Health Information System's Responses to COVID-19 Pandemic in China: A National Cross-sectional Study

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Abstract

Objective After the outbreak of the coronavirus disease 2019 (COVID-19) pandemic, Chinese hospitals and health information technology (HIT) vendors collaborated to provide comprehensive information technology support for pandemic prevention and control. This study aims to describe the responses from the health information systems (HIS) to the COVID-19 pandemic and provide empirical evidence in the application of emerging health technologies in China.

Methods This observational descriptive study utilized a nationally representative, cross-sectional survey of hospitals in China ($N = 1{,}014$) from 30 provincial administrative regions across the country. Participants include hospital managers, hospital information workers, and health care providers.

Results Among all the responses, the most popular interventions and applications include expert question-and-answer sessions and science popularization (61.74%) in online medical consultation, online appointment registration (58.97%) in online medical service, and remote consultation (75.15%) in telehealth service. A total of 63.71% of the participating hospitals expanded their fever clinics during the pandemic, 15.38% hospitals used new or upgraded mobile ward rounds systems, and 44.68% hospitals applied online self-service systems. Challenges and barriers include protecting network information security (57.00%) since some hospitals experienced cybersecurity incidents. 71.79% participants hope to shorten wait time and optimize the treatment process. Health care workers experienced increased amount of work during the pandemic, while hospital information departments did not experience significant changes in their workload.

Conclusion In the process of fighting against the COVID-19, hospitals have widely used traditional and emerging novel HITs. These technologies have strengthened the capacity of prevention and control of the pandemic and provided comprehensive information technology support while also improving accessibility and efficiency of health care delivery.

Keywords

- health information system
- implementation
- informatics
- health information exchange
- COVID-19
- artificial intelligence
- telehealth
- health care delivery

Background and Significance

After the outbreak of the coronavirus disease 2019 (COVID-19) pandemic, Chinese hospitals and health information technology (HIT) vendors collaborated to provide comprehensive information technology support for pandemic prevention and control.[1,2] It is critical to investigate the successful experiences and existing challenges to fight against COVID-19 from the perspectives of the hospital

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health information system (HIS). This study aims to describe the responses from the HIS to the COVID-19 pandemic and provide empirical evidence in the application of emerging health technologies in China. Specifically, we demonstrate the practices and implications of the critical responses, which include: how to carry out the reconstruction of the hospital information system; effective ways of using emerging HIT, and informatics tools to improve health care service capabilities and treatment efficiency; challenges to promoting hospital informatization construction and collaboration within or outside the health care systems; and barriers to providing patients with high-quality, high-efficacy, and accessible health care services during the pandemic. We employed the survey results from the China Hospital Information Work Report, which was released by the China Hospital Information Management Association (CHIMA).[3]

Hospitals in China are classified into three different levels based on the criteria outlined in ►Table 1. In addition, hospitals at each level have been further classified as Class A, Class B, and Class C.[4] Currently, there are 2,749 level-3 hospitals, 9,687 level-2 hospitals, and 11,264 level-1 hospitals.[5]

The essence of hospital hierarchical classification is the standardized management of hospitals in accordance with the principles of modern hospital management and the characteristics of medical and health services in different regions or environments. The basis for hierarchical hospital management is the level of the hospital's facilities, technical construction, health care service quality, and scientific management.

There were 1,014 hospitals from 30 provincial administrative regions across the country that participated in the national cross-sectional survey. Of all the hospitals, 521 (51.38%) participants were 3A hospitals, 102 (10.06%) participants were 3B hospitals, 300 (29.57%) participants were from 2A hospitals, and 91 (8.99%) participants were from 2B hospitals. Of all the individual participants ($N = 1014$), 881 (86.88%) were hospital information workers, 74 (7.30%) were hospital managers, 42 (4.14%) were health care providers, and 17 (1.68%) were doing other work (administrative officer, etc.) in the hospitals.

Methods

The data for this study are from CHIMA's hospital information system surveys during the COVID-19 pandemic.[3] The research area covered general hospitals, specialized hospitals, and integrated traditional Chinese and Western medicine hospitals, etc. Hospitals that did not respond in time would receive email and telephone notifications. The survey data include participants' demographic information; information system infrastructure, use, and applications; regional medical and HIS construction; information technology outsourcing, etc. In China, the HIT infrastructures are always operated by system suppliers from the HIT market. The IT departments of hospitals are mainly responsible for the procurement, management, and subsequent maintenance of the system.[6] The research protocol could be found at CHIMA's website.[3] This study aims to describe the responses from the HIS to the COVID-19 pandemic and provide empirical evidence in the application of emerging health technologies, informatics tools, and digital interventions in China.

