

# The Research of Tai'an Big Data Ecological Status Based on IPV9

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**Abstract**—In recent years, medical problems have always been a topic of concern. With the improvement of people's life quality, the attention to diseases has also reached a new height. It has also become a livelihood issue for the whole nation to enjoy low-cost and high-quality medical services. This paper researches the current situation of China's medical treatment, summarizes the existing problems in China's medical treatment, analyzes the development situation and opportunities of China's big data in medical treatment, and finally introduces and analyzes the Tai 'an health ecosystem based on the independent and controllable new network IPV9 technology, and forecasts the brand-new digital medical network. In information age, new IT technology will inevitably become the key to the development of medical care.

**Keywords**-Health Platform; Medical Big Data; IPV9

## I. PROJECT BACKGROUND

In the "13th Five-Year Plan for Deepening the Reform of the Medical and Health System" issued by the State Council in December 2016, it was proposed that during the "13th Five-Year Plan" period, it is necessary to have conduct New breakthroughs on grading diagnosis and treatment, modern hospital management, universal medical insurance, drug supply

security and New breakthroughs have been made in the construction of 5 systems including supervision, and promote reforms in related fields at the same time<sup>[1]</sup>.

The "13th Five-Year Plan for National Population Health Informatization Development Plan" issued by the National Health and Family Planning Commission in January 2017 requires: strengthen the construction of population health informatization and health medical big data service system vigorously, and promote the government health medical information system and Public health and medical data interconnection , open sharing, eliminate information barriers and islands, focus on improving the ability of population health information governance, vigorously promote the development of medical big data applications, and explore new models of "Internet medical treatment" services.

The " 'Thirteenth Five-Year Plan' for Shandong Province's Population Health Informatization Construction" issued by Shandong Province in August 2016 clearly pointed out that it is necessary to accelerate the promotion of population health informatization construction and improve the level of health and family planning services. By 2017, all provincial and municipal platforms will be completed and interconnected. By 2020, the health and family

planning information network and grassroots information management system will expand to cover non-governmental health and family planning institutions. It is proposed to improve the construction of regional population health data centers and health and family planning information networks, strengthen the standardization of provincial and municipal population health information platforms, and strengthen the application of public health management information, family planning management information, medical services and security information, and drug procurement management. Information application, comprehensive management information application, administrative office information service, improve the construction of information security system, promote the "one-card use" of population health information, and promote the "Internet + health care" services to facilitate people and benefit the people.

## II. PROBLEMS IN THE MEDICAL INDUSTRY

Population growth and aging, the expansion of the medical market in developing countries, the advancement of medical technology and the continuous increase in labor costs will drive the growth of expenditure. Global medical expenditures in 2017-2021 are expected to grow at a rate of 4.1% per year, while the growth rate in 2012-2016 is only 1.3%. Increasing incidence of chronic diseases, changing dietary habits and increasing obesity have exacerbated the upward trend of chronic diseases, especially cancer, heart disease and diabetes. There are currently about 114 million diabetic patients in China, and the number of patients in the world is expected to increase from 415 million at present to 642 million in 2040. Traditional research and development (R&D) costs have risen, and the time to market has been slow. From 2004 to 2014, drug development costs increased by 145%. The labor force is insufficient. With the rapid changes in the population structure and the rapid development of technology, skilled and semi-skilled healthcare workers will be greatly reduced.

### A. Supply-demand structure imbalance

In 2016, there were 2.31 practicing (assistant) physicians per 1,000 population in my country. In 2015, the number of physicians per thousand population in my country ranked between 25-30 among the countries counted by OECD. In addition, the poor practice environment of doctors in my country has made fewer outstanding talents enter the medical system year by year.

### B. Unbalanced development of medical resources

From 2010 to 2016, the compound growth rate of the number of diagnosis and treatment and the number of institutions in tertiary hospitals were 10.7% and 8.3%, respectively, while that of primary hospitals was only 1.5% and 0.4%. The traditional mode of medical treatment makes the tertiary hospitals overcrowded, resulting in poor medical experience and serious waste of high-quality medical resources. Therefore, my country still regards the implementation of graded diagnosis and treatment as the current primary task.

### C. Medicare Overdraft

"The China Medical and Health Care Development Report 2017" predicts that by 2024, a cumulative deficit of 735.3 billion yuan will be in deficit. Improving the ability of medical insurance to control fees and exploring innovative payment mechanisms are imminent. Therefore, it is imperative to improve the existing medical treatment model and implement graded diagnosis and treatment.

