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Fighting against COVID-19: Experience from China's Practice*

ZHU Yu[1†], LIU Jiuchang[2‡], WU Xiaodong[3§]

1. Department of International Cooperation, Chinese Academy of Engineering, Xicheng District, Beijing 100088, China
2. Department of International Collaboration, Chinese Academy of Medical Sciences & Peking Union Medical College, No. 9 Dongdan Santiao, Dongcheng District, Beijing, 100730, China
3. General Office, Chinese Academy of Engineering, Xicheng District, Beijing 100088, China

COVID-19 is now engulfing the entire world. On March 11, the World Health Organization (WHO) officially declared the novel coronavirus pneumonia (COVID-19) a global pandemic. By April 27, the epidemic has hit 213 countries and regions, with over 2.87 million cases confirmed (WHO, 2020). Facing this grim situation, with no cure or effective vaccine available, the experience and lessons from China's containment of this vicious virus – all gained at the costs of lives and pains – might be of special value of reference for the international community.

I.Early Discovery, Early Reporting, Early Quarantine and Early Treatment

Early discovery, reporting, quarantine and treatment are measures of critical importance in the prevention and control of COVID-19 (Shenzhen News, 2020). In the absence of effective vaccines, to control the spread of a new infectious disease, the focus should be on finding the source of infection and cutting off the infection route as soon as possible. This can be the general principle of China's entire prevention and control strategy, and also the starting point for measures such as lockdown, "*Fangcang*" Shelter Hospitals, and tracing close contacts. The different measures we have taken are precisely aimed at these two goals. Early testing and reporting of infections have enabled us to detect the source of infection as early as possible to avoid a wider spreading; and early quarantine and early treatment have ensured that the infection route is effectively cut off, at the same time preventing the deterioration of the patient's condition. By eliminating the source of infection and stopping the transmission early, these measures altogether have helped relieving the excessive stress on the medical system. In addition, keeping the public informed timely of the dynamic transmission with regular briefings has also helped people avoid possible dangers and hence reducing their chances of infection.

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† Co-first author ZHU Yu currently works as Deputy Division Director of Division II, Department of International Cooperation, Chinese Academy of Engineering. Her research interests mainly cover urban built environment and urban planning.
‡ Co-first author LIU Jiuchang currently works as Associate Research Fellow, Department of International Collaboration, Chinese Academy of Medical Sciences & Peking Union Medical College. Her research interests focus on health policy and management.
§ The corresponding author, Prof. WU Xiaodong currently serves as Deputy Director General of the General Office, Chinese Academy of Engineering. His research interests focus on biology.

II. Resolute Lockdown for Effective Control of the Spreading Epidemic

To curb the outbreak of the epidemic, Wuhan was put into a "lockdown" from January 23, 2020, with suspension of urban public transport means, subways, ferries and long-distance passenger buses and cars throughout the city; airports, railways and other passages for departure from the city were all shut off. The lockdown of Wuhan has effectively stopped cases of infection from spreading to the rest of China, sacrificing the economy of the city and even the whole province of Hubei for the people's health of the whole country and beyond. Since the lockdown, digital technologies such as big data, artificial intelligence, and cloud computing have played an important role in epidemic monitoring and analysis, prevention and treatment, and resource allocation. We try to better utilize infrastructure, actively adopt digital management, implement "health codes", trace the whereabouts of infected residents, make medical observations, and try to "let data run more and let the masses run less".

III. The "*Fangcang*" Shelter Hospitals

The "*Fangcang*" Shelter Hospitals, frequently compared to the "Noah's Ark" in Wuhan, are a type of temporary medical facilities of large capacity for treating mildly symptomatic patients designed and established as an effort to stem infection spread. While China was rapidly building the *Huoshenshan* Hospital and *Leishenshan* Hospital to admit severely ill patients, *Fangcang* Shelter Hospitals were established meanwhile to treat mildly ill patients. Both kinds of hospitals have played an important role in easing the medical resources shortage during the emergency rush. Transformed and rebuilt from existing public facilities, *e.g.* exhibition centers and stadiums *etc*., these shelter hospitals can address the pressing issue of virus transmission in communities originated from mild and moderate cases (Wuhan Municipal Health Commission, 2020), thus effectively cutting off the infection chain. Since Feb 5, a total of 16 *Fangcang* Shelter Hospitals have been put into use, resulting from rapid construction work. Offering patients with medical treatment at a massive scale and low costs, these facilities have helped more than 12,000 patients recover (Chen *et al.*, 2020). This smart strategy has rapidly expanded the capacity of admission and treatment, as a proven key measure for mitigating the local epidemic. By March 10, all *Fangcang* Shelter Hospitals had accomplished their periodic mission. During the days of their operation, they demonstrated their efficacy as a crucial step to bring the disastrous epidemic in Wuhan under control. It marked a major public health measure that China had never taken before, as an innovative implementation of China's policy for COVID-19 prevention and containment – no patient shall be left unattended or untreated (Wuhan Municipal Health Commission, 2020; Xinhua News, 2020).

