



ORIGINAL ARTICLE

Emergency response to COVID-19 epidemic: One Chinese blood centre's experience

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Funding information

Technology Innovation Research and Development Project of Chengdu Science and Technology Bureau, Grant/Award Number: 2020-YF05-00128-SN

Abstract

Objective: The COVID-19 epidemic has caused a significant global social and economic impact since December 2019. The objective of this study was to demonstrate the emergency response of a Chinese blood centre on maintaining both the safety and the sufficiency of blood supply during large, emerging, infectious epidemics.

Materials and Methods: Early on in the outbreak of COVID-19, the Chengdu Blood Center developed strategies and implemented a series of measures, including enhanced recruitment efforts, addition of new donation deferral criteria and notification after donation, optimisation of donor experience, development and implementation of a new coronavirus nucleic acid detection technology platform for blood screening and screening all donations for SARS-CoV-2 RNA to maximumly protect the safety of blood supply during a time of unclear risk.

Results: Starting on February 20, the immediate satisfaction rate of blood product orders in Chengdu city's clinical settings reached 100%, and there was no case of blood transfusion infection.

Conclusion: The recent experience during the outbreak of SARS-CoV-2 reminded us that improvement in the areas of national and international collaborative programmes for dealing with blood availability and safety concerns during early stages of a disaster and regional and national mechanisms for timely communication with the general public on behalf of blood services should help to better prepare us for future disasters.

KEYWORDS

blood center, COVID-19, emergency response

1 | INTRODUCTION

A novel beta-coronavirus infection, which was later named Corona Virus Disease 2019 (COVID-19), was first identified in Wuhan, Hubei province, China in December 2019 and has since rapidly spread worldwide.^{1,2} Then, the World Health Organisation (WHO)

announced the outbreak of COVID-19 in China as a Public Health Emergency of International Concern (PHEIC) on January 30.³⁻⁵ On March 11, COVID-19 was announced as a pandemic by the WHO.⁶

By April 20 2020, according to Center for Disease Control and Prevention surveillance,⁷ 2 314 621 cases of COVID-19 had been reported in 212 countries, territories or areas, including the United States, Spain, Italy, Germany, the United Kingdom, France, Turkey,

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Iran, China and so on. Although recent data indicate that COVID-19 has been sustainably controlled in China,⁸ the infection is still being increasingly diagnosed internationally, imposing tremendous challenges on the entire healthcare system, as well as having a significant social and economic impact globally.

The issue of emergency disaster planning for blood collection services received attention after the September 11, 2001, terrorist attacks.⁹⁻¹¹ Large-scale emergency disaster events, either man-made or naturally occurring, present additional challenges to the blood collection system, which is already constantly under stress to maintain a safe and sufficient blood supply. The previous outbreak of severe acute respiratory syndrome (SARS) in Guangdong province, China, resulted in a significant negative impact on blood supply.^{12,13} How to maintain both the safety and the sufficiency of blood supply during large emerging infectious epidemics, especially in the early stage when less data are available, is a challenge shared by blood services around the world.

The Chengdu Blood Center was founded in 1962 and is responsible for ensuring the sufficiency and safety of the clinical use of blood for more than 350 medical institutions in 22 districts in Chengdu, Sichuan Province. For many years, its blood collection and supply capacity has ranked among the top in China; 409 000 units of blood were collected in 2019, ranking fourth in China and second in sub-provincial cities of China; the donation rate was 15 per 1000, and the 18 to 25 age group was the main population of blood donation. This paper introduces the measures taken by the Chengdu Blood Center (CBC) during the SARS-CoV-2 epidemic and hopes to provide information based on experience for all blood services.

2 | MATERIALS AND METHODS

Early on during the outbreak of COVID-19, the CBC developed strategies and implemented a series of measures in accordance with policies developed by the Sichuan provincial health commission and the recommendations of the Chinese Society of Blood Transfusion in order

to ensure blood safety and balance blood collection and supply.¹⁴ Details are shown in Figure 1.

