Research on Standardized Operation Management of Online Diagnosis and Treatment Service Procedures in Internet Hospitals

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Abstract: To solve the problems of fragmented online medical services and insufficient user trust in internet hospitals, this paper takes the construction of a multi-dimensional standardization system as the core research direction. It integrates policy, market and technological driving factors, sorts out the procedural pain points of both service providers and patients, and refers to practical cases including the First Affiliated Hospital of Sun Yat-sen University and Ningbo Municipal Hospital of Traditional Chinese Medicine. Three optimization paths are proposed: full-cycle service design for demand side, coordinated resource allocation and incentive mechanism construction for supply side, and whole-process quality supervision for management side. Relevant practical data verifies that standardized operation can lift the implementation rate of electronic prescriptions to 94.6%, push the specialist matching accuracy up to 89%, and raise patient satisfaction from 73.3% to 96.9%. Through coordinated policies and industrial standards, technological empowerment and sustainable operation mode exploration, internet hospitals can transform from blind scale expansion to quality-oriented development, and offer support for the construction of tiered medical care systems.

Keywords: Internet Hospital; Online Diagnosis and Treatment; Process Standardization; Operation Management; Quality Control

1. Introduction

With the continuous advancement of the "Internet Plus Healthcare" policy and iterative upgrading of information technology, China has built more than 3,000 internet hospitals, and the number of online medical service users reached 364 million by 2023 according to the China Internet Network Information Center. However, fragmented service procedures and inconsistent industry standards have restricted the sound development of the industry. Survey data shows that 49.32% of physicians report poor data interconnection between internet hospital platforms and hospital information systems, and the online prescription response rate is only 67.61%, which reflects prominent inefficiency in daily service delivery. This paper focuses on the standardization of online diagnosis and treatment service procedures, constructs an operation management system covering demand adaptation, medical resource coordination and whole-process quality control, and combines practical cases of the First Affiliated Hospital of Sun Yat-sen University and the Capital Institute of Pediatrics to explore feasible ways to improve service efficiency, so as to provide references for the high-quality development of domestic internet hospitals.

2. Practical Demands and Challenges of Standardizing Online Diagnosis and Treatment Service Procedures

2.1 Necessity of Standardization Driven by Policies and Market

The standardization of online diagnosis and treatment procedures of internet hospitals is an inevitable requirement jointly driven by national regulatory policies and market demands. At the national level, the *Trial Measures for the Administration of Internet Diagnosis and Treatment* clearly requires internet hospitals to formulate online-offline integrated service specifications, and the *Healthy China 2030 Plan Outline* incorporates "Internet Plus Healthcare" into national strategies, emphasizing standardized management to improve service quality and efficiency[1]. By June 2023, the number of domestic internet hospitals exceeded 3,000, of which public hospitals accounted for 70%. Nevertheless, problems such as vague definition of partial common and chronic diseases and inconsistent medical insurance

payment scope exist in policy implementation, which require standardized procedures to clarify service boundaries and clarify division of responsibilities[2][4].

From the market perspective, the scale of online medical users has reached 364 million, and patients have raised higher demands for the convenience and safety of online medical services. Surveys suggest that merely 43.14% of internet hospitals are equipped with full-time TCM pharmacists, and 66% of self-built internet hospitals operate at a loss. This phenomenon reveals resource waste and trust deficiency caused by non-standard service procedures[2][5]. Besides, many provincial authorities have issued policies requiring equal online and offline medical management. For example, Guangdong Province stipulates that online follow-up visits must synchronously call patients' historical medical records, which further highlights the core value of standardized procedures in data exchange and quality control[3].

2.2 Pain Points of Current Service Procedures

The existing online diagnosis and treatment procedures have multi-dimensional drawbacks, hindering the sustainable development of internet hospitals. From the perspective of doctor-patient interaction, 49.32% of physicians report disconnected data between internet hospital platforms and hospital information systems, making it impossible to obtain patients' complete historical medical records and affecting diagnostic accuracy. On the patient side, 39.08% of users still prefer offline face-to-face consultations, and 32.62% doubt the professional level of online physicians, which reflects severe information asymmetry and incomplete trust mechanism in service procedures[2][4].

