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POLICY NOTE

LESSONS FROM HOSPITALS' EXPERIENCES IN RESPONDING TO COVID-19

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Republic of Korea – World Bank Group Partnership
On COVID-19 Preparedness and Response

Lessons from Hospitals' Experiences in Responding to COVID-19

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ABSTRACT

Hospitals have faced diverse and serious challenges during the COVID-19 pandemic. This policy note attempts to provide a review of hospital experiences and response during this period, together with lessons to support hospitals in preparing and responding to future pandemics. The note highlights the importance of a holistic and comprehensive approach to health care delivery rather than a simple improvement of health care capacity in responding to pandemics and disease outbreaks. During an outbreak or pandemic there is likely to be a need for a country to rapidly expand the capacity for diagnostic testing by expediting its approval process for the availability and use of appropriate test kits. Also, introducing innovative testing venues such as “drive-throughs” and “walk-throughs” has significantly helped access and increased the number of tests that can be done on a daily basis. Countries can respond to an increased patient load by increasing hospitals’ surge capacity for mass critical care by mobilizing trained medical teams to intensive care units, and they can improve intensive care capacity by using intermediate care wards, postsurgical recovery rooms, operating theaters, and areas of intervention. Countries can transform public venues such as exhibition centers and residential facilities (such as dormitories for athletes) into health care facilities, where patients with mild to moderate infection can be isolated from their homes while being provided with medical care, disease monitoring, food, shelter, and social activities. Countries need to relax regulatory guidelines, expand reimbursement of costs, and increase access to advancing technology such as telehealth and virtual care to address public health needs and improve care efficiency during the pandemic.

1. BACKGROUND

COVID-19 is an infectious disease caused by the SARS-CoV-2 virus, which has a phylogenetic resemblance to SARS-CoV (Zhu et al. 2020). It became a public health emergency of international concern since it was first identified in Wuhan, the capital city of Hubei province in China, in early December 2019. There were 394,381,395 confirmed cases of COVID-19 and 5,735,179 confirmed deaths globally as of February 7, 2022, according to the WHO (World Health Organization) Coronavirus (COVID-19) Dashboard.

Hospitals and health care institutions providing patient treatment by specialized staff and equipment have faced diverse and serious challenges during the pandemic. As essential players in the treatment of COVID-19 infections in critically ill patients, hospitals needed more negative pressure rooms, isolation rooms, ventilators, personal protective equipment (PPE), and other supplies. At the same time, they were suffering revenue losses due to a decline in outpatient visits, elective procedures, and surgeries. The American Hospital Association estimated a financial impact of US$202.6 billion in lost revenue for America's hospitals and health care systems from March 1, 2020, until June 30, 2020—or an average of US$50.7 billion per month (Kaye et al. 2021).

Hospitals in middle- and low-income countries faced even greater challenges, as they were burdened with limited access to health care, worse health status, and poverty. Despite PPEs being a necessary precaution for managing patients, only 12.6 percent of doctors in Pakistan, for example, reported having access to all forms (N95 respirators/masks, gloves, gowns or full suits, and face shields or goggles) in their hospitals, while 53.1 percent of doctors in the US reported having full access (Ahmed et al. 2020).

This policy note provides a review of hospitals' experiences in responding to COVID-19, with the goal of helping hospitals prepare and respond to the pandemic. The review begins with a description of the preparedness and response measures for hospitals, including existing guidelines, followed by data on the incidence, hospitalization, and mortality of COVID-19. This is followed by an exploration of the experiences of both COVID-19 and non-COVID-19 patients in securing access to hospital care, the management of surge capacity, and the introduction of hospital innovations and technology for COVID-19 treatment. Finally, lessons from hospital experiences are discussed, while avoiding a one-size-fits-all approach for countries with diverse economic conditions and medical systems.

2. FRAMEWORKS AND PROTOCOLS FOR HOSPITAL PREPAREDNESS AND RESPONSE TO COVID-19 AND HOSPITALIZATION

The World Health Organization developed the COVID-19 Strategic Preparedness and Response Plan (SPRP 2021) to overcome the challenges caused by COVID-19 (WHO 2021). The plan has six strategic objectives: suppress transmission, reduce exposure, counter misinformation and disinformation, protect the vulnerable, reduce deaths and illness, and accelerate equitable access to new tools.