In 2015, the National Health and Family Planning Commission proposed that a tiered diagnosis and treatment system will be fully established in 2020, including primary consultation at the grass-roots level, two-way referral, swift triage, and up-down linkage triage. During the construction of the new model, there are three main problems.

1) Information does not circulate, and most medical institutions are isolated islands of information, and patient information cannot be quickly shared and circulated;

2) Resources are not circulating, high-quality doctors are mostly concentrated in the top hospitals of major provincial capitals, and the top three hospitals have limited energy, and the primary medical care they can support every year is limited;

3) Interests are not interlinked, and there is no effective mechanism of interest binding between hospitals to promote the circulation of patients between hospitals.

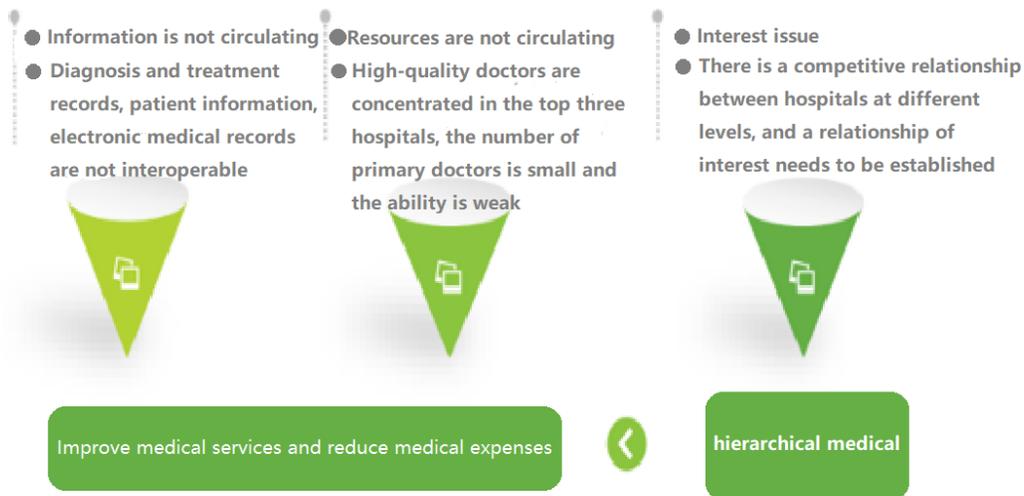


Figure 1. Problems encountered in the implementation of graded diagnosis and treatment in 2018

*D. Aging enters a serious stage*

According to the China Industry Information report, in 2017, my country's population over 65 years old accounted for 11.4%, the birth rate was 12.43% (2016 birth rate 12.95%), and the population structure showed an aging trend. Based on 2013, the over-two-week visit rate of people over the age of 65 is 26.4%, and under

the influence of modern living habits, the incidence of chronic diseases such as diabetes and hypertension is also increasing<sup>[2]</sup>. The number of diagnosis and treatment will continue to rise, and the medical system will also face great pressure. As shown in Figure 2, Figure 3.

