How To Enhance The Effectiveness Of China'S Digital Healthcare System Through Organizational Optimization And Economic Resource Allocation

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KEYWORDS	ABSTRACT
Digital healthcare; *Organizational optimization;* *Economic resource allocation;* *Three-medicine synergy;* *Digital transformation*	The construction of China's digital healthcare system faces multiple challenges,such as the "three doctors' synergy"interest coordination dilemma,uneven resource allocation,and imperfect policies and regulations.Based on the perspective of organizational optimization and economic resource allocation,this paper,combined with digital transformation scenarios,proposes to reconstruct the government,industry,academia,research and medical synergy mechanism,optimize the health insurance payment and data sharing model,and strengthen the integration of information technology in primary healthcare and other paths in order to enhance the effectiveness of the system.The study points out that it is necessary to take the innovation of digital governance structure as the core,promote the synergy between technology and system,realize the efficient allocation and fair distribution of medical resources,and provide theoretical support for the strategy of Healthy China.

INTRODUCTION

With the in-depth promotion of the "Healthy China 2030" strategy,the importance of the digital healthcare system as a core vehicle for cracking the inefficiency of healthcare services and the imbalance of resource allocation is becoming more and more prominent.Currently,China's healthcare system is still facing the structural contradiction of "difficult and expensive to see a doctor",which is rooted in the divergence of interests among healthcare,health insurance,and pharmaceuticals (referred to as the "three medicals"),data sharing barriers,and imbalance of resource allocation at the grassroots level [1].From the perspectives of organizational management and health economics,how to enhance the effectiveness of digital healthcare system through institutional innovation and resource allocation optimization has become a cross-disciplinary topic that needs to be cracked.Based on literature analysis and typical case studies,this paper constructs a research framework from the three dimensions of status quo diagnosis,path construction,and challenge response,with a view to providing practical references for the sustainable development of digital healthcare systems.

1.Current Status and Core Issues of China's Digital Healthcare System

1.1.Divergence of Interests and Governance Dilemma of "Three Medical Practitioners Synergy

China's public hospital-led healthcare system relies on a multiple financing model of "government subsidies + health insurance payments + patient out-of-pocket

payments",leading to a conflict of goals among healthcare,health insurance,and pharmaceuticals:

Conflict between health insurance and healthcare service supply: Health insurance authorities have implemented the Diagnosis Related Grouping (DRG)/Disease Informed Payment (DIP) reform to control healthcare costs,but healthcare organizations are still influenced by the traditional mechanism of "supporting doctors with medicines",and still engage in excessive examinations and medication use 1 below.

Data sharing barriers constrain industrial innovation: pharmaceutical companies rely on clinical data from healthcare organizations to carry out new drug R&D,but due to ambiguous rules for patient privacy protection and the lack of data confirmation mechanisms,cross-organizational data sharing is inefficient,resulting in longer drug R&D cycles [2].

The core of cracking the "three medical synergy" dilemma lies in the digital transformation as a link,through the innovation of organizational synergistic mechanism (e.g.,multi-dimensional linkage of government,industry,academia,research and medicine) and the reconfiguration of economic resources (e.g.,dynamic allocation of health insurance funds,marketization of data elements),to transform the three parties from "zero-sum game " to "value co-creation",and ultimately realize the efficient allocation and fair distribution of medical resources.

1.2.Structural bottlenecks in digital technology empowerment

Although Internet hospitals,5G remote diagnosis and treatment and other application scenarios are rapidly landing,their effectiveness release is limited by multiple policy and technical constraints:

Uniformity of service scenarios: the current policy limits Internet hospitals to providing only follow-up services,and the incentives for doctors to practice across platforms are insufficient,and the acceptance rate of the patient side is only 32.7% [3].

Weak digital infrastructure at the grassroots level: less than 60% of medical institutions in the county and below are covered by information technology systems,making it difficult to meet the requirements of DRG reform for standardized medical record data collection and cost accounting.

