


Health digital technology in COVID-19 pandemic: experience from China

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INTRODUCTION

Since the outbreak of COVID-19 in December 2019, hospitals in many countries have come under great strain. As medical resources are diverted to fight the outbreak and strict restrictions are imposed by authorities, regular medical services have come to a standstill in the affected area. To cope with numerous people seeking medical care, Chinese hospitals have adopted multiple innovative information technologies. These technologies have unprecedentedly improved the Chinese hospital's entire response capacity and reduced the workload of medical workers when facing the COVID-19 outbreak. Here, we reported four strategies that Chinese hospitals have implemented to tackle the crisis.

TELEMEDICINE SERVICE

Chinese hospitals have launched free online medical consultation services soon after the outbreak. The prearranged outpatient clinic was moved online or on mobile apps. Based on the experience of Peking Union Medical College Hospital, its mobile app opened a specialised online consulting section for febrile patients on 10 February.¹ Since then, the hospital has promoted online specialist consultation services orderly. A total of 805 specialists from 43 different departments of the hospital had joined online specialist consultation by 2 March. On the day of 17 February, the hospital provided telemedicine services for at least 1 500 patients. Meanwhile, nearly all Chinese tertiary hospitals launched such platforms with the help of local authorities. Apart from free medical consultations for patients, these platforms also released up-to-date official statistics about COVID-19, disease prevention and control knowledge, and

contact information of psychological counselling.

When people can access professional medical guidance through computers or other mobile devices, their panic and anxiety about the epidemic may recede. For patients who need essential medical help, online health platforms allow doctors to check their inspection reports and offer medical guidance and advice. Most of all, this strategy could efficiently reduce the risk of cross infection, control the speed of virus transmission and relieve the pressure of hospitals. Besides, online conferences can connect doctors from different hospitals across the country and realise the multidisciplinary team cooperation. For example, doctors in the epicentre Wuhan could hold an online multidisciplinary consultation conference call with experts in Guangdong province to discuss severe disease or death cases of COVID-19.²

INTELLIGENT ROBOT

Numerous Chinese medical workers fighting on the frontline were at a high risk of infection and tolerated physical exhaustion from overwork. To relieve exhausted medical workers from the ongoing demand, some Chinese hospitals deployed intelligent robots. These robots can be widely used in the contagious working environments of hospitals to minimise the risk for cross infection and conserve valuable resources. These intelligent robots are mainly used for disinfecting facilities, delivering goods and providing surveillance in hospitals. One representative example is a field hospital in the Hongshan Sports Center of Wuhan, China (also called Smart Field Hospital).³ Powered by Wuhan Wuchang Hospital, China Mobile, and a maker of



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cloud robotics systems named 'CloudMinds', this field hospital was staffed by richly functional robots: navigation robots specified for orienting patients; inspection robots designed for monitoring patient vital signs including temperature, heart rate and blood oxygen levels; transportation robots responsible for delivering food, medicine and other supplies to patients; disinfection robots used for disinfecting spaces and cleaning the floors and even humanoid robots specifically tailored to provide patients some kind of interaction and entertainment. The facility could serve up to 20 000 patients with all its medical services carried out by robots and other Internet of Things devices. Moreover, the COVID-19 pandemic is currently prompting companies worldwide to develop new robots that can meet hospital actual demand while the global spread of coronavirus seems unstoppable.

CONTACT-FREE STRATEGY

In fact, without person-to-person contact, the application of online medical services and remote-controlled delivery robots has embodied the contact-free principle to some extent. However, the practice for contact-free principle in hospitals does not end there. The innovative contact-free digital technology also exists in the fever detection, isolation wards care and drug refill process.

As patients walk through the hospital entrance, high-performance infrared thermal cameras will screen temperature of the large population in real time and quickly detect people with abnormal body temperature.⁴ In the community, drones are applied to take people's temperature by the same principle. In addition, inspection robots, connected 5G thermometers and smart wearable devices can also be options for medical workers to measure temperature. Notably, the speed and accuracy of these methods are rather fast and high than human-conducted readings. Best of all, they allow the frontline medical staff to measure body temperature without close physical contact, thus greatly reducing the risk of infection.

In China, remote health-monitoring devices, mobile telecom devices and cloud video services are used to collect and transmit the information of patients in some isolation wards. For example, the vital signs of patients in the isolation ward are supervised by wireless health-monitoring equipment. In addition, medical workers usually communicate with their patients by WeChat (the most popular social media software in China). When the simultaneous implementation of medical care is needed, medical workers can hold video conferences with their patients in different isolation wards.

Patients with chronic diseases have a stable demand for regular drug refills. When the outbreak escalated, many patients turned to online channels for face masks, over-the-counter drugs and prescription drugs for the first time instead of purchasing drugs from the hospital pharmacies and retail pharmacies. Many Chinese hospitals started to collaborate with

online retail pharmacies to provide convenience for patients. After patients upload the e-prescription and complete the payment, the online retail pharmacies can offer contact-free online-to-offline delivery.⁵ The volunteer places drugs on an agreed location and the corresponding app or platform later sends pickup notification to prevent any direct physical contact.

COMMUNITY OUTREACH AND SUPPORT

Digital technology allows hospitals to get support from social collaborations. The real-time information network issued by Chinese tech companies like Baidu makes patients clear to designated hospitals qualified to treat fever and coronavirus.⁶ This network integrates information including the distance from the nearest hospital, traffic conditions, real-time hospital treatment capacity into an intelligent model, thus drastically reducing confusion and waiting time of the patients.

Chinese hospitals have cancelled the on-site registration and implemented a comprehensive appointment system since the outbreak. Hospitals also took various digital methods to minimise the infection risk of the outpatient department, such as controlling the number of patients during different time periods by network-based reservation system and rapidly screening people with high-risk by QR codes.⁷ The users of the health QR code system can fill out a standard electronic questionnaire with their identity details, address, symptom, travel history of the epidemic area and the history of close contact with confirmed patients and so on. Based on the big data, the system can comprehensively evaluate a person's recent exposure possibilities and risks and therefore hospitals do not need to complete the time-consuming investigation for patients with health QR code.

In the fight against the COVID-19 pandemic, medical workers worldwide are facing unprecedented challenges. Health digital technology has been widely used in China and could be rewarding experience for other countries.

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