SARS-CoV 2, the virus responsible for COVID-19, is a new pathogen for humans, and there are many unanswered or partially answered questions about it. On January 21, 2020, the first imported case of COVID-19 was reported in Sichuan Province. On the same day, the CBC held the first meeting of COVID-19 control to evaluate and prepare for the possible impact of the COVID-19 outbreak. The timing coincided with the Chinese Lunar New Year national holiday. CBC's leadership group for COVID-19 consists of several working groups that work separately but collaboratively to develop, implement and adjust CBC's emergency response plans. Serving as the provincial blood management centre, CBC established the Provincial Emergency Management Plan, collected data and assisted other blood centres in Sichuan Province through audio conferences.

The most immediate impact of COVID-19 was on blood availability. From January 2020, blood shortages began to occur in several parts of China. Multiple factors contributed to decreased blood availability, with the most significant factor being government-mandated extended closure of workplaces and all non-essential public places/services, as well as the call for people to stay at home to create social distancing. These measures greatly interrupted the pre-epidemic blood collection workflow, which predominantly relied on blood mobiles stationed at high-traffic public places and workplace blood drives.¹⁵⁻²¹

In addition to the social distancing measures, which restricted potential donors' mobility, many people also had concerns of contracting the infection by going to a blood centre to donate blood. At the same time, there were media programmes encouraging the public to optimise nutrition intake to enhance immunity. This message likely unconsciously created psychological barriers for people to give blood during the epidemic.

To overcome these challenges, the CBC developed a programme to maintain blood availability through enhanced recruitment efforts using media publicity, education and close coordination and cooperation between all stakeholders to achieve synergy and efficiency.

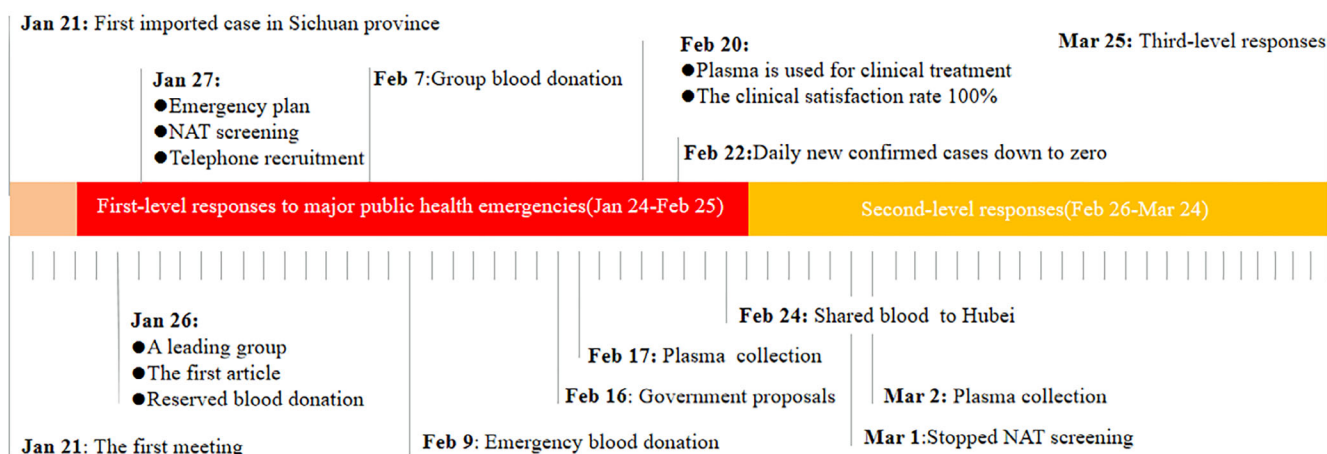


FIGURE 1 Timelines of emergency response of Chengdu Blood Center during the outbreak of COVID-19 [Color figure can be viewed at wileyonlinelibrary.com]

2.1 | Media and publicity

1. Full advantage was taken of the Chengdu Blood Donation accounts with Sina Microblog and WeChat. These popular social media venues provide direct access to millions of users in the Chengdu area.
2. Collaborate with local TV stations and other media to widely publicise knowledge about voluntary blood donation, increase public's awareness of the need for blood and dispel people's doubts and worries by providing information about COVID-19. From January 21 to March 24, a total of 2221 blood donation-related articles were published in local media. Among them, "First level response, we are in action" published on January 26, 2020, was the first public report about COVID-19 by a Chinese blood service and has been read more than 40 000 times.

