# Viral attacks on the blood supply: the impact of severe acute respiratory syndrome in Beijing

The issue of emergency disaster planning for blood collection professionals has received attention since the September 11, 2001, terrorist attacks.[1-3] The goal of such plans is to protect blood safety and availability during unusual times when unpredicted additional stress is added. Because either man-made or natural disasters vary in their nature, they often present different demands on the blood banking community. Although some disasters may significantly increase the temporary blood need, others may do more to compromise the availability of blood without a significant increase in the need for blood. Either a sudden increase in the demand or a significant decrease in the supply can break the back of the system already stressed trying to keep a delicate balance. When the supply end is affected, it can be the result of the unavailability of blood donors, interruption in the operation of normal blood collection systems, or both. In some situations when a new infectious agent(s) is involved, because of the potential possibility that the new agent(s) may be transmissible through blood transfusion, the adequacy of the existing donor screening procedure can also be called into question. Because it is hard to prepare for the unknown, it is intrinsically challenging for the blood bank community to develop plans to prepare for such emergencies. What has been helpful is that, as a community, blood centers from around the world are sharing their experiences and learning together about how to deal with such disasters. The lessons learned from last year's severe acute respiratory syndrome (SARS) epidemic should add to our collective knowledge and experience.

The SARS epidemic originated in November 2002 in Guangdong province of China.[4] Based on information collected by the World Health Organization by August 2003, more than 8000 people have contracted the disease from at least 29 countries.[5] More than 800 patients have died from SARS so far. The rapid spread of the disease, the appearance of alarmingly high infectivity, and the high fatality rate put public health authorities worldwide in a spin trying to find effective ways to curb the infection. Meanwhile, SARS also caused significant general panic in epidemic regions as well as many other parts of the world. In regions severely affected by the SARS epidemic such as Hong Kong, Beijing, and Toronto, communities were shaken by the disruptions in daily routines. To contain the spread of the disease, local governments closed many public places including social and entertainment venues, universities, business offices, and hospitals. There were also significant interruptions in many aspects of normal society functions including local and international commerce, government and cultural exchanges, tourism, and business travel. Beijing streets, usually bustling with activity, were virtually deserted for weeks.

With a newly identified infectious agent(s), there is always concern about the possibility that the disease may be transmitted through blood transfusion. Although the primary route of transmission for SARS coronavirus appears to be direct mucous membrane contact with infectious respiratory droplets and/or through exposure to fomites,[6] the possibility of other modes of transmission is still being examined.[7,8] Even with no confirmed cases of SARS transmission by blood transfusion, several precautionary measures were implemented by Chinese blood centers in spring 2003 to prevent the potential risk of SARS transmission through blood.[9] These measures included: 1) new questions were added to the donor questionnaire about predonation contact history with suspected SARS patients or people with contact history with SARS; 2) normal body temperature was added as a criterion for donor qualification; 3) all donors were required to notify the blood collection facilities if fever, cough, or other suspected SARS symptoms occurred within 2 weeks after donation; and 4) a SARS antibody testing research project was soon started using available tests on donor samples.[9] This issue of **TRANSFUSION** features an article on using NAT in SARS screening.[10]

In addition to concerns about the safety of blood, a greater challenge encountered by blood centers in affected regions was the sudden decrease in the blood collections. Outbreaks of new or reemergent infections can often be accompanied by several consequences during the acute phase of the outbreak. At the early stage of a new outbreak, there is often incomplete epidemiologic information about the infection, including knowledge on how the disease transmits. Communication between government public health agencies and the general public can also be inadequate. These factors can combine to produce widespread fear and panic in the general population.

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The disruption of blood availability can be caused by multiple factors such as the difficulty for collecting facilities to reach donors or donors to reach collection facilities. In the context of generalized fear for the new infection, staff members of the blood collection establishment may also show reluctance to go to public places to collect blood. All these factors can result in a great degree of disruption of the routine blood collection system and compromise the availability of the blood supply. What happened to blood collection and supply during the SARS epidemic in Beijing helps to illustrate this multitude of challenges presented by infectious disease outbreaks that need to be dealt with by the blood bank community to protect the integrity of the blood supply.

