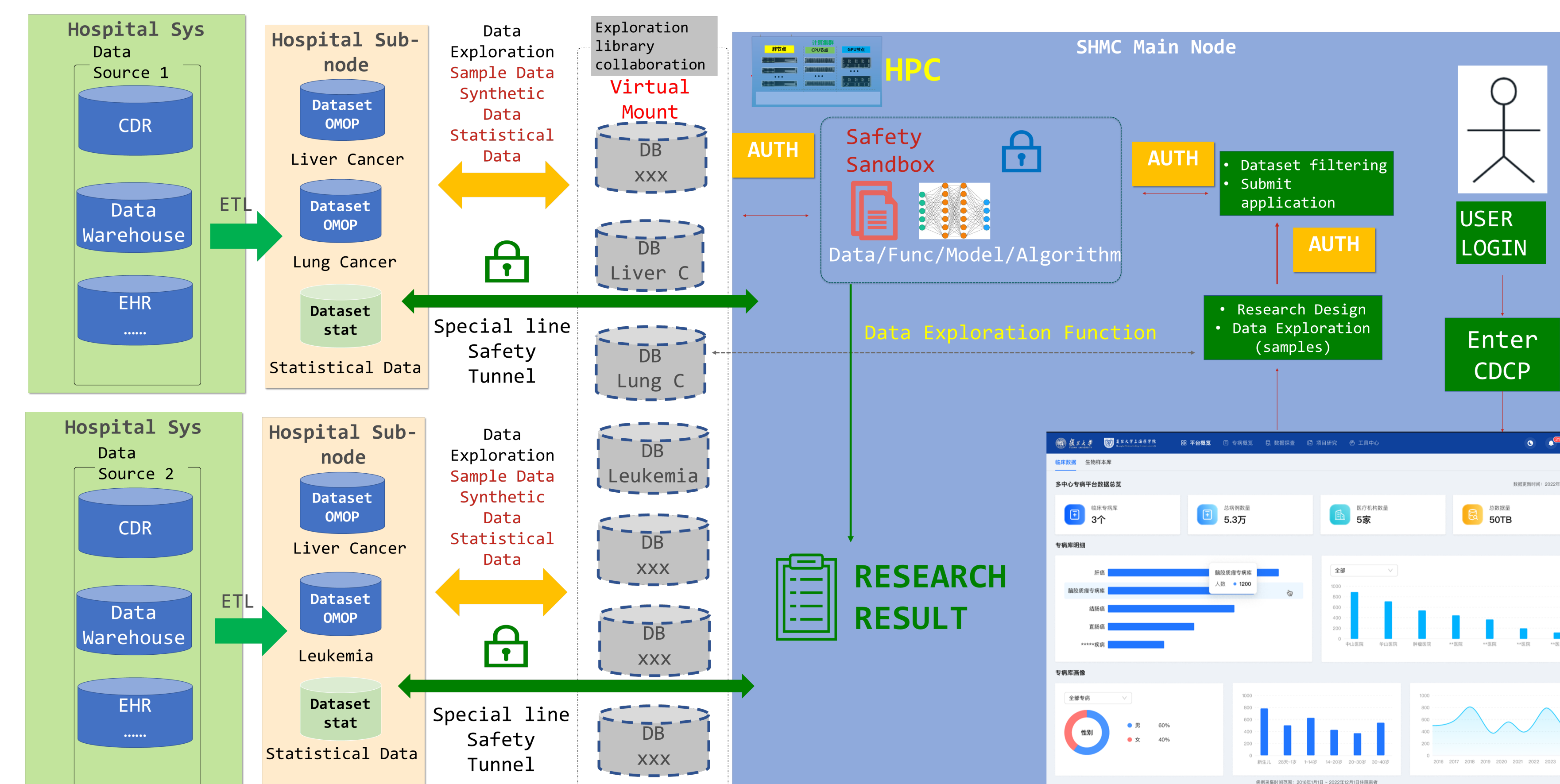


Figure 1:
CDCP + PCP
Design

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Figure 2:
Conceptual
Topology



Results

This is an active project until end of 2023 and still in progress. As an important support platform for multi-center clinical research, combined with the actual needs of Shanghai Medical College of Fudan University, and in accordance with relevant laws and regulations, it provides medical data management support for multi-center research projects that comply with the principles of medical ethics and relevant regulations. A basic privacy computing platform is established to fully utilize the value of data research on the basis of data governance on the premise of protecting data security and authorized use. Multi-center data fusion brings the following key advantages to the medical research of Shanghai Medical College of Fudan University:

- ◎ **Eliminate or reduce data bias:** differences in research areas, methods, and methods will bring data differences between different research centers, and through data fusion, data bias can be eliminated or reduced, so that the generalization ability of research results is stronger;
- ◎ **Expand the sample size of research:** Data fusion can enable the sharing of clinical data between different research centers, expand the amount of data samples required for scientific research, and improve the performance of the final AI model.
- ◎ **Reduce manpower input:** Different from the traditional method of manual sample collection, the project platform can effectively collect medical data from multiple parties, reduce manpower investment, and accelerate the process of clinical research.

Conclusions

In evidence-based medical research, single-center clinical studies often have certain limitations, such as small sample size; The representation of the selected cases is not broad and comprehensive; Limited by the diagnosis and treatment expertise of the research center, patients with certain disease characteristics are concentrated; The reflected clinical diagnosis and treatment mode is single, etc. In recent years, multi-center clinical research has been carried out in many disease research fields, that is, multiple research units and researchers have completed the research work collaboratively according to the same research design and for the same research purpose. Multicenter clinical studies can be clinical drug trials or more generalized clinical studies, including prospective and retrospective clinical studies.

This project relies on the private computing platform which contains a lot of usable but invisible data. It only provides data value but does not disclose the original data. Meanwhile, it realizes the unified, standard, and whole-process quality management of each center. Multi-center studies will include more cases, effectively integrate resources, and obtain more data quickly, and expanding the sample size will greatly improve the quality and value of the research; In addition, the more important advantages of multi-center research are that it covers more diverse research subjects, overcomes the bias and systematic error of the study to the greatest extent, and brings the research results closer to the truth of the clinical research to reveal the problem, and can fully mine and utilize multi-center medical datum. It can help doctors to make more accurate clinical diagnosis, more accurately predicts the cost and efficacy of therapeutic schedule, better evaluates drug efficacy and safety and medical technology, more effectively analyzes population health data, and predicts disease outbreaks, etc.

It will play an important role in high-level scientific research and striving for innovative breakthroughs. It can also accelerate the progress of multi-center clinical research to provide key data guarantee for promoting interdisciplinary cooperation and scientific research integration and innovation. Also, it is conducive to further promote and deepen the reform of medical education management system of Shanghai Medical College, Fudan University, and helps Fudan University build a first-class clinical medical discipline. It has significant social benefits.