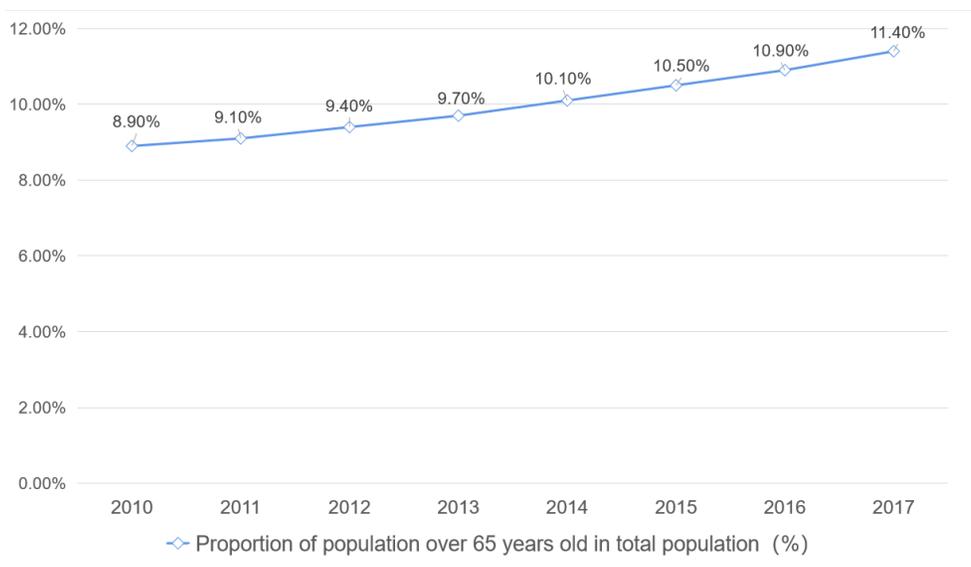


Figure 2. Proportion of the population aged 65 and over in China from 2010 to 2017

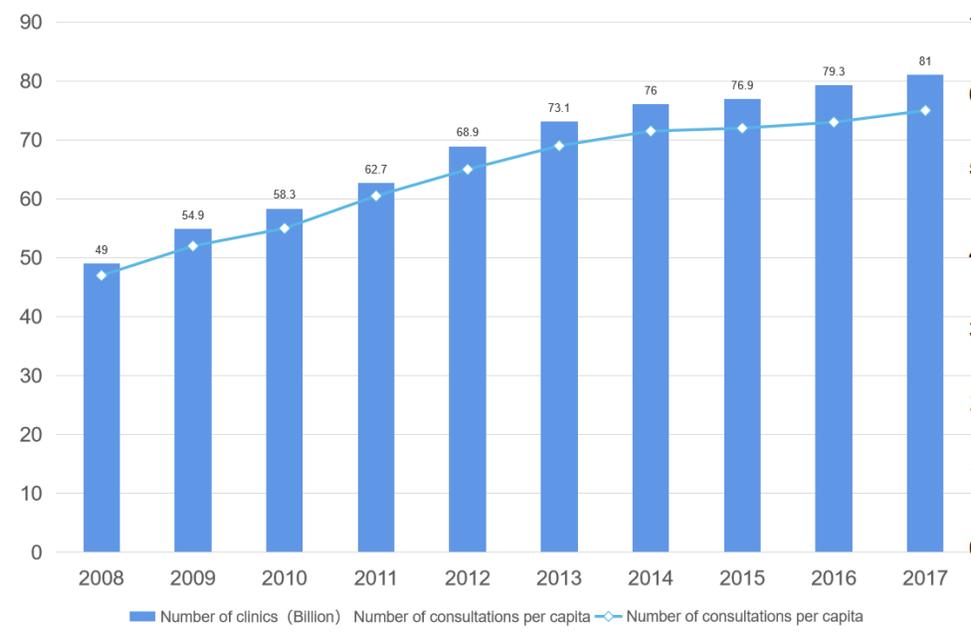


Figure 3. Number of consultations and treatments per capita in my country from 2008 to 2017

#### E. High proportion of chronic diseases, sub-health, and lung cancer

There are 170 million people with hypertension and more than 100 million people with high blood fat in my country. There are 92.4 million people with diabetes, and an average of one person has diabetes every 30 seconds. At present, the sub-health ratio of white-collar workers in mainstream cities in my country is as high as 76%, and the number of white-collar workers who are overworked is close to 60%. The proportion of healthy people in the true sense is less than 3%. my country has more than 800,000 newly diagnosed lung cancer patients each year, and the death rate ranks first among all malignant tumors.

Chronic diseases in my country have the characteristics of "large number of patients, long duration of illness, high cost of medical treatment, and large demand for services", which has formed the predicament of the Chinese medical industry.

#### III. DEVELOPMENT STATUS OF CHINA'S MEDICAL MARKET

The development of the medical big data industry is driven by valued medical care (that is, the win-win of medical service quality and medical cost), and its potential value space is huge, and it is generated in specific application scenarios. The service targets of medical big data can be residents, medical service institutions, scientific research institutions, medical insurance management institutions and commercial insurance companies and public health management departments.

McKinsey's 2013 report predicted that in the United States alone, the application of medical big data is expected to reduce medical expenses by 300 billion to 450 billion US dollars per year. China has huge population base, serious waste of medical resources, shortage of medical resources and unreasonable allocation, excessive growth of medical expenses, and weak development of commercial insurance. The application of medical big data is rich and can be deeply explored. The market size is at least 100 billion.