Concurrently, the European Centre for Disease Control (ECDC) provided a simpler checklist for hospitals preparing for the reception and care of COVID-19 patients. Elements to be assessed include establishment of a core team and key internal and external contact points; human, material, and facility capacity; communication and data protection; hand hygiene, personal protective equipment, and waste management; triage, first contact and prioritization; patient placement, moving of the patients in the facility, and visitor access; and environmental cleaning (ECDC 2020).

The German Society of Hospital Disaster Response Planning and Crisis Management developed comprehensive and specific recommendations for hospitals to cope with the COVID-19 pandemic (Wurmb 2020); these recommendations can serve as useful guidelines in reviewing hospital experiences during the pandemic. The primary goal to be pursued by hospitals was defined as maintaining conventional or contingency care for as long as possible, while delaying crisis care. The "hospital incident command," structured for a comprehensive management of a pandemic, was required to contain six categories of staff: (1) staff management and administration; (2) situation report; (3) operational command; (4) technology and logistics; (5) communication, media, and press; and (6) IT and mobile services.

While maintaining the functionality of hospitals with nosocomial infection control measures, elective medical care can be reduced to increase hospitals' treatment capacity for COVID-19 patients. An example is to categorize elective care by weeks of acceptable postponement (Category I: 0–2 weeks; Category II: 2–4 weeks; Category III: 4–12 weeks; Category IV: more than 12 weeks), which can be decided transparently by a board of consultants, with consent (Wurmb 2020).

To increase hospitals' surge capacity for mass critical care, it is also necessary to mobilize trained medical staff to intensive care units by recruiting and training nurses and doctors from other specialties, cooperating with other health care institutions, and recruiting and training medical students. Intensive care capacity should be escalated gradually using intermediate care wards, postsurgical recovery rooms, areas of intervention, and operating theaters. Areas equipped and intended for medical treatment should be prioritized before other areas of hotels, schools, or function halls. Finally, a consensus-based approach would eventually be required to triage patients and to allocate resources in a certain prioritized manner (given a lack of resources and mass critical care in most cases)—for example, based on urgency and prospects of treatment success (Wurmb 2020).

The US COVID-19 Treatment Guidelines Panel at the National Institutes of Health provides continuously updated therapeutic guidelines for nonhospitalized and hospitalized adults with COVID-19. For example, nonhospitalized patients with symptoms of COVID-19 should be triaged via telehealth visits to determine whether they require COVID-19-specific therapy and in-person care, while patients with dyspnea should be referred for an in-person evaluation by a health care provider and followed closely during the initial days following the onset to assess for worsening respiratory conditions (COVID-19 Treatment Guidelines Panel 2022).