Results

Hospital Health Information Interventions

Hospital HIS played a very important role in supporting the prevention and control of the COVID-19 pandemic, especially in the application of telehealth, remote diagnosis and treatment, artificial intelligence (AI), and big data technology.[7] Many hospitals performed informational interventions, such as epidemiological surveys and patient fever surveys, interoffice payment, emotion monitoring, medical record services, big data analysis and tracking of high-risk patients, and health information exchange (HIE).[8]

During the pandemic, the top five applications of hospital informatization interventions in the Chinese hospital HIS were (►Table 2): internet consultation (70.40%), pre-examination and separation of patients (64.69%), remote telehealth consultation (63.29%), health code application (57.28%), and remote cooperative office and audio and video conference (50.81%). Given the concern of cross-contamination, many Internet hospitals in China (e.g., WeDoctor, haodf.com)

Table 1 Hospital levels and classifications in China

Hospital level	Beds	Size	Personnel
Level 1	20–99	≥45 m^2 per bed	≥1 doctor with the title of attending physician or above ≥3 physicians, five nurses total
Level 2	100–499	≥45 m^2 per bed	≥1 doctor with the title of attending physician or above per department ≥3 doctors with the title of deputy chief physician or above ≥0.88 health technician, 0.4 nurse per bed
Level 3	≥500	≥60 m^2 per bed	≥1 doctor with the title of attending physician or above per department ≥1.03 health technician, 0.4 nurse per bed ≥2 clinical dietitians total The director of each department has the title of deputy chief physician or above The proportion of engineering and technical personnel (technicians, assistant engineers) accounts for ≥1% of the total number of health technical personnel

Table 2 Hospital health information interventions (Top 10) during the COVID-19 pandemic

Hospital information interventions	*N*	Percentage (%)
Internet consultation	654	70.40
Pre-examination and separation of patients	601	64.69
Remote telehealth consultation	588	63.29
Health code[a]	532	57.28
Remote cooperative office and audio and video conference	472	50.81
Information security reinforcement	411	44.24
Public health promotion and education	380	40.90
COVID-19-related data report	366	39.40
Patient-reported medical history	359	38.64
Health information remote operation and maintenance	350	37.67

[a]Health code is an electronic pass. It contains the health condition of the holder. Through filling in personal information, health status, travel history, residence, and contact with suspected or confirmed patients, the application automatically generates a Quick Response code in three colors: red, yellow, and green, which indicate the risk level.

offered free online consultation of COVID-19 and guidance for home quarantine during the pandemic.[9] Other hospital informatization interventions like pre-examination and separation of patients, remote telehealth consultation have also improved the efficiency in delivering health care services.

Online Medical Consultation

During the pandemic, online medical consultation has achieved rapid development because it could avoid provider–patient contact and reduce the risk of infection. Compared with online medical service, online medical consultation focused on the basic interactions or communications between health care providers and patients, during which patients asked questions and sought clinical guidance. The survey results show that, in the business composition of hospital online medical consultation, expert question–answer sessions and science popularization are the most popular, with 626 (61.74%) respondents; the pandemic prevention and control science popularization is next, with 564 respondents (55.62%); the pandemic information release ranks third with 395 respondents (38.95%); and carrying out the intelligent diagnosis and screening applications ranks fourth, with 273 respondents (29.62%). Many hospitals used AI to facilitate rapid diagnosis and risk prediction of COVID-19. For example, cloud-based and AI-assisted CT services were applied to detect COVID-19 pneumonia cases. This technology enabled the CT scan system to complete tasks in few seconds, detect COVID-19 pneumonia with high accuracy, and speed up the diagnostic process substantially.[10]

Internet diagnosis and treatment consultation services facilitated people to receive medical and health consultation through the Internet during the pandemic, effectively alleviated the pressure of hospital outpatient and emergency department, avoided the risk of aggravating the pandemic situation caused by the gathering of patients in the hospital, and reduced the burden on the front-line medical staff.[11]

Online Medical Service

Many hospitals in China conducted online consultations and electronic prescriptions through the internet, thus promoting the internet medical service as the "second battlefield" in the fight against the pandemic. Among the online medical services performed by hospitals, the number of online appointment registrations was 598, accounting for 58.97%; 527 participants provided online consultation using medical images and videos, accounting for 51.97%; the number of online follow-up visits was 257, accounting for 25.35%; 214 participants provided online check-in visits, accounting for 21.1%; and 161 participants provided online prescription and drug distribution, accounting for 15.88%.