At present, the domestic medical big data industry is still in its infancy, and it is moving towards the growth stage, and the market scale is constantly rising. According to the analysis report of the Global Health and Medical Big Data Industry Development Prospects and Investment Strategic Planning Analysis 2018-2023

released by the Prospective Industry Research Institute, the market size of China's medical big data industry in 2015 was about 46.6 billion, and there is still room for future growth. bigger. The market size is expected to reach 91 billion yuan by 2022. As shown in Figure 4.

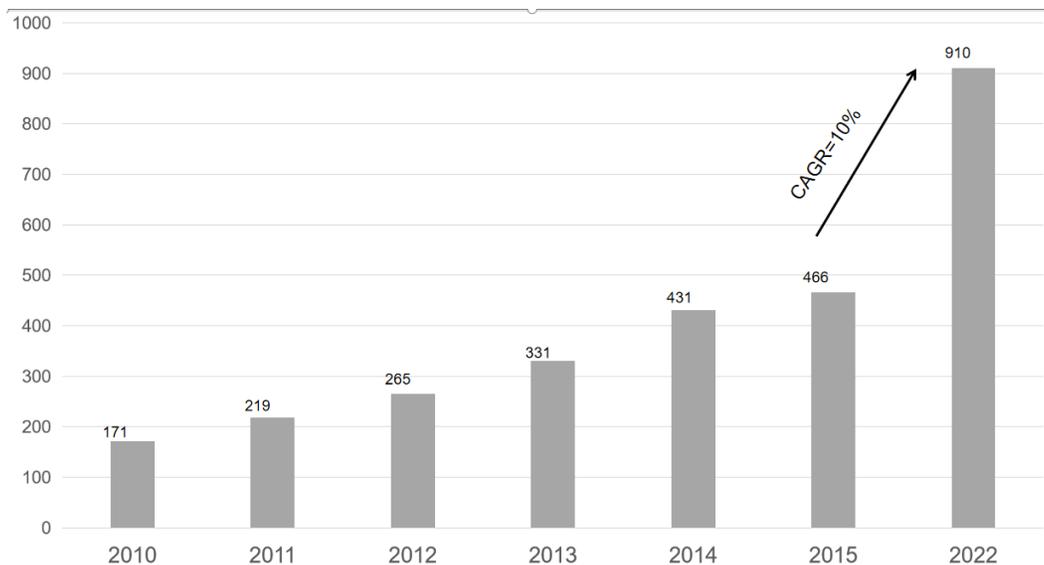


Figure 4. Market scale and forecast of China's health and medical big data industry (unit: 100 million yuan, %)

#### IV. TAI'AN HEALTH BIG DATA PLATFORM

##### A. Future Network IPV9

IPV9 officially applied for a patent certificate in December 2011. The main content refers to the 0-9 Arabic digital network as a virtual IP address, and the decimal is used as a text representation method, that is, a method of use that is easy to find online users; Efficiency and convenience for end users, some of which can be used directly as domain names; it has an endless number of assignable IP addresses and has a maximum of  $2 \times 2048$ -bit addresses, which is the cornerstone of the future digital world<sup>[3]</sup>. At the same time, because it uses the classification and coding of the original computer network, cable broadcast TV network and telecommunications network services, it is also known as "the new generation of safe and reliable information integrated network protocol."

Compared with IPv4 and IPv6, IPV9 has more obvious advantages, its address space is larger, the routing table forwards packets faster, it can provide better and cheaper network platform services, and has better security And compatibility, the most important thing is that IPV9 has independent intellectual property rights, and China has mastered the core technology, based on IPV9 technology to establish a safe and controllable and compatible traditional network Internet system, further promote the formation of ISO future network standards, thus breaking the United States Internet hegemony puts cybersecurity in your own hands. The formation of network standards in the future will further promote the independent establishment of Internet systems in various countries to achieve safe and controllable cyberspace.

## *B. China's Big Data Ecosystem*

### *1) Opportunities for The Construction of China's Big Data Ecosystem*

Taking the opportunity of urban transformation as an opportunity to actively plan for the construction of new smart cities and create a benchmark for the construction of new smart cities in my country has become a development goal in the process of urbanization everywhere. Among them, smart medical is not only an important part of the construction of smart cities, but also an important part of promoting the reform of the medical and health system.