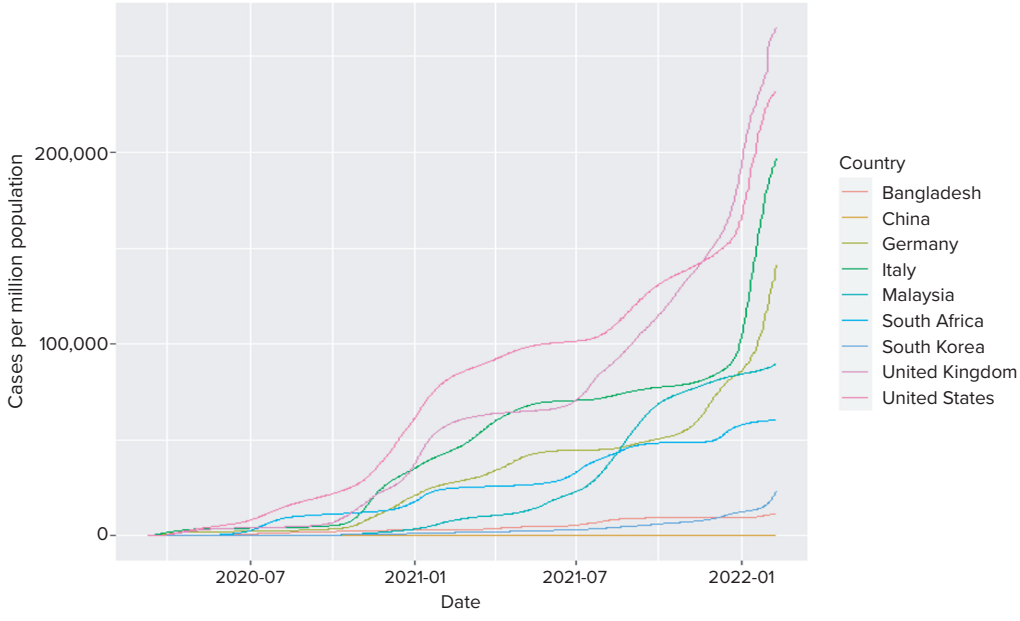
3. INCIDENCE, HOSPITALIZATION, AND MORTALITY OF COVID-19 BY COUNTRY

According to the WHO, while most COVID-19-infected people will experience mild to moderate respiratory symptoms and recover without requiring special treatment, older people and those with underlying medical conditions such as cardiovascular disease, diabetes, chronic respiratory disease, or cancer can develop more serious illness. A study of clinical characteristics of 1,099 patients between December 11, 2019, and January 29, 2020, from 552 hospitals in 30 Chinese provinces showed that the most common symptoms were fever (43.8 percent on admission, but 88.7 percent during hospitalization) and coughing (67.8 percent) (Guan et al. 2020). The treatments provided were intravenous antibiotics (58 percent), oxygen therapy (41.3 percent), and oseltamivir (35.8 percent), among others. Although clinical outcomes were measured only for the brief studied period, median length of hospital stay was 12 days with a rate of 5 percent for admission to intensive care unit and a case fatality rate of 1.4 percent (Guan et al. 2020).

To examine incidence, hospitalization, and mortality of COVID-19 by countries, nine countries (Bangladesh, China, Germany, Italy, Malaysia, South Africa, Republic of Korea [Korea], the United Kingdom [UK], and the United States [US]) were chosen, taking into account not only data availability but also diverse economic and medical conditions.

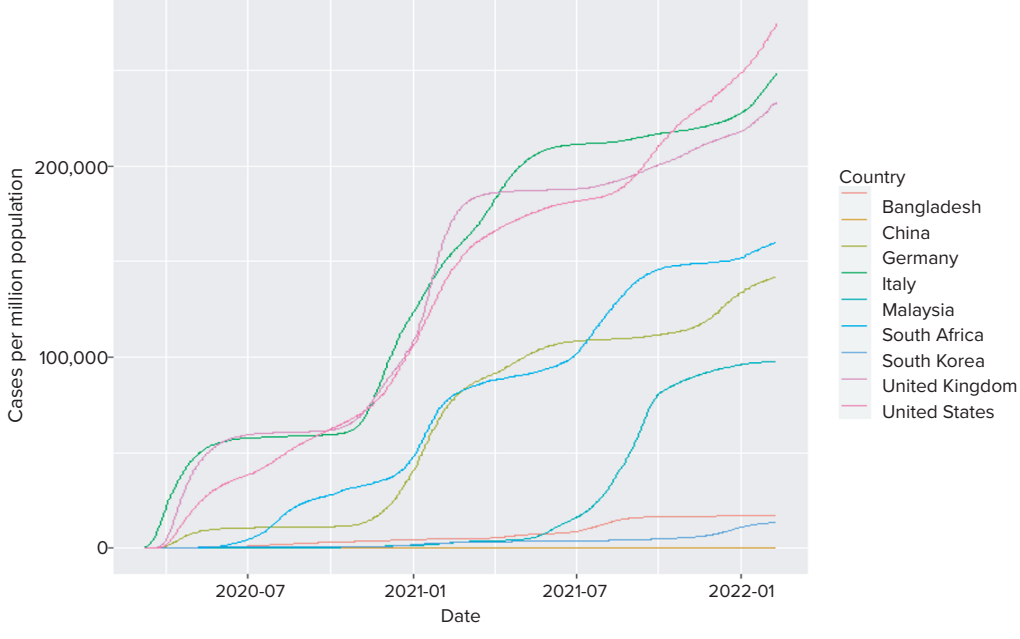
Whereas total cases of COVID-19 in the world increased from 557 on January 22, 2020, to 403,244,280 on February 9, 2022, total deaths of COVID-19 increased from 17 to 5,777,952 (Our World in Data n.d.). Cases per million population ranged significantly, from 74 in China and 11,348 in Bangladesh, to 232,093 in the US and 264,572 in the UK as of February 9, 2022 (Figure 1 and Appendix Table 1). Deaths per million population, during the same time period, ranged from 3 in China and 136 in Korea, to 2,483 in Italy and 2,740 in the US, in increasing order (Figure 2). It is notable that wealthier countries with more health care resources have had a greater burden from COVID-19 than low-income countries. This is consistent with an analysis that finds no correlation between some of the health care capacity indicators and variations in infection-fatality ratios across countries (COVID-19 National Preparedness Collaborators 2022).