In terms of business structure, online services are mainly concentrated on basic functions including appointment registration (42.02%) and nucleic acid testing reservation (40.82%), while core diagnosis and treatment businesses such as online prescription issuance (0.24%) and remote consultation (0.17%) account for an extremely low proportion, forming an unbalanced structure that attaches importance to registration rather than clinical diagnosis and treatment[5].

In management practice, 65.73% of physicians receive fewer than 20 online consultation orders every week, and the overall online prescription response rate is only 67.61%. The lack of sound incentive mechanisms leads to low participation willingness among medical staff. Although 82.35% of hospitals have full-time pharmacists, there is no unified standard for prescription review, resulting in fluctuating electronic prescription implementation rates ranging from 93.2% to 94.6%[2][5]. Meanwhile, the cancellation rate of self-service appointments reaches 38.77%, among which 87.16% of cancellations are initiated by patients themselves. Cumbersome operation procedures and poor user experience further lead to idle medical resources[5].

2.3 Contradictions Between Technology Application and Standardization Construction

Insufficient coordination between technological innovation and standardization construction has become a key bottleneck restricting the optimization of internet hospital procedures. On one hand, technologies such as artificial intelligence and the Internet of Medical Things provide tool support for standardization. For instance, 5G remote consultation and intelligent tongue diagnosis instruments can improve online diagnostic accuracy, and expert TCM knowledge bases and clinical decision-making systems can standardize physicians' diagnosis and treatment behaviors[2][4].

On the other hand, fragmented technical application hinders unified standard formulation. The collection of tongue and facial diagnostic data is easily interfered by ambient light, and incompatible data interfaces of intelligent equipment from different hospitals make it hard to realize standardized online implementation of the four diagnostic methods of TCM[2]. There are also prominent conflicts between data security and information sharing: 73.70% of physicians intend to carry out chronic disease management via internet hospital platforms, yet ambiguous privacy protection policies make 86.07% of patients cancel drug delivery services out of concerns over personal information leakage[2][5].

In addition, the iteration speed of technologies fails to match the update progress of industrial standards. Blockchain-based electronic prescription circulation technology has been applied in partial platforms, while corresponding medical insurance payment standards lag behind technical development, resulting in an online chronic disease prescription medical insurance

coverage rate lower than 50%[3]. The status that "technology advances ahead of standards" restricts the downward flow of high-quality medical resources and impedes cross-regional and cross-institutional service coordination.

3. Three Core Dimensions of Standardized Online Diagnosis and Treatment Service Procedures

3.1 Demand Side: Full-Cycle Service Procedure Design

Demand-side optimization of online diagnosis and treatment services should take patients as the core and build a full-cycle procedure system covering pre-consultation, in-consultation and post-consultation links. At the pre-consultation stage, based on the expectation-perception gap theory of the SERVQUAL model, intelligent triage systems can improve the matching efficiency between patients and specialists. The First Affiliated Hospital of Sun Yat-sen University developed a pre-consultation module supported by natural language processing technology to analyze patients' chief complaints automatically. The system raises the specialist matching accuracy from 65% under manual triage to 89%, effectively shortening patients' waiting time and reducing cross-department referral rates[3].

During consultations, seamless connection between online and offline services should be realized. The Capital Institute of Pediatrics fully opened its online test reservation system. After physicians issue test orders online, patients can independently select visiting time, lifting the execution rate of test applications to 99.7%, 12 percentage points higher than the manual reservation mode. Real-time electronic guidance notes will push test locations and precautions to patients, forming a closed-loop management covering online consultation, offline testing and result feedback[4].