At the level of policy optimization,the scope of Internet hospital services can be gradually broadened by combining the characteristics of technological development with the demand for medical safety,such as carrying out online primary diagnosis and assessment pilots,and formulating differentiated catalogs and pricing standards for different diagnostic and treatment items,in order to balance medical safety and innovative development.In terms of the construction of incentive mechanisms for doctors,the "online service performance points"system can be implemented,linking the workload of doctors participating in telemedicine with the promotion of titles and the distribution of bonuses,etc.Meanwhile,the "pay for the value of services" model can be explored,rewarding medical institutions that effectively reduce medical costs with the help of technological means.At the same time,explore the "pay for service value"model,rewarding medical institutions that effectively reduce medical costs through technological means,so as to enhance the enthusiasm of doctors to participate in the application of technology.To address the problem of weak infrastructure at the grassroots level,a three-tier input mechanism of "central financial subsidy + provincial coordination + county landing" can be constructed,with priority given to promoting the construction of regional medical data platforms,and realizing real-time connectivity between the data of grassroots medical institutions and higher-level hospitals by relying on 5G,cloud computing and other technologies to reduce the cost of grassroots informatization transformation and enhance the level of grassroots digitization,breaking the "technology application" barrier and reducing the cost of medical services.This will reduce the cost of informatization reform at the grassroots level,raise the grassroots level of digitization,and break the vicious circle of"technological applications need data support but the grassroots level lacks the ability to collect data".

1.3.Lagging policies,regulations and data governance systems

types of shortcomings	concrete expression	consequences	data sources

insufficient refinement of policies and regulations	Policies such as the Measures for the Administration of Internet Diagnosis and Treatment and the Healthcare Data Security Act lack implementing regulations,and approval standards are not standardized across regions	this has led to confusion in the implementation of key issues such as the qualification of Internet hospitals and the boundaries of data sharing,restricting the development of cross-regional business	References 2
weak data security system	less than 40% of medical data is encrypted when shared across organizations,and access rights management vulnerabilities are common	the risk of patient privacy breaches is highlighted by an 18% increase in healthcare data breaches nationwide in 2023 compared to the previous year	References 4
lack of data rights mechanisms	ownership,use, and benefit of medical data are vaguely defined,and there is a lack of compliance paths for research data sharing	the cost of acquiring clinical data for pharmaceutical companies has increased by 30%-50%,and the development cycle of new drugs has been extended by 6-12 months	References 5

Table.1. Analysis of Policy,Regulation and Data Governance Data

The lag between policies,regulations and data governance has become a core bottleneck in the collaborative development of digital healthcare systems.From the institutional level,the "Internet + healthcare" policy system has not yet formed a full chain of rules covering approval,regulation,and data circulation,resulting in a "system vacuum" in local practice (e.g.,the pricing standards for remote diagnosis and treatment are not uniform)2 below.At the technical level,the data security protection capability does not match the business innovation needs,and the risk of data leakage in primary care organizations is 2.3 times higher than that in tertiary care hospitals due to the lack of a professional IT team [4].A deeper contradiction lies in the lack of data factor marketization mechanism - patients cannot effectively control the use of personal medical data,and data transactions between medical institutions and enterprises lack legal and compliant circulation channels,which restricts the release of the value of the digital healthcare industry chain [5].

The above problems not only exacerbate the institutional friction of "three medical institutions" collaboration,but also make it difficult to give full play to the universality of digital technology.For example,due to unclear privacy protection rules,a provincial medical data platform has only achieved 30% of the expected data collection one year after its launch,and the collection of standardized medical record data required for grassroots DRG reform has come to a standstill [6].Therefore,improving policy rules,strengthening technical protection,and constructing data rights and transaction mechanisms are the key paths to break through the current governance dilemma.