Figure 1: Total Cases of COVID-19 by Country



Sources: Our World in Data (assessed on February 10, 2022)

Figure 2: Total Deaths from COVID-19 by Country



Sources: Our World in Data (assessed on February 10, 2022)

In each country, total cases increased dramatically between March 9, 2020, and February 9, 2022: from 594 to 77,267,254, in the US, from 629 to 18,045,697 in the UK, and from 1,176 to 11,832,331 in Germany. Simultaneously, total deaths increased from 22 to 912,255 in the US, from 3 to 159,090 in the UK, and from 463 to 149,896 in Italy. Both total cases and deaths increased the least in Korea and China, among the countries examined.

Within each country, COVID-19 patients in hospitals per million population, from July 15, 2020, to February 8, 2022, increased from 14.1 to 326.6 in Italy, from 1.7 to 104.6 in Malaysia, from 28.9 to 199.2 in the UK, and from 101.4 to 280.5 in the US. Simultaneously, COVID-19 ICU patients in hospitals per million population rose from 2.9 to 28.5 in Germany, from 0.9 to 22.8 in Italy, from 0.1 to 4.2 in Malaysia, from 0.3 to 5.2 in Korea, from 2.2 to 6.3 in the UK, and from 27.8 to 55.1 in the US. Fewer COVID-19 patient numbers in hospitals and ICUs were reported in Malaysia and Korea. They were comparable to the number of hospital beds per 1,000 population in 2016 (from Our World in Data); for example, 0.79 in Bangladesh, 1.62 in Malaysia, 2.57 in the UK, 2.77 in the US, 3.17 in Italy, 4.02 in China, 8.06 in Germany, and 11.98 in Korea. Unlike in the cross-country study above, other data has shown, notably, that hospital-based resource availability per COVID-19 cases—for example, intensive care unit beds—is significantly correlated with decreased incidence rate of death across US geographic regions, underscoring the importance of hospital resource flexibility in early health care response to the pandemic (Janke et al. 2021).

Table 1: COVID-19 Patients and ICU Patients in Hospitals by Country

Country	Date	Patients per million population	ICU patients per million population
Germany	07/15/2020		2.9
	02/08/2021		47.2
	02/08/2022		28.5
Italy	07/15/2020	14.1	0.9
	02/08/2021	359.0	35.5
	02/08/2022	326.6	22.8
Malaysia	07/15/2020	1.7	0.1
	02/08/2021	106.8	12.6
	02/08/2022	104.6	4.2
South Korea	07/15/2020		0.3
	02/08/2021		3.7
	02/08/2022		5.2
United Kingdom	07/15/2020	28.9	2.2
	02/08/2021	392.1	47.4
	02/08/2022	199.2	6.3
United States	07/15/2020	101.4	27.8
	02/08/2021	230.9	58.1
	02/08/2022	280.5	55.1

Sources: Our World in Data (accessed February 10, 2022)

4. HOW TO SECURE BETTER ACCESS TO HOSPITAL CARE FOR BOTH COVID-19 AND NON-COVID-19 PATIENTS

Hospitals should maintain conventional or contingency care for as long as possible, while increasing hospitals' treatment capacity for COVID-19 patients (Wurmb 2020). In the US, for example, all hospital admission declined by 34.1 percent, including non-COVID-19 admissions, which declined by 42.8 percent from February 2020 to April 2020, as indicated by data from 201 hospitals in 36 states (Birkmeyer et al. 2020). Non-COVID-19 admissions declined more for those hospitals that had the highest proportion of COVID-19 admissions to total admissions in the highest quintile of COVID-19 exposure than hospitals in the lowest quintile. Non-COVID-19 patients from minority or low-income neighborhoods may have experienced barriers preventing hospital access, leading to higher mortality rates (Birkmeyer et al. 2020).