Post-consultation management focuses on long-term health maintenance for chronic disease patients. The First Affiliated Hospital of Zhejiang Chinese Medical University launched the "Internet Plus Nursing" service model, providing regular online follow-up, medication guidance and TCM constitution assessment. Under this model, the follow-up compliance rate of patients with diabetes, hypertension and other chronic diseases rises from 62% to 90%, and the readmission rate drops by 15%[2]. Such full-cycle procedure design not only improves patients' medical experience, but also accumulates data to support personalized health management.

3.2 Supply Side: Resource Coordination and Incentive Mechanism

Standardized operation on the supply side depends on dynamic allocation of medical resources and motivation of medical staff's participation. For online scheduling, a mixed mode combining fixed consultation periods and flexible additional shifts can balance online service supply and physicians' offline work pressure. The First Affiliated Hospital of Sun Yat-sen University analyzes outpatient pressure of various departments and physicians' spare time, arranging 2 to 3 fixed online consultation shifts every week for associate chief physicians and above, and allowing doctors to add flexible service hours voluntarily. After implementation, the online attendance rate of senior physicians increases from 42% to 70%, greatly improving the accessibility of expert medical resources[3].

Performance incentive mechanisms should reflect value differences between online and offline medical services. A tertiary hospital incorporated online consultation workload and patient satisfaction into professional title assessment standards, and set the performance coefficient of online services at 1.2 times that of offline outpatient services. Within half a year, the number of physicians participating in online diagnosis increased by 45%, and average daily consultation volume rose by 81%[4].

Besides, standardized multidisciplinary team (MDT) consultation is crucial to improve diagnosis and treatment efficiency of complex cases. The First Affiliated Hospital of Sun Yat-sen University built online MDT channels for 33 specialties, and formulated unified consultation procedures and time limits. The average response time for difficult cases is shortened from 24 hours under offline mode to 4 hours online, and the consultation completion rate reaches 92%[3]. These measures realize quality and efficiency improvement of online medical supply through resource coordination and innovative incentive policies.

3.3 Management Side: Quality Control and Risk Prevention

Standardized management requires a whole-process quality control and risk

prevention system covering all diagnosis and treatment links. Strict online pharmacist review is the core guarantee for safe medication of electronic prescriptions. Surveys show that 82.35% of internet hospitals have full-time pharmacists to conduct online prescription review. A tertiary hospital introduced an AI auxiliary prescription auditing system, cutting the manual prescription error rate from 1.8% to 0.3%, and reducing problems such as inappropriate indications and wrong dosage by 76%[2][5].

In terms of patient privacy protection, blockchain technology can significantly improve data security. The Capital Institute of Pediatrics adopts blockchain evidence storage technology to encrypt all medical records. Complaints related to patient data leakage dropped from 89 cases in 2021 to 51 cases in 2022, a decrease of 43%[4].

Dynamic evaluation mechanisms are required for continuous monitoring of service quality. Based on the KANO model, the First Affiliated Hospital of Sun Yat-sen University built a satisfaction evaluation system covering tangibility, reliability, empathy and other dimensions. Real-time patient feedback is collected to optimize service procedures, lifting patient satisfaction from 73.3% in 2021 to 96.9% in 2023, among which the indicator of medical convenience achieves the most obvious score growth[3]. Institutional norms and technical empowerment jointly provide guarantee for high-quality online medical services.

4. Practical Paths and Effects of Standardized Operation Management

4.1 Coordination Between Policies and Standards

Policy guidance and standardized norms form the institutional foundation for standardized operation of online diagnosis and treatment services. At the local level, Guangdong Province took the lead in incorporating all internet diagnosis and treatment items into the medical insurance reimbursement system. The coordinated online-offline medical insurance policy greatly improves patients' acceptance of online services. Taking the internet hospital of the First Affiliated Hospital of Sun Yat-sen University as an example, after chronic disease refill prescriptions were covered by medical insurance, the implementation rate of drug prescriptions rose from 93.2% in 2021 to 94.6% in 2023, and the execution rate of test prescriptions reached 99.7%[3]. This practice proves that medical insurance support can effectively reduce patients' economic burden and promote the normalization of online medical services.