Online health care service played an essential role in assisting the fight against the pandemic, which effectively alleviated the pressure of hospital outpatient services and cross-infection.[12] It was also convenient for doctors to follow-up and connect with discharged patients, which became a powerful supplement to offline clinical service.

Telehealth Service

To prevent the spread of the pandemic, the most basic requirement is to reduce the number of people gathering in crowds.[13] The telehealth system can effectively eliminate contact between doctors and doctors or doctors and patients while completing diagnosis and treatment with improved efficiency. The survey results reported that 762 respondents (75.15%) performed remote consultation during the pandemic, 413 (40.74%) conducted distance training and education, 388 (38.26%) adopted remote collaborative office work, 161 (15.88%) performed remote ward rounds, 123 (12.13%) performed the remote referral, and 37 (3.65%) took advantage of other remote digital applications (including remote electrocardiogram, remote diagnosis, etc.). The telehealth system was convenient for experts to conduct consultations and discuss cases and treatment plans through video conferences.[14] In some hospitals, video monitoring of critically ill patients has also been beneficial,[15] which protected the safety of health care workers (HCWs) to the greatest extent while providing effective health care services for patients.

Transformation of Hospital Information System

Due to the emergency outbreak of the pandemic, many hospitals' outpatient and inpatient did not have sufficient capacities to receive additional patients. The hospital HIS has to be transformed based on the actual clinical needs. The survey shows that 646 (63.71%) of the participating hospitals expanded their fever clinics during the pandemic, 457 (45.07%) performed the transformation of the patient appointment system, 372 (36.69%) updated electronic health record (EHR) templates for SARS-CoV-2 (SARS2 or severe acute respiratory syndrome coronavirus 2), 286 (28.21%)

developed pandemic reporting and surveillance system, and 62 (6.61%) performed other information system transformation (such as medical insurance information labeling, outpatient and emergency process transformation, etc.). Many hospitals actively mobilized resources, established special organizational structure for the pandemic, and expanded the number of fever clinics and isolation wards to provide more space for patients. Hospital information department provided optimized plans for transformation, which provided technical feasibility for setting up temporary isolation, diagnosis, and treatment areas. According to the needs of pandemic prevention and control, many hospital information departments quickly completed the transformation of HIS, which demonstrated the power and advantages of HIT.

Hospital Mobile Health Application and Digital Service

Hospital mobile health (HMH) systems include mobile ward rounds system, mobile infusion information systems, nursing information systems, etc. These systems facilitate the digital and virtual service implementation for HCWs, which could reduce human contact and the risk of cross-infection. During the COVID-19 pandemic, some hospitals built or upgraded the HMH systems to improve the efficiency and accessibility of health care, which also ensured the safety of HCWs and patients. The survey shows that 156 (15.38%) hospitals used new or upgraded mobile ward rounds system; 143 (14.10%) upgraded or built new nursing information systems; 97 (9.57%) purchased new personal digital assistants (PDAs); 69 (6.81%) built new or upgraded mobile infusion systems; 69 (6.81%) performed other HMH upgrades or transformations (such as mobile visit and mobile digital radiography, etc.). Even so, 629 (62.03%) hospitals did not take any actions to upgrade or transform the HMH systems.

Emerging Health Technologies

After the outbreak of the pandemic, the national HIS performed many informatics responses through health technology lens. The emerging technologies, including online self-service systems, AI, medical robots, have been applied to improve the safety of HCWs and patients.[16] Practical experience in Chinese HIS has demonstrated that applying the emerging technologies could provide pivotal advantages in addressing the public health challenges. These technologies have unprecedentedly improved the Chinese HIS and its entire response capacity. This survey collected technology strategies that the hospitals have implemented during the pandemic.

►Table 3 shows that 453 (44.68%) hospitals applied online self-service systems; 169 (16.67%) utilized AI medical imaging screening; 75 (7.39%) used medical robots; 73 (7.19%) applied mobile logistics robots; and 54 (5.32%) used other emerging technologies, including bedside video consultation, 5th generation mobile network (5G) remote consultation, remote monitoring, etc. There were 400 (39.45%) hospitals that did not apply any emerging technologies. During the pandemic, self-service systems were widely used, in which AI played an irreplaceable role. AI medical imaging screening could assist in rapid detection; medical guidance robots could provide intelligent guidance services in hospitals; and mobile logistics robots could realize contactless transportation of materials. All these applications greatly improved the efficiency of health care delivery, and also reduced the risk of infection. Even so, there were still a considerable number of hospitals that did not apply emerging health technologies during the pandemic, which means that there is still a lot of room for the application and promotion of emerging health technologies in the health care industry in China.