One key concern of securing access to hospital care during the pandemic is the fear of nosocomial infection, the transmission of the virus within a hospital. A within-hospital SEIR (susceptible-exposed-infected-recovered) transition model of SARS-CoV-2 in a typical English hospital with 1,000 beds and 8,000 health care workers estimated that approximately 20 percent of infections in inpatients, and 73 percent of infections in health care workers, between March 9, 2020, and July 17, 2020, were due to nosocomial infections (Evans et al. 2021). Accommodating suspected COVID-19 patients in single rooms or bays has the potential to reduce hospital-acquired infections in patients by up to 35 percent; periodic testing of health care workers can reduce their infection by as much as 37 percent.

The Republic of Korea expanded the capacity of diagnostic tests rapidly by expediting an approval system for urgent test-kit use and introducing both drive-through (drive one's own automobile for the testing process) and walk-through testing centers (walk through a one-person testing booth) (Kang, J., et al. 2020). Reliable tests have been important in controlling the spread of COVID-19. Total number of tests per thousand population in Korea increased from 9 on April 5, 2020, to 137 on January 31, 2021, and to 1,004 on January 30, 2022 (Our World in Data n.d.). The COVID-19 patients, when tested positive, were classified into three categories (mild, moderate, severe) of disease severity, and "moderate" and "severe" cases were prioritized for hospitalization. Costs of tests and treatment were supported by the government: 80 percent by National Health Insurance, 10 percent by the central government, and 10 percent by local governments.

Some hospitals in Korea set up screening clinics outside of emergency departments (ED) to preemptively identify COVID-19 patients and prevent them from entering EDs and non-COVID hospitals. They also increased isolation rooms by installing portable negative-pressure machines through window vents. Hospitals received Level D supplies from the Korea Disease Control and Prevention Agency (KDCA), based on the number of hospitalized cases and health care personnel. When Level D supplies ran short, four-item PPE sets consisting of disposable plastic gowns, gloves, masks, and goggles or face shields were used. Some of the PPE items were reused after being disinfected appropriately when supplies further dwindled. Health care personnel were advised to work 2 to 3 hours wearing Level D sets, and the screening clinic staff was advised to rotate every 3 hours. They were asked to report any symptoms twice daily (before work and after lunch) and exempted from work immediately for 14 days when testing positive or exposed to a case without appropriate protective equipment (Kang, J. et al. 2020).

Similarly, Beijing Tiantan Hospital in China set up a screening clinic where patients had to fill out an epidemiological survey and undergo blood tests, chest CT scans, and nucleic acid testing to be hospitalized, to reduce the risk of nosocomial infection. Patients admitted to the emergency room were also screened by a chest CT scan and a throat swab culture beforehand, and if suspected of being infected, transported to a transitional care unit in the departments of neurosurgery, neurology, surgery, or internal medicine. Only patients with negative test results were allowed in the outpatient department. Infected patients required a negative pressure operating room (Wang et al. 2020).

A survey of 38 hospitals in Tokyo, Japan, estimated that 284 health care personnel had contracted COVID-19, and nosocomial transmission to inpatients occurred at 13 out of the 38 hospitals (34 percent), negatively affecting hospital functioning (Tagashira et al. 2021). The total number of cases of nosocomial transmission to

inpatients reached 156, and 42 (27 percent) of them died during hospitalization according to data for the period up to May 31, 2020. Importantly, 18 hospitals reported verbal abuse targeting both infected and noninfected health care personnel following reports of nosocomial transmission, and a portion of the respondents felt that media reports negatively affected the hospital's functioning—8 out of 38 (21 percent) for their own hospital and 24 out of 38 (63 percent) for other hospitals. It was also notable that some of the main differences between hospitals with and without nosocomial transmissions included the availability of hospital-specific COVID-19 preparedness policies (hospital guidelines, manuals, and so forth) and the creation of passages for patients with suspected COVID-19 to minimize cross-contamination in emergency departments or outpatient clinics.