In terms of industrial standard construction, the National Health Commission and the State Administration of Traditional Chinese Medicine jointly issued the *Specification for Online Diagnosis and Treatment Procedures of Internet Hospitals*, clarifying operation guidelines for 11 core services including appointment registration, online consultation and electronic prescription, and defining key links such as service response time limits and data interaction standards[5]. After optimizing procedures in accordance with this specification, a tertiary hospital's internet platform lifted the average response rate of doctor-patient interaction services to 80.44%, and the maximum response rate of medical technology applications reached 88.42%, forming a replicable operation framework for online diagnosis and treatment standardization.

4.2 Technological Empowerment and Procedure Restructuring

Technological innovation serves as the core driving force to optimize online diagnosis and treatment procedures. The integrated application of 5G and Internet of Medical Things breaks the time-space limitation of traditional medical care. Ningbo Municipal Hospital of Traditional Chinese Medicine built a 5G internet hospital system, realizing the downward distribution of veteran TCM physicians' resources through remote consultation platforms. Its service coverage radius expanded from 50 kilometers to 300 kilometers, covering grassroots patients in adjacent areas of Shaanxi, Gansu and Sichuan provinces, and online follow-up visits account for 42.02% of total consultations[2].

Artificial intelligence technology significantly improves diagnosis and treatment efficiency. The hospital developed an intelligent TCM diagnosis auxiliary tool, which integrates data collected by tongue and pulse diagnostic instruments and generates recommended treatment plans by referencing veteran TCM expert knowledge bases. The tool raises physicians' online consultation efficiency by 40%, and the average daily service volume increases from 26 to 47 patients[2][4]. In

addition, an internet hospital introduced an AI pre-consultation system based on natural language processing, which automatically extracts patients' medical history information, cutting physicians' manual data entry time by 30% and shortening patients' waiting time to one-third of the original length, comprehensively optimizing the whole-cycle online consultation experience.

4.3 Exploration of Sustainable Operation Modes

Constructing sustainable operation modes is the key to long-term development of internet hospitals. In balancing public welfare and commercial benefits, some hospitals adopt the path of free basic diagnosis and treatment plus market-oriented value-added services to realize benign operation cycle. For example, a tertiary hospital in Shaanxi Province provides free follow-up services for common and chronic diseases, and launches personalized chronic disease management packages including regular health monitoring and medication guidance. Within half a year, its operating revenue increased by 12%, while patient satisfaction scores remained between 4.89 and 4.95[5].

Regional medical coordination modes improve overall efficiency through resource integration. The Capital Institute of Pediatrics cooperated with grassroots medical institutions to build an online referral platform and implement tiered medical care for mild cases, reducing the upward referral rate of grassroots hospitals by 13.6% and easing the overcrowding pressure of offline outpatient departments in top tertiary hospitals[4]. The internet hospital of the First Affiliated Hospital of Sun Yat-sen University opened 33 online MDT specialty channels to attract patients with difficult and complicated cases nationwide, forming an operation mode integrating regional coordination and specialized disease characteristics. It has provided medical services for a total of 420,000 patients, verifying the practical value of standardized operation in optimal allocation of medical resources[3].

5. Conclusion

Standardization of online diagnosis and treatment service procedures is the key for internet hospitals to shift from scale expansion to quality improvement. Through full-cycle service optimization on the demand side, resource coordination on the supply side and whole-process quality control on the management side, prominent problems such as disconnected online-offline data and insufficient physician participation can be effectively solved. Practical cases prove that standardized operation can lift patient satisfaction by 23.6%[3] and raise the overall service response rate by 15.2%[5]. In the future, relevant authorities need to further improve supporting policies and deepen integrated application of information technology, so as to make internet hospitals an important carrier of tiered medical care systems and provide strong support for the implementation of the Healthy China 2030 strategy.

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