Table 3 Emerging health technologies and digital service during the pandemic

Emerging health technologies and digital service	*N*	Percentage (%)
Online self-service systems	453	44.68
AI medical imaging screening	169	16.67
Medical robots	75	7.39
Mobile logistics robots	73	7.19
Other technologies	54	5.32

Challenges of Hospital Information Systems

►Table 4 shows the challenges that the HIS faced during the pandemic: 578 (57.00%) hospitals reported having difficulty protecting network information security; 563 (55.52%) reported that their informatization implementation projects were hindered during the pandemic; 427 (42.11%) reported that second-line engineers had difficulties cooperating with field engineers during the pandemic, thus making it challenging to solve field problems efficiently; 233 (22.98%) reported that they were unable to guarantee the success of the upgraded program when the tests were difficult to complete; and 83 (8.19%) experienced other situations, such as heavy workload and insufficient labor. There were various technology problems in the hospital information systems to provide dynamic elaboration of specific needs of hospitals. HIT vendors should work with hospital stakeholders to tackle specific issues in the information system.[17]

Barriers to Hospital Information Systems Implementation

In the information age, hospital informatization has become increasingly important; especially in the period of the global

Table 4 Challenges of hospital information systems

Challenges of hospital information systems	*N*	Percentage (%)
Protecting network information security	578	57.00
Informatization implementation	563	55.52
System workflow and cooperation problem	427	42.11
Upgrade and test-related issues	233	22.98
Other	83	8.19

Table 5 Barriers to hospital information systems implementation

Barriers to hospital HIS implementation	*N*	Percentage (%)
Waiting time and treatment process workflow	728	71.79
Network information security	702	69.23
Internet consultation platform development	599	59.07
Remote consultation and office	537	52.96
Pandemic information releasing platform	518	51.08
Other	51	5.03

public health emergency, the support and guarantee of HIT are particularly critical. Hospitals need to further improve their informatization implementation based on actual characteristics, provide better information technology services for clinical and hospital information system management, improve diagnosis and treatment efficiency, ensure information security, and facilitate health care quality.[18]

The pandemic situation in China has been basically controlled, achieving a milestone in the world.[19] However, some issues and barriers were exposed during the pandemic. ►Table 5 shows that 728 (71.79%) participants believed that it was necessary to shorten the wait time and optimize the treatment process; 702 (69.23%) believed that the network information security protection should be strengthened; 599 (59.07%) thought that internet consultation platform should be further developed and applied; 537 (52.96%) thought that remote consultation and office were needed; 518 (51.08%) believed that it was necessary to establish a comprehensive information platform to analyze the pandemic information or related diseases; and 51 (5.03%) considered that hospitals should solve other shortcomings, such as development of integrated electronic systems and flexible information exchange structure. Hospital workflow efficiency and health data cybersecurity were the most concerned barriers in the implementation of integrated HIS.[20] Heath care providers expected to expand the online medical and health services with a comprehensive HIE platform across different level hospitals.

Hospital Health Information System Cybersecurity

Of all the participants who responded to the question about the investigation of cybersecurity incidents during the pandemic, 43 (4.63%) had experienced virus, worm, Trojan, and other harmful programs that attacked HIS operation; 42 (4.52%) had suffered from denial of service, backdoor attacks, vulnerability, or other external attacks; 33 (3.55%) reported system operation failures caused by the system renovation or update; and 14 (1.51%) had information leakage, loss or theft, information tampering, or other information destruction incidents. Although 752 (80.95%) did not experience security issues, HIS network security was still a concern. Hospitals should strengthen network information security to prevent hacker attacks and protect EHR data from being used inappropriately.

Patient Volume in the Outpatient, Inpatient, and Emergency Department

Since the novel coronavirus is highly infectious, many hospitals have restructured their outpatient, inpatient, and emergency departments during the pandemic. Of the respondents who answered the question about the impact of patient volume, 750 (80.73%) reported a significant decrease in patient volume, 147 (15.82%) reported a moderate decrease, 10 (1.08%) reported a moderate increase or significant increase, and three (0.32%) reported maintaining the same level as usual.