As an example for combating nosocomial transmission, a university hospital with 808 beds in Seoul, Korea, was referenced (Kim, S., et al. 2020). A staff member in charge of transferring patients within the hospital was confirmed to be positive on February 20, 2020. The entire outpatient clinic and all emergency rooms were temporarily closed for two weeks, and the entire hospital was thoroughly cleaned and disinfected. Inpatients without any symptoms or contact with COVID-19 patients were discharged, while those who had been in contact were quarantined in single rooms for two weeks. Two thousand nine hundred and twenty-four (2,924) inpatients and employees (213 doctors, 901 nurses, 271 medical support staffs, 952 hospital employees, 494 inpatients, 87 guardians and caregivers, and 11 volunteers) were tested, which resulted in a 0.1 percent overall positivity rate (3 positive cases). Epidemiologists from the KDCA and the hospital's infection control unit reviewed electronic medical charts, closed-circuit television (CCTV), and travel history to identify individuals who potentially encountered COVID-19 patients within the hospital. The review found that 9.9 percent of those subjects had been in contact with the four COVID-19 patients (1 hospital staff, 2 inpatients, and 1 caregiver). The final total number of hospital-associated infection was 14 (4 within the hospital and 10 outside the hospital). The hospital reopened on March 9, 2020, 17 days after closing (Kim, S., et al. 2020). Another experience of closing and reopening a hospital due to nosocomial infection similarly demonstrated the importance of thorough contact tracing and testing of all health care workers and patients in containing hospital-associated outbreaks (Lee et al. 2021).

Closing and reopening hospitals is not a feasible choice for many less-developed countries like Bangladesh, where treatment conditions are worse with concentration of inadequate health care facilities in urban areas, insufficient number of medical workers, and lower quality of medical equipment including PPE (Al-Zaman 2020). COVID-19 testing rates remained low there due to a limited number of testing laboratories and kits, their uneven distributions across the country, a lower number of medical workers, and an unregulated testing system, among other factors (Al-Zaman 2020).

5. MANAGING SURGE CAPACITY AT HOSPITALS: SUPPLIES, STAFF, AND SPACE DURING THE PANDEMIC

While securing access to hospital care for all patients is a priority, it is also important for hospitals to efficiently mobilize resources and manage surge capacity during the pandemic. The German Society of Hospital Disaster Response Planning and Crisis Management recommended the mobilization of trained medical staff to intensive care units (Wurmb 2020).

In the Lombardy region of Italy, a regional critical care task force was formed consisting of physicians, senior critical care nurses and representatives from the medical directorate, hospital management, and hospital infection control to increase hospital surge capacity (Carenzo et al. 2020). The task force designed a response plan to: (i) establish cohorts of ICUs, emergency departments, and wards dedicated to the treatment of COVID-19 patients; (ii) design appropriate procedures for the reception, assessment, isolation, and movement of suspected and confirmed cases; and (iii) train all staff expected to work in the dedicated ICUs on PPE usage and patient management. Starting with four operation bays for a step-up approach, the first ICU was selected on the ground floor due to its proximity to the emergency department and the limited number of access points allowing easy access control. Available beds were gradually expanded by monitoring daily needs. A

system implementing four shifts a day was developed, given the discomfort of working in personal protective equipment, and shifts were designed to mix experienced and unfamiliar personnel together in each shift to better sustain the process. Staff members were trained on how to use PPE, precautions to be adopted during tracheal intubation, and how to rapidly turn a patient from supine to prone and vice-versa with only three health care workers (Carenzo et al. 2020).