The maturity of IT technology, the emergence of SOA technology, SaaS application mode, and the rapid development of high-tech technologies such as wireless networks, the price of IT equipment is getting lower and lower, making this construction practically feasible from a technical and economic perspective. At the same time, with the continuous application of cloud computing technology in the practice of medical informatization, regional medical informatization construction can achieve better results on this basis.

The national health industry development realizes major projects for the conversion of old and new kinetic energy, and provides great opportunities for the development of big data ecological domains throughout the health area. Continue to integrate and promote the leapfrog development of the city's health service industry, and promote economic development with the adjustment of the health service supply side.

In August 2007, the Ministry of Information Industry formally defined IPv9 as the next-generation Internet to distinguish IPv6 from the next-generation Internet. On February 23, 2013, the State Council issued a notice on the national mid-term and long-term plan for the construction of major scientific and technological infrastructure (2012-2030), which stated in the construction of key future network test facilities during the "The Twelfth Five-Year Plan" period: Relying on increased bandwidth and progressive

improvement can no longer meet the needs of future development. To break through the future network basic theory and support the new generation of Internet experiments, build future network test facilities, mainly including: original network equipment system, resource monitoring and management system, covering cloud Open services such as computing services, IoT applications, spatial information network simulation, network information security, high-performance integrated circuit verification, and quantum communication networks.

For the future network based on IPv9, the document requires accelerating the construction of major scientific research infrastructure such as the national future network test facility, and actively carries out network new technology, new application test verification and application demonstration, and requires significant enhancement of the network information technology independent innovation ability Form the first-mover advantage of future network technology.

### *2) The Situation Facing China's Big Data Ecological Domain Construction*

The environment at home and abroad has undergone profound changes, medical service capabilities and residents' family health awareness have been continuously improved, and the "Healthy China" strategy has been implemented in depth. The Party and the country attach great importance to the health work of the whole people. The Fifth Plenary Session of the Eighteenth Central Committee of the Party will raise "healthy China" into a national strategy. The country has successively issued policy documents such as "Outline of "Healthy China 2030"", "Outline of Strategic Planning for Traditional Chinese Medicine Development (2016-2030)", and "National Nutrition Plan (2017-2030)". The development of the healthcare industry has created a good environment.

The State Council approved the "Overall Plan for the Construction of Comprehensive Experimental

Zones for Conversion of New and Old Kinetic Energy in Shandong". Shandong Province is vigorously implementing major projects for the conversion of old and new kinetic energy, accelerating the promotion of "four new" to promote "four modernizations", and actively creating a national demonstration province with integrated medical and nursing care As one of the "top ten" industries in the province's conversion of old and new kinetic energy, the healthcare industry clearly proposes the development goal of building a trillion-level healthcare industry by 2022. As an important meeting point for the improvement of people's livelihood and the conversion of old and new kinetic energy, Shandong Province will continue to increase its support for the medical and health industry.

A new round of scientific and technological revolution and industrial transformation has accelerated. Life sciences and technology continue to make new breakthroughs, accelerated application of major technologies such as genetic engineering, molecular diagnostics, stem cell therapy, 3D printing, and the depth of the next generation of information, biology, engineering technology and medical health fields such as big data, cloud computing, Internet, artificial intelligence Integration is getting closer and closer, and technologies such as telemedicine, mobile medicine, precision medicine, and smart medicine are developing vigorously, and new forms and models of health industries such as health management, health care for the elderly, health tourism, leisure health, and "Internet + health" are flourishing.

The consumption structure of residents continued to upgrade. With the substantial improvement of living standards and the rapid transformation of life concepts, the consumption structure of residents has accelerated to a developmental and enjoyable type, the general public's health awareness has increased, and health needs have diversified from a single medical service to disease prevention, health promotion, health care and rehabilitation, etc. Services are changing, and people's

demand for health products and services is increasing. At the same time, the continuous improvement of the social security system and the rapid development of the medical insurance business will certainly further stimulate the market demand for medical care and health.

The problem of population aging is becoming increasingly prominent. In recent years, the aging population in Shandong has shown a large base, rapid growth, aging, disability, and empty nesting, and the aging population has been deepening. On the one hand, the needs of elderly people's life care and medical health are doubled, the consumer demand in the field of medical care and health is strong, and the development space of related industries is huge. On the other hand, the medical care and health industry in Shandong is still in its infancy, with relatively insufficient supply-side capabilities, structural contradictions and policy barriers, lack of high-quality resources, narrow coverage of medical and nursing integration, and insufficient professionals to meet the needs of the elderly Demand for health care services at different levels.