IV. Multi-disciplinary Interaction to Enable National Technology Innovation Campaign (NTIC)

Technology innovation is a high-caliber weapon to defeat the epidemic, and the tacit, close cooperation across different disciplines of medical science and biotechnology, has made possible swift and effective responses to the emergent situation. Chinese scientists and doctors detected the first signs of the emerging disease with uncharacterized symptoms, and worked for 50 successive hours to identify the pathogen as a novel coronavirus. The experts worked against the clock to finish the genome-wide sequencing of the virus in early January and shared the sequence data with the WHO timely. Resulting from synergic actions taken by virologists, pathologists and biotechnology experts, research and development of vaccines were immediately initiated at different labs across the country and accelerated simultaneously following five technical roadmaps, respectively focusing on inactivated vaccines, recombinant genetic engineering vaccines, adenovirus vector-based vaccines, nucleic acid vaccines and vectors of attenuated influenza virus vaccines. Clinical trials of therapies for clinical application were soon carried out amid the epidemic, and the results of the clinical trial on Lopinavir and Ritonavir Compound Preparation, the very first therapy against novel coronavirus, were timely published (Cao, Wang, & Wen, *et al*., 2020).

V. Establish a Unified, Highly Efficient Command System

The fight against the virus has featured with quick, conscientious responses to the outbreak: medical institutions filed network reports in 2 hours upon discovery of a case, testing labs returned results within 12 hours, and disease prevention and control centers completed epidemiological investigations and finished tracking close contacts within 24 hours. The entire country has worked as a whole and coordinated all sides to back up the prevention and control of the epidemic. More than 330 medical groups, with efficient medical and nursing professionals were deployed and rushed to the rescue of Hubei Province (Xi, 2020). As many as 19 provinces were mobilized for pair assistance, improving the nucleic acid amplification testing capacity per day. On the other hand, the diagnostic and treatment protocol against the disease have undergone seven amendments and updates thanks to the collaborative efforts of multidisciplinary experts based on clinical practice, aimed at effective prevention and control of the epidemic. All this would not have been possible without a unified and highly efficient command center that can blueprint an overall roadmap and formulate measures in response to the fast-changing situation, coordinate forces from different sectors, and mobilize different resources toward the same goal.

Newly emerged infectious diseases are the common foe of the whole humanity. At the critical moment, the world calls for a synchronized and synergic fight against the epidemic, since a possible overall recovery hinges on our collective response as a community of shared future. Chinese science community will work further to strengthen international cooperation in virology, epidemiology, risk communication, clinical management, vaccines and drug development, public health and ecological investigation, supporting WHO to fight against the epidemic and protect human health.

References

Cao, B., Wang, Y., Wen, D. *et al*. A Trial of Lopinavir-Ritonavir in Adults Hospitalized with Severe Covid-19. [J] *N. Engl. J. Med.*, May 7, 2020.

Chen, S. *et al.* Fangcang shelter hospitals: A Novel Concept for Responding to Public Health Emergencies. *The Lancet*, Apr 2, 2020. DOI: 10.1016/S0140-6736(20)30744-3.

Shenzhen News, *Zhong Nanshan on the Best Ways to Stay Clear off Novel Coronavirus* (in Chinese), extracted on Jan 25, 2020 at https://news.sznews.com/content/2020-01/25/content_22803812.htm

World Health Organization, *Coronavirus Disease 2019 (COVID-19) Situation Report - 98*, Extracted on April 27, 2020 at https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200427-sitrep-98-covid-19.pdf?sfvrsn=90323472_4

Wuhan Municipal Health Commission. *Fangcang Shelter Hospitals Have Helped in Achieving "Leaving No Patient Untreated"* (in Chinese). Feb 24, 2020. http://wjw.wuhan.gov.cn/front/web/showDetail/2020022409772 (accessed Feb 24, 2020)

Xi Jinping. Speech at the Meeting on the Prevention and Control of the Novel Coronavirus Disease (COVID-19) and the Coordination between the Epidemic Control and Economic and Social Development (in Chinese). *People's Daily*, Feb 24, 2020.

Xinhua News. *Key Task at This Stage* (in Chinese). Mar 13, 2020. http://www.xinhuanet.com/politics/2020-03/13/c_1125708821.htm