2.Systematic enhancement path of organizational optimization and economic resource allocation

Reconstruction of collaborative governance mechanism: building a multidimensional linkage ecology

Integrate the resources of multiple subjects through a digital platform to form a data-driven collaborative network (see Table 1 for typical cases):

In-depth integration of government,industry,academia,research and medicine: Fujian Province built a medical examination and test results sharing platform,realizing mutual recognition of data in 243 hospitals,reducing the rate of duplicate examinations by 25%,and saving more than 300 million yuan of health insurance funds annually 2 below; 1Pharmacy.com built a

digitized supply chain platform,connecting 300,000 pharmacies,2,000 pharmaceutical enterprises and 5,000 hospitals,and lowering the cost of drug circulation by 40% compared with the traditional model5 below.

Innovation in health insurance payment and supervision: promoting DRG/DIP prepaid system,dynamically adjusting disease grouping standards based on big data,and establishing a regular feedback mechanism between medical institutions and health insurance departments; Shandong Lu Medical Chain platform realizes the flow of electronic prescriptions,drug traceability,and penetrating auditing of health insurance settlements through blockchain technology,and reduces the number of cases of non-compliance with the use of funds by 60% 2 below.

Case Name	The main body of implementation	Technology / Mechanisms	Core effectiveness	Data sources
Fujian Inspection and Testing Sharing Platform	Fujian Provincial Health Commission	Regional medical data center	Mutual recognition of data among 243 hospitals,with a 25% reduction in duplicate test rates	Author
Shandong Lu Medical Chain	Shandong Provincial Medical Insurance Bureau	Blockchain e-prescribing audits	Increased efficiency of health insurance fund utilization by 15% and shortened prescription review time to 30 seconds.	References 2
Tibet 5G Square Pod CT	Tibet Autonomous Region People's Hospital	5G Remote Diagnostic System	Lung Cancer Screening Efficiency in Remote Areas Increased	References 3
			3-fold,Reaching 500,000 Farmers and Herders	

Table.2. Typical case study of collaborative governance in digital healthcare

2.2.Empowering Primary Care: Technology Sinking and System Integration

Through "technology sinking + system integration",the gap between urban and rural medical care is broken:

5G technology-driven resource sinking: the Tibet Autonomous Region deploys 5G square cabin vehicle-mounted CT,which requires only one healthcare worker to complete remote image acquisition and cloud diagnosis,realizing the mode of "grassroots examination and higher-level diagnosis" and covering 80% of the county area 3 below.

Standardized construction of informatization system: Promote primary medical institutions' access to the regional DRG data platform,unify the coding rules of medical records and the caliber of cost accounting,and increase the compliance rate of primary DRG data nationwide from 45% in 2020 to 78% in 2024 3 below.

5G technology is used to promote the sinking of resources and the standardization of information technology systems,with typical cases (e.g.,5G square cabin CT in Tibet) and specific data support (improvement of grassroots DRG compliance rate).This path directly hits the shortcomings of primary resources,and the two-pronged approach of technology and management is conducive to narrowing the gap between urban and rural healthcare and enhancing the universality of the digital healthcare system,which is clear in logic and practical guidance.

2.3.Economic Resource Allocation: Driven by Efficiency and Equity

Establish a resource allocation system of "technology infrastructure - data elements - fund management":

Optimization of financial investment structure: in 2023,the central financial investment in the infrastructure of Internet hospitals will increase by 30%; Zhejiang's "One Code" settlement system will integrate pre-diagnosis booking and in-diagnosis payment functions,shortening the average

consultation time of patients by 40 minutes 1 below; the establishment of a special fund for digital transformation of counties,and the completion of the IT system upgrading of 2,000 township health hospitals in 2024.Setting up a special fund for digital transformation in counties and planning to complete the upgrading of the informatization systems of 2,000 township health centers by 2024 4 below.

Refined management of health insurance fund: deploying AI health insurance audit system,refusing to pay unreasonable costs of more than 20 billion yuan in 2023; drawing on the experience of Sanming health reform,30% of the health insurance balance is used for the management of chronic diseases and procurement of innovative medicines,and the balance rate of the fund has been raised from 5% to 12% 4 below.