Workload of Hospital Information Department

Of the 929 respondents who answered the question about the workload of the hospital information department, 230 (24.76%) reported decreased workload in the information departments; 226 (24.33%) reported an increase of workload; 161 (17.33%) reported the same workload as usual; 145 (15.61%) had significantly increased workload, while 145 (15.61%) indicated that the workload had been significantly reduced. In general, the workload of the hospital information department was not significantly changed during the pandemic because of the applications of health technologies and digital interventions.

In the process of fighting against the COVID-19, the traditional and emerging HITs have been widely used in hospitals and other clinical settings like mobile cabin hospital. These technologies have strengthened prevention and control of the pandemic, and provided comprehensive information technology support while also improving accessibility and efficiency of health care delivery.

Discussion

In this study, we found that among all the responses to COVID-19 in China, the most popular interventions and applications include expert question-and-answer sessions and science popularization (61.74%) in online medical consultation, online appointment registration (58.97%) in online medical service, and remote consultation (75.15%) in telehealth service. 63.71% of the participating hospitals expanded their fever clinics during the pandemic, 15.38% hospitals used new or upgraded mobile ward rounds systems, and 44.68% hospitals applied online self-service systems. Challenges and barriers include protecting network information security (57.00%) since some hospitals experienced cybersecurity incidents, showing concerns about health privacy and data security. Most participants hope to shorten wait time and optimize the treatment process.

During the pandemic, it is critical to use health-related data to understand the disease and tailor national policies. HIS is a crucial component of any country's responses during the global public health emergency since most data are collected or integrated into these systems.[21] This information is essential for timely and appropriate responses to

various situations, such as allocation of resources of health care, especially in low- and middle-income countries or resource-limited regions.[22] In China, many hospitals actively mobilized resources, established special organizational structure, and expanded the number of fever clinics and isolation wards to provide more space for patients.[23]

The hospital HIS in many resource-limited regions does not have sufficient capacities as expected, which makes it difficult to monitor the course of the COVID-19 pandemic.[24] Hospital HIS can contribute to locally-grounded information that has been utilized to develop national or regional policies and make effective decisions for health-related resource allocation and responses.[25] By using emerging technology, Chinese hospital HIS optimized the process of diagnosis and treatment, improved the efficiency of diagnosis and treatment, and facilitated the timely treatment of patients. The construction of intelligent hospitals and internet hospitals improved health care services, such as the appointment of diagnosis and treatment, which played an active role in responding to the COVID-19 pandemic. These experiences provide some insights for other countries and regions to prevent and control the COVID-19 pandemic and consolidate the improvements.

Given the main barriers to hospital information systems implementation and practical situation, hospitals at or above the second level could establish an appointment system for diagnosis and treatment, providing outpatient appointments at different time slots (e.g., the chunk of each appointment was 30 minutes), along with inpatient appointments and elective surgery appointments. Hospitals that carried out daytime surgery could provide surgery appointments accordingly. Level-3 hospitals should provide centralized examinations and outpatient treatment appointment services. Hospitals at all levels should optimize the appointment diagnosis and treatment process to avoid repeated queuing caused by multiple appointments in outpatient clinics, and shorten hospital waiting times.[26] Some Chinese hospitals strengthened the management of outpatient appointment sources, promoted real-name appointment systems, and promoted technology upgrades.[1] Hospitals at or above the second level established outpatient and inpatient service centers; these centers could integrate various function modules of patient services.[27] In addition, these centers can also provide patients with the one-stop appointment, triage, follow-up services, and gradually become an integrated intelligent online patient service centers.

An integrated intelligent hospital HIS has three main components: clinical care, health service, and health management. HIT is the liaison across the three domains to continuously improve the modernization level of hospital governance, form a modern hospital service, and develop management model that integrates online and offline paradigms, and provide patients with higher quality, higher efficiency, safer, and more considerate health care services.

