More broadly, understanding and potentially influencing public opinion will be important components of any strategies to combat COVID-19 and prevent future pandemics[10]. This global problem requires global solutions, and our survey indicates that the redistribution of some pre-purchased vaccines to countries most in need has public support.

Data Availability

Data are available from the authors upon request. ❐

Editorial note: This article has been peer-reviewed.

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Author contributions

P.M.C. and R. D., overall design of the CANDOUR study; L.S.J.R., P.J.L. and M.V., design of the questionnaire; J.-F.B., A.M. and J.F., interpretation of the results; and A.B., statistical analysis. All authors contributed to the manuscript and approved the final version.

Competing interests

The authors declare no competing interests.

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Improving patient care through the development of a 5G-powered smart hospital

To the Editor—In 2018, Guangdong Second Provincial General Hospital (GD2H) started incorporating artificial intelligence (AI) into hospital management and operations, including patient registration and triage, diagnosis aids, health-record organization, digital payment, and the transportation of operating-room supplies[1,2]. Due to the limitations of big-data sharing via the current 4G hospital network, practical applications of AI cannot be closely connected throughout the hospital, which compromises efficiency and reduces patient satisfaction. For example, if a patient is waiting for emergency surgery in the operating room after a magnetic resonance imaging scan, the surgeons can proceed only until the image files and reports are transferred to the system in the operating room, which takes time and causes delays.

To address this issue, GD2H recently announced the building of a comprehensive smart hospital in conjunction with Huawei, using 5G technology that features low latency, high capacity, increased bandwidth and a wireless nature[3]. The 5G hospital has attracted worldwide attention because of the potential for fundamentally changing how hospitals operate. By using 5G in combination with cloud storage and AI, the comprehensive 5G smart hospital will cover areas of healthcare, teaching and training, research, and management, with 5G technology applied both within and outside the hospital, including ambulance, outpatient and inpatient services, and the operating room. The 5G smart hospital has several potential benefits, as outlined below.

In 2019, GD2H started to guide complex surgery conducted in remote hospitals, connected live via 5G, that allowed the operating room to be turned into a classroom[4]. Since then, GD2H has continued to explore ways that 5G could overcome the problem of real-time data sharing due to distance and volume of data. GD2H has now equipped its ambulances with a portable computerized tomography scanner, an electrocardiogram and an echocardiogram machine, as well as first-aid supplies. Once a patient enters the ambulance, the use of 5G allows real-time data on rapid assessment, with examinations and diagnoses, monitoring, and initial treatments transmitted to the hospital system simultaneously. If necessary, a multidisciplinary team can arrive within minutes for consultation and decision-making, while the emergency room is made ready to receive the patient. The 5G-powered ambulance as a mini-hospital will shorten the time from

A nurse initiating a smart infusion device for intravenous therapy while the patient checks his treatment plan on the bedside smart touchscreen. Credit: GD2H (taken by Haoshu He)

disease onset to treatment received, which should improve the survival of patients and achieve better outcomes.

The smart hospital at GD2H has applied 5G widely in the wards, which also make use of wearable trackers, smart touchscreens, robots for supply delivery and cleaning, infusion devices, and real-time monitoring and warning systems. Infusion devices transmit data on the speed and time remaining to the monitoring system automatically, while a warning signal is sent to the operating desk and the nurse's wearable tracker, worn on the wrist, if anything requires clinical attention (Fig. 1). This is especially appreciated by patients with sleep problems, because the nurse can handle the infusion via remote tracking, without interrupting the patient's sleep.

Patients in the wards can also receive remote consultations and monitor their own treatment. Patients can access all the data on examinations, treatments and expenses either from bedside touchscreens or from the smartphone app DingBei Doctor, which was developed by GD2H[5]. Accessing online consultations and discussions should improve inpatients' satisfaction, facilitate management of their own health conditions and, ultimately, improve patient-centered outcomes.

Experiences with 5G smart hospitals such as GD2H may provide lessons for internet hospitals. The internet hospital is a fully digital platform that provides healthcare services and has the potential to be a telehealth model for healthcare provision and consumption in China. Internet hospitals aim to alleviate the disparity in healthcare resources in different parts of China, and to satisfy the emerging needs of patients, who want to receive medical care through an online platform, without the need for travel[6]. The internet hospital also provides an opportunity for controlling nosocomial infections, especially during the COVID-19 pandemic[7]. Patients can receive a contactless professional consultation and medical advice before visiting a hospital and, if needed, they can request home delivery of treatments after receiving an electronic prescription. The unavailability of big-data sharing is a key barrier to the efficiency and usage of an internet hospital[8], so the use of 5G may be a potential solution to increase the use of internet hospitals.

In the future, we expect that the use of 5G in conjunction with AI will help with data-driven hospital management and decision-making, due to the extensive information available instantaneously, combined with a decision support system. Such rapid decision-making would have been very helpful at the start of the COVID-19 pandemic, when public panic led to a surge of patients into hospitals.

Other uses of the 5G smart hospital include hospital security, training for novice practitioners and researchers, patient self-management, and student teaching. There are also challenges, including public acceptance of 5G, the cost of infrastructure building, data security and privacy protections[9]. The initiation of a 5G-powered smart hospital at GD2H provides an exploratory platform for addressing these concerns. as well as for exploring how this technology can enhance patient outcomes and instill a culture of evidence-based decision-making. ❐

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