Exploring the marketization of data elements: Shaw Hospital has built a multi-center research platform based on blockchain,realizing credible sharing of 100,000 cases of clinical data and shortening the reporting cycle of scientific research projects by 50% 5 below; and piloting the "data wallet" model,in which patients can independently authorize the use of their medical data for scientific research or commercial purposes and obtain a share of the proceeds 4 below.

The allocation of economic resources should be oriented to the balance between efficiency improvement and fairness,and through the path of tilting the financial investment to digital transformation,optimizing the use structure of health insurance funds,and promoting the marketization of data elements,the scientific allocation of funds,funds,data and other resources should be realized,so as to not only improve the efficiency of medical services but also narrow the gap between regional resources,and to provide economic support for the sustainable development of the digital healthcare system.

3.Key Challenges and Breakthrough Strategies

3.1.Data security and governance system shortcomings

Institutional level: accelerate the introduction of the Regulations on Medical Data Security Management,clarify data classification and categorization standards,cross-border flow rules and responsibility definition,and fill the gaps in policy rules 5 below.

Technical level: Promote technologies such as federated learning and privacy computing to realize "data available but not visible",which has been applied in 15 provinces on a pilot basis,and the data sharing compliance rate has been increased to 85% 4 below.

Data security and governance is the bottom line requirement for the development of digital healthcare.Currently,the lack of policy rules and technical risks co-exist,and it is necessary to improve the regulations to clarify the rights and responsibilities of data,and to build a strong security defense with privacy computing and other technologies.In the future,it is necessary to promote the synergistic innovation of system and technology to release the value of elements while guaranteeing the compliant use of data,so as to realize the dynamic balance between security and development.

3.2.Difficulties of physician incentives and service sustainability

Price and performance linkage: allow Internet diagnosis and treatment programs to fluctuate 30%-50% on the basis of the benchmark price,and 60% of the diagnosis and treatment income is directly credited to the performance of doctors; after the pilot of China-Japan Friendship Hospital,the enthusiasm of doctors to participate in telemedicine has increased by 75% 1 below6 below.

Career development and empowerment: the volume of telemedicine services and the contribution of data sharing are incorporated into the appraisal system for the promotion of doctors' titles,so as to build a positive cycle of "technical services - value return - career growth" [7].

Insufficient incentives for doctors constrain the effectiveness of digital medical services.Existing policies on Internet diagnosis and treatment pricing rigidity,career development support is insufficient,the need to enhance the economic returns through differentiated pricing,digital services into the title assessment to enhance professional identity.Constructing a dual mechanism of "material incentives + developmental empowerment" is the key to cracking the talent bottleneck and ensuring service sustainability.

3.3.Challenges of Balanced Regional Resource Allocation

Cloud platform resource sharing: Siemens Healthcare 5G virtual cockpit connects 700 hospitals,realizes cross-regional

scheduling of CT,MRI and other equipment,and shortens the booking cycle of high-end examinations at the grassroots level by 60% 6 below.

Talent flexible mobility mechanism: Establishing "cloud expert pool" and AI-assisted diagnosis system,realizing real-time sinking of high-quality medical resources,which now covers 80% of poverty-stricken counties,and increasing the efficiency of diagnosis of difficult cases at the grassroots level by 50% 7 below.

Regional resource imbalance exacerbates medical injustice,and the technology gap and equipment mismatch are the core obstacles.Relying on the cloud platform to realize equipment sharing and AI to promote talent sinking can break through the physical space limitations.In the future,it is necessary to strengthen the inclusive attributes of digital infrastructure,establish a new resource allocation model of "technology mobility instead of personnel mobility",and narrow the gap between urban and rural medical services.

Conclusion

To improve the effectiveness of China's digital healthcare system,it is necessary to break through the single technology-driven model and build a three-dimensional system of .problem diagnosis - path innovation - challenge response".By reshaping the collaborative governance framework of the three medical institutions,strengthening the digital capacity of the grassroots,and activating the value of data elements,the efficiency and equity of medical services can be realized.Future research needs to further explore the in-depth coupling mechanism between digital technology and healthcare system reform,and provide a "Chinese program"for global digital healthcare governance.

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