### *C. Health Tai'an Big Data Platform*

On November 20, 2018, at the 9th Dacheng Road, Beijing, organized by the Chinese People's Liberation Army General Staff of the IPv9 Technology Project Application Demonstration Seminar, the meeting discussed and demonstrated the healthy Tai'an big data ecological domain as an IPv9 technology application case. It is required to accelerate the construction of healthy Tai'an big data ecological domain and rapidly increase the scale of IPv9 network, and strive to build Tai'an into an IPv9 network technology demonstration area through the construction and promotion of healthy Tai'an big data ecological domain<sup>[4]</sup>.

Health Tai'an big data ecological domain can provide residents with personalized health management and health care methods to improve residents' satisfaction, so as to achieve minor illnesses at the

grassroots level, serious illnesses into hospitals, and rehabilitation in the community; can provide residents with life-cycle health Information to provide residents with networked and information-based health services and health management, residents can obtain continuous, comprehensive and high-quality health care services; can improve the efficiency of health services, reduce residents' waiting time for medical treatment; can support high-quality regional health The rational use of resources effectively solves the rational division of labor and resource allocation among grassroots and second-level large hospitals and preventive and health care institutions, and alleviates the problem of difficulty and expensive medical treatment for residents.

By building a healthy Tai'an big data ecological domain system, the demand for "health services in the same city" will be realized. The construction process realizes the above-mentioned "smart medical" development in Tai'an City by establishing four standards: unified data standards and norms for health information in Tai'an City, sharing of public health information resources in the same city, electronic two-way referral and inspection results, mutual recognition in the same city and application of health cards in the same city content. Taking the healthy Tai'an big data ecological domain as the core, it realizes the interconnection and sharing of information from horizontal to side and vertical to the end, as well as comprehensive business collaboration. Form a full life cycle of medical and health services, intelligent medical care, refined management and scientific decision-making, promote the development of large health industries, achieve the purpose of more scientific management, smarter business, and more beneficial to residents, and promote the openness of health and family planning in Tai'an City. The development by leaps and bounds strongly supports the construction of the medical highlands in Shentai'an City and the health of Tai'an. Through the construction of this platform, the information construction of health and family

planning in Tai'an has reached the national first-class level. Since the system was built, it has been tested in medical institutions across the city and achieved good results.

#### *D. 5G Communication Technology Pushes Medical Industry to New Heights*

5G is the abbreviation of the fifth generation mobile communication technology. However, unlike 4G, 3G, and 2G, 5G is not an independent, new wireless access technology, but a Including 2G, 3G, 4G and WiFi technology evolution, as well as some new supplementary wireless access technology after the integration of the general term<sup>[5]</sup>.

Compared with the previous generations of networks, most of which focus on the characteristics of communication technology itself, the advantages of 5G networks have brought the high-speed, safe and free communication between people, people and things, and things. Smart development in industries with higher requirements, such as the medical industry, offers the possibility. This is mainly to apply 5G's high-speed, low-latency and high-capacity features to improve first aid, remote diagnosis and treatment, and personalized medical treatment.

Facing the opportunities brought by 5G and Internet of Things technology, the Chinese government is actively advancing and continuously formulating relevant policies. 5G represents a brand-new digital medical network, and is likely to enhance the patient's medical experience. It can help users maintain health through three major capabilities: medical Internet of Things (IoMT), enhanced mobile broadband (eMBB) and mission-critical services. When these three are brought together, they can provide users with comprehensive and personalized services anytime, anywhere.

## V. CONCLUSION

The medical problems of the masses are always issues that the country attaches importance to. The

medical level of a country determines the political foundation and ruling foundation of the country, and reflects the comprehensive national strength and the security of people's livelihood. The development of China's medical industry is at a critical stage. With the promotion of relevant policies and the support of the new future network IPV9 technology, Internet technology is bound to become the core of medical development. This paper analyzes the problems, characteristics and development status of China's medical industry and introduce of the Tai'an Health big data platform based on IPV9. IPV9 is independently developed by our country, has independent intellectual property rights, and can achieve low cost and high efficiency. It is the core key technology of the next generation Internet. It is believed that with the support of these technologies, the new Internet technology will

establish a set of targeted systems that meets my country's national conditions, allowing my country's medical treatment to develop on the right path at high speed and high quality.

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