In response to the actual medical needs of patients, hospitals should promote the in-depth integration of information technology and health care services, thus providing patients with full-process, personalized, and intelligent services covering pre-, during-, and after diagnosis.[28] Taking advantage of internet technology to continuously optimize the health care service process and mechanisms, hospitals can provide various innovative services, such as intelligent medical guidance and triage, waiting reminders, inter-office settlement, mobile payment, in-hospital navigation, and inspection and examination results notification. Online services, such as mutual recognition of test results, self-service printing, and query of outpatient and emergency EHR can also be achieved. Meanwhile, hospitals may actively promote the construction and application of referral services, telemedicine or telehealth, drug distribution, and patient management systems.[27] The integrated HIS bridges online and offline services, and realizes the organic connection between clinical diagnosis and treatment and patient services.[29] In addition, promoting patient-oriented health-related data sharing applications will be valuable to continuously improve the hospital's intelligent service level.[30] Specifically, hospitals should work with researchers and industry vendors to make more efforts to the development and application of intelligent medical equipment, such as surgical robots and surgical navigation and positioning devices, and intelligent auxiliary systems that integrate functions like disease diagnosis, treatment, rehabilitation, and follow-up care.[23,31]

Health-related data are also valuable for researchers to train models to predict the future course of the pandemic. Radanliev et al called for the availability of a repeatable approach for the analysis and visualization of data records and an initial baseline measurement.[32] Hospitals should explore the data integration application of public health and health care services, which can promote the HIE of the hospital EHR and the patient-generated health data,[33] thus facilitating the transition of residents' health information across different health care settings.

In addition, health privacy and data security are critical concerns.[34] Hospitals should further improve the application of the outpatient and emergency EHR systems; improve the standardization of clinical diagnosis and treatment; develop and apply the intelligent clinical diagnosis and treatment decision-making support system; and ensure the safe and effective application of EHR, therefore achieving a closed-loop coverage of the entire diagnosis and treatment process.

For hospitals that lack resources and HIT support, the implementation should be problem-oriented and demand-driven to design tailored infrastructures of the hospital's intelligent management system. Internet, internet of things, and other information technologies can be utilized to realize the interconnection and real-time surveillance of the hospital's HIS.[35] Meanwhile, hospitals should also establish a diagnosis and treatment information database to provide big data support for clinical quality control, medical technology management, diagnosis and treatment behavior regulations,[36] drug use evaluation, service process optimization, workflow efficiency improvement, and health care resource management. Furthermore, all the health care institutions should be encouraged to actively expand innovative applications of intelligent management; use the intelligent tools to predict hospital operation trends; effectively provide managers with objective decision-making support; improve

the level of modern hospital management; and gradually build an intelligent hospital system with integrated clinical care, health service,[37] and health management system.[38] The implementation of intelligent HIS will facilitate the planning and execution of key care-delivery processes, staff working schedules arrangement, resource allocation (e.g., imaging facilities, inpatient beds, operating rooms, etc.). All the predictive analyses through data-driven models will enable higher operational efficiency, especially in a global pandemic.

Limitations

This is an observational descriptive study that employed the survey from the China Hospital Information Work Report. We did secondary analysis based on the cross-sectional survey results and could not test or verify the research problems with causality. There may be a certain level of bias due to the absence of statistical tests. Even so, because the study sample was well represented the population proposed to be studied, the experiences and implications may be generalizable and useful in other countries and regions.

Conclusion

In the process of fighting against the COVID-19, health information system in China has widely used traditional and emerging novel HITs. These technologies have strengthened the capacity of prevention and control of the pandemic and provided comprehensive information technology support while also improving accessibility and efficiency of health care delivery. The most popular interventions and applications include expert question-and-answer sessions and science popularization, online appointment registration, and remote consultation. Challenges and barriers include protecting network information security. The workload in hospital information department was not significantly different during the pandemic, while HCWs experienced increased workload. The implementation of intelligent HIS will facilitate the mitigation of the impact of pandemic, distribution of vaccines, and resumption of operation and production.

Clinical Relevance Statement

Health information systems should actively expand innovative applications of intelligent management; use the intelligent tools to predict hospital operation trends; effectively provide health care workers with objective decision-making support; improve the level of modern hospital management; and gradually build intelligent hospital systems with integrated clinical care, health service, and health management system.

Multiple Choice Questions

1. The most adapted health technologies and digital service in Chinese health care system to respond COVID-19?
   a. Online self-service systems.
   b. AI medical imaging screening.
   c. Medical robots.
   d. Mobile logistics robots.

   Correct Answer: The correct answer is option a.

2. The biggest challenge of hospital information systems in China to respond COVID-19?
   a. Protecting network information security.
   b. Informatization implementation.
   c. System workflow.
   d. Upgrade and test related issues.

   Correct Answer: The correct answer is option a.

Note

The data underlying this article are available in the article.

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Conflict of Interest

None declared.

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