2.2 | Strengthen recruitment efforts

We enhanced our recruitment efforts through the use of short message service (SMS) by increasing both the number of messages and coverage area. Recruitment using mobile phone calling was also implemented. In addition, we worked closely with the city government to organise emergency group blood drives. The Sichuan Provincial Health Commission published a plea encouraging people to give blood. From January 21 to March 24, 2020, more than 670 000 recruitment-related short messages were distributed, and over 5200 recruitment phone calls were placed.

2.3 | Optimising the donor experience

A 24-hour hotline was set up to assist both individuals and groups with online donation appointment scheduling. Within a short time, functionality of the online scheduling system was improved so that donors could easily search for an appropriate donation time and location, as well as make the appointment online using mobile phones. Donations are scheduled in a manner to prevent crowding at the donation sites in order to protect donor and staff safety. Blood collection sites were set up and locations adjusted according to donation appointment volume to maximise the convenience and safety of donors.

Epidemiological data suggest that the main transmission route for SARS-CoV 2 is mostly through contact and droplet transmission; infected individuals with no or mild symptoms can spread the virus as well.²²⁻²⁴ Protecting staff from contracting COVID-19 during the blood collection process is a priority for CBC. This is particularly critical for Chinese blood services because, typically, a region is only supported by one blood service, for example, the CBC is the only blood provider supporting Chengdu city with a population of 16 million. If staff member infection occurs and the infection spreads within a blood service, the resultant significant interruption of the blood service's functions may severely compromise an already tenuous blood

supply situation. The CBC took the following measures to protect both donors and staff at donation sites:

2.4 | During blood collection

All staff members and donors were asked to wear protective face masks, and body temperature was checked before entering the collection site. Hand sanitisation was required before body temperature was taken. Reminders and barriers were set up to ensure safe physical distance between individuals in the waiting area and during the process of completing questionnaire, physical examination and blood collection.

2.5 | Disinfection and medical waste management

The CBC enforced strict adherence of standard operating procedures (SOPs) for site and equipment disinfection. Facility air ventilation was performed at least twice a day for not less than 30 minutes each time. Surfaces including seats, stairs, escalator handrails, workbenches, floors and instruments were wiped with chlorine disinfectant or 75% alcohol before and after work. Regular and enhanced disinfection of blood delivery vehicles was performed between each trip, especially the steering wheels, door handles and seats. The use of central air conditioning was minimised.

Retraining and reminders were provided to the staff to follow established procedures for handling medical waste. An emergency treatment plan was developed for blood, secretions or vomit from individuals diagnosed or suspected of having COVID-19.

2.6 | Maximising blood safety during a time of unclear risk

For any emerging infectious outbreak, one of the challenges is how to maximally protect the safety of blood supply even when only incomplete information is available. So far, there has not been direct evidence proving transfusion-transmitted infection of SARS-CoV 2. At the same time, some infected individuals, including asymptomatic blood donors, have been found to have detectable SARS-CoV 2 RNA in their blood.²⁵ A possibility for transmission of SARS-CoV 2 through transfusion cannot be completely eliminated.²⁶

The CBC implemented the following measures to reduce the risk of potential transmission of SARS-CoV 2 through transfusion:

1. New deferral criteria: Any prospective donor with any of the following conditions were deferred for at least 28 days: a travel or residency history to the Hubei province; contact history with individuals with a travel history to the Hubei province; the donor or relatives experiencing symptoms including fever, dry cough or other clinical symptoms suggestive of COVID-19 infection.