Even orthopedic departments and specialty hospitals had to adapt to the challenges of the COVID-19 pandemic (Schwarzkopf et al. 2020). The orthopedic department of New York University (NYU) Langone Health, New York, had to reassign operating room nurses to medical COVID-19 floors and have attending surgeons cover urgent care locations. The department tried to maintain transparent leadership by sharing data on the number of emergency department visits, admissions, inpatient census, intubated patients, discharges, and deaths related to COVID-19, which helped in lessening fear of the unknown for the staff. Elective surgery, defined initially as a surgical procedure that can be postponed for at least three months, was not allowed, starting March 9, 2020. Medical staff offered patients options to reschedule their surgery to a future date, be put on a waiting list to be scheduled as soon as possible when elective surgery resumed, or be contacted when activity to discuss options resumed for patients. NYU also expedited graduation for interns in the fourth-year medical school class exceptionally early, and residents were able to rehearse surgical procedures using 10 virtual reality headsets and a surgical simulator program that could be used at home for operative experience. It also expanded its mental health support using webinars, virtual mental health clinics, and direct provider care (Schwarzkopf et al. 2020).

A novel way to respond to a shortage of hospital beds under the surge of infections was implemented in Wuhan, China (Chen et al. 2020). Public venues such as stadiums and exhibition centers were transformed into health care facilities, called Fangcang shelter hospitals. These facilities isolated patients with mild to moderate COVID-19 from their homes, while providing medical care, disease monitoring, food, shelter, and social activities. Fangcang shelter hospitals were an important alternative to isolation in homes and enabled staff to monitor patients frequently and refer worsening patients quickly to traditional hospitals. The 16 Fangcang shelter hospitals, built over a period of 3 weeks, provided 13,000 beds and care to about 12,000 patients. They were less costly to build and manage with fewer medical staff than traditional hospitals. This strategy also increased the efficient distribution of medical care, with bed vacancy rate for severe and critical patients in the traditional hospitals rising from 4 percent on February 4, 2020 (before the Fangcang shelter hospitals) to 16 percent on February 22, 2020 (with 16 Fangcang shelter hospitals). According to data from February 29, 2020, 13 percent of patients admitted at the Fangcang shelter hospitals were transferred to traditional hospitals (Chen et al. 2020).

Other countries such as Iran, the US, the UK, and Spain transformed public venues such as stadiums and exhibition centers into health care facilities. Korea also transformed dormitories and residential facilities into community treatment centers (CTC) for asymptomatic or mild COVID-19 cases to respond to a shortage of hospital beds (Lee et al. 2020; Kim, J., et al. 2020). A community treatment center in Seoul, Korea, operated from March 16 to May 27, 2020, with 208 rooms, 5 doctors during the day and 1 at night, 4 nurses during the day and 2 at night, and 3 daily consultations using smartphone video calls. During the operation, 213 patients (26.5 percent of 803 total patients and 35.7 percent of 597 newly diagnosed patients in Seoul) were admitted to this CTC: 75 from home, 137 from hospitals, and 1 from another CTC. The median length of stay was 21 days (interquartile range: 12 to 29 days) with 3.2 daily consultation sessions and 0.5 daily tests (chest X-ray, reverse transcription polymerase chain reaction). The most frequently prescribed medications were those for fever/pain control (19.5 percent), cough/sputum (11.6 percent), and rhinorrhea (8.9 percent). Until it closed on May 27, 2020, 191 patients (89.7 percent) were discharged home and 22 (10.3 percent) to hospitals (Lee et al. 2020).

It is important to note that telemedicine was used to minimize medical staff contact with infectious patients at CTCs in Korea. Seoul National University Hospital (SNUH), a teaching hospital with 1,700 beds in Seoul, converted the remote Mungyeong Human Resource Development Center into a CTC (SNUH-CTC). Patients admitted to the SNUH-CTC checked and reported their symptoms twice a day through a smartphone application, and nurses at the monitoring center of SNUH monitored them and provided video consultations twice a day. Doctors at SNUH also monitored patients once a day and provided video consultations once every two days. One hundred and thirteen (113) patients were admitted to the SNUH-CTC from March 5 to March 26, 2020 (Kang et al. 2020).

6. HOSPITAL INNOVATIONS AND TECHNOLOGY TO USE IN RESPONSE TO COVID-19

During the pandemic, several technologies such as telehealth, artificial intelligence, and robotics were developed and adopted to address public health needs, improve care efficiency, and develop treatments and vaccines (Clipper 2020). Telehealth can provide diverse services and virtual care to patients while ensuring low risk of virus exposure. The Stafford Act and the National Emergencies Act allowed the Centers for Medicare and Medicaid Services (CMS) in the US to expand Medicare's telehealth benefits by relaxing regulatory guidelines and enlarging reimbursement and access to telehealth and virtual care.