2. All donors were instructed to notify the CBC within 28 days after donation if they or their relatives have symptoms of COVID-19, such as fever, cough, fatigue and shortness of breath, or had been quarantined. Print instructions were provided to all donors. If a blood donor after donation reports suspected symptoms, the CBC would 1, quarantine the associated blood components; 2, retrieve blood components from clinical facilities if they were not yet transfused; and 3, quarantine the staff members exposed to the donor. The CBC followed up with these donors with phone calls. If a donor was later suspected or diagnosed with COVID-19 and the related blood components have been transfused to patient (s), reports would be filed immediately with local health authorities.

3 | RESULTS

3.1 | Blood collection and supply

From January 21 to March 24, 2020, the CBC collected a total of 33 812 blood donations (58 810 units of blood products). During the first-level responses to major public health emergencies of Sichuan Province (January 24 to February 25 020), the unit of blood products and clinical orders suffered a 36.9% and 21.8% decline, respectively, compared with the same period in the Spring Festival of 2019, which showed a 17.2% and 12.6% decline during the second-level responses, respectively (February 26 to March 24, 2020). Starting from February 20, the immediate satisfaction rate of blood product orders (the units of the blood product distributed/the units of the blood product in the order*100% within 24 hours) in Chengdu city's clinical settings reached 100%. In addition, on February 24 and March 12, the CBC was able to export a total of 900 units of red blood cells to Hubei province, which is the most heavily affected Chinese region.

3.2 | Donors and staff safety

From January 21 to March 24, 2020, none of the donors and staff were infected with COVID-19. A total of 14 call-back cases were investigated, and no suspected or confirmed infection was found.

3.3 | Blood screening and plasma collection

The CBC made the early decision to screen all donations for SARS-CoV-2 RNA when waiting for additional blood safety information to be available. A new coronavirus nucleic acid detection technology platform for blood screening was developed and quickly implemented (manuscript submitted). Between 27 January and February 29, 2020, a total of 16 287 blood donor specimens were screened, and all results were negative.

3.4 | Convalescent plasma therapy

Convalescent plasma therapy was among the therapeutic methods listed in the fourth edition of the COVID-19 diagnosis and treatment guidelines issued by the Chinese National Health Commission.²⁷ Within 48 hours of the publication of the new guidelines, the CBC completed convalescent donor testing, plasma collection and preparation. As of March 24, a total of 2800 mL of plasma from eight recovered patients has been provided to hospitals and transfused into critically ill patients.

4 | DISCUSSION

In recent years, the CBC experienced the SARS epidemic (2003), Wenchuan Earthquake (2008) and Lushan Earthquake (2011). Through these public health and natural disaster crises, the CBC has accumulated experiences and developed a system for responding to such unforeseeable challenges.²⁸⁻³⁰ However, a preparedness plan and response to serious public emergencies always faces unexpected challenges due to the unpredictable characteristics of the new crisis. We hope to share the CBC's experiences during the SARS-CoV-2 epidemic. Protecting the availability and safety of blood is a challenge for blood services around the globe.

ACKNOWLEDGMENTS

All authors participated in COVID-19 prevention and control work. XMF made significant contributions to supervising the COVID-19 prevention and control work and finalising the manuscript. PH, JXK, YL and XCL performed the emergency response, analysed the data and drafted the manuscript, and ML, MD, YWZ, HT, RL, JZ and YX performed the emergency response of blood supply. WL and JLG reviewed and revised the manuscript. HS contributed to reviewing and revising the manuscript. The work should be attributed to the Chengdu Blood Center. This work was supported by a grant from Technology Innovation Research and Development Project of Chengdu Science and Technology Bureau (No.2020-YF05-00128-SN).

[Correction added on 12 March 2021, after first online publication: The Acknowledgment section has been updated in this version.]

CONFLICT OF INTEREST

The work has not been submitted elsewhere for publication, in whole or in part. All authors have read the manuscript and approved submission to your journal. There is no ethical/legal conflict involved in the article.

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How to cite this article: Hu P, Kang J, Li Y, et al. Emergency response to COVID-19 epidemic: One Chinese blood centre's experience. *Transfusion Medicine.* 2021;31:155-159. <https://doi.org/10.1111/tme.12719>