Three medical institutions in the US—Stanford Health Care, Stanford Children's Health, and County of Santa Clara Health System—independently deployed inpatient telemedicine programs during March 2020 (Vilendrer 2020). Differences existed among them in patient demographics and technological capabilities, but they chose readily available consumer-grade technology with minimal infrastructure investment. Their experiences showed the feasibility of rapid deployment of inpatient telemedicine to reduce pathogen transmission and PPE use and to facilitate medical staffs' work during the pandemic.

The pharmacy services also faced challenges involving staffing, supplying and distributing drugs, and off-label use of drugs during the pandemic (De Filippis 2020). In carrying out activities to maintain the usual distribution of drugs to chronic patients while also managing COVID-19-related drugs, the medical institutions in China launched remote pharmacy services such as online prescriptions, consultation, and delivery services for drugs (Liu et al. 2020).

7. RECOMMENDATIONS

The COVID-19 pandemic is requiring investment in more effective preparedness and response for hospitals. Hospitals, especially those in middle- and low-income countries, have faced diverse and serious challenges under the pandemic situation. Lessons from diverse hospital experiences across selected countries are summarized below.

1. A "full value chain" and comprehensive approach to health care delivery is needed rather than only improving hospital capacity, in responding to pandemics like COVID-19.
2. A pandemic requires rapid expansion of the capacity of diagnostic tests through the expediting of an approval system for urgent test-kit use and introduction of innovative testing processes such as drive-throughs and walk-throughs. Capable and reliable tests are crucial in controlling the spread of COVID-19.
3. The setting up of screening clinics outside emergency departments to triage COVID-19 patients and the creation of passages for patients with suspected COVID-19 to minimize cross-contamination have proven beneficial.
4. Hospitals' surge capacity for mass critical care can be increased by mobilizing trained medical teams to intensive care units and reducing the ICU load by using intermediate care wards, postsurgical recovery rooms, areas of intervention, and operating theaters.
5. Public venues such as exhibition centers and residential facilities can be transformed into health care facilities to isolate patients with mild to moderate COVID-19 from their homes while they are provided with medical care, disease monitoring, food, shelter, and social activities.
6. Relaxation of regulatory guidelines and expansion of reimbursement and access to advancing technology, such as telehealth and virtual care, are needed to address public health needs and improve care efficiency during the pandemic.

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ANNEX

Table 1: Total Cases and Deaths of COVID-19 by Country

Country	Date	Cases	Deaths	Cases per million population	Deaths per million population
Bangladesh	03/09/2020	3		0.02	
	02/09/2021	538,765	8,229	3,240	49
	02/09/2022	1,887,271	28,703	11,348	173
China	03/09/2020	80,735	3,120	56	2
	02/09/2021	89,734	4,636	62	3
	02/09/2022	106,663	4,636	74	3
Germany	03/09/2020	1,176	2	14	0.02
	02/09/2021	2,302,051	63,006	27,438	751
	02/09/2022	11,832,331	119,457	141,028	1,424
Italy	03/09/2020	9,172	463	152	8
	02/09/2021	2,655,319	92,002	43,986	1,524
	02/09/2022	11,847,436	149,896	196,255	2,483
Malaysia	03/09/2020	117		4	
	02/09/2021	248,316	909	7,576	28
	02/09/2022	2,956,332	32,065	90,198	978
South Africa	03/09/2020	3		.05	
	02/09/2021	1,479,253	46,869	24,637	781
	02/09/2022	3,631,642	96,502	60,485	1,607
South Korea	03/09/2020	7,478	53	146	1
	02/09/2021	81,930	1,486	1,597	29
	02/09/2022	1,185,361	6,963	23,104	136
United Kingdom	03/09/2020	629	3	9	0.04
	02/09/2021	3,976,087	113,933	58,294	1,670
	02/09/2022	18,045,697	159,090	264,572	2,332
United States	03/09/2020	594	22	2	0.07
	02/09/2021	27,351,867	473,923	82,159	1,424
	02/09/2022	77,267,254	912,255	232,093	2,740

Sources: Our World in Data (accessed February 10, 2022)

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