During the height of the SARS epidemic in Beijing (April-June 2003), there was an initial decrease in the need for blood for clinical use, primarily owing to postponing some elective surgical procedures because of hospital closings. The much more pronounced effect was the significant decline in the volume of blood collected. Beginning in mid-April 2003, daily collections in Beijing dropped sometimes to one-tenth or lower of typical daily collections. This decrease was primarily caused by unavailability of blood donors as a result of avoidance of public places and the closing of workplaces and universities that are locations for blood drives during normal times. Some members of the potential donor population also feared that giving blood might weaken their immune defense, therefore rendering them more susceptible to the SARS infection. Despite increased efforts to mobilize volunteer donors through programs broadcast by the Chinese central TV station, daily collections in Beijing remained significantly lower than usual between April and early July 2003. Other mechanisms implemented in Beijing during the SARS epidemic to protect blood availability included a centrally coordinated citywide program to increase monitoring and restriction of clinical use of blood and emergency plans to coordinate imports from other regions. Between April and July 2003, it was necessary for Beijing to import significant numbers of blood products from other Chinese regions to ensure blood availability for clinical use.

Several important issues stood out during the blood shortage crisis in Beijing during the SARS epidemic last year:

1. For emergency situations such as the SARS epidemic, even when the disaster itself does not cause increased blood needs, blood supply can also be significantly compromised owing to the unavailability of blood donors.
2. During an acute blood shortage, administrative measures to restrict the amount of clinical blood use do work but only to a limited degree. Despite Beijing city government's repeated emergency pleas for hospitals to restrict blood use, the decrease in daily clinical use of blood only lasted a short time (a few weeks) before demand rebounded back to previous levels.
3. Many issues require special attention to ensure the quality of blood products when coordinating the importation of blood. These issues include maintaining the required temperature of the blood products during transportation, meeting the packaging requirement to protect blood products, and ensuring that all imported blood products meet the requirement in donor testing and data recording. These factors can contribute to high cost associated with wastage of blood.
4. Emergency arrangement to import large volume of blood during crisis situations can present multiple pitfalls in guarding blood safety. To ensure blood safety, samples from all imported blood products were retested in Beijing using the required donor screening tests. Difficulties were encountered in retesting owing to use of different sample tubes and sample labeling (bar code) systems. These differences resulted in increased manual work during retesting and inventory management that potentially increased the risk of errors associated with high volume manual manipulation in sample and unit handling.

In the struggle to protect blood availability during the SARS crisis, exemplary dedication and ingenuity were demonstrated by members of the blood bank community from both Beijing and other regions that supplied blood to Beijing. Insights gained by Chinese blood bankers during the SARS epidemic should also be valuable for blood bankers elsewhere. These experiences again highlight the importance of developing disaster preparedness plans. Central to planning should be the establishment of infrastructure(s) for emergency blood sharing between blood centers. Sharing between neighboring regions would often be preferable because the shorter physical distance may decrease the risk of damage to blood products during transportation and reduce costs. Another valuable lesson is the great value of standardizing blood center practices. Efforts should be made to standardize practices in all areas including donor testing procedures (reagents and methods), donor qualification criteria, sample and unit labeling system, and packaging methods. Minimizing inconsistencies in blood collection and management systems between blood centers will not only save time and cost, but perhaps even more importantly will decrease the potential risk of error that may be associated with emergency operations during crisis situations. Standardization of practices should also help to ease concerns about blood safety when sharing blood resources.

Although no one plan will meet the need for all crisis, we believe that all emergency plans should include the following essential elements: building an infrastructure for collaboration that can be rapidly activated during crisis; establishing central mechanisms to direct communication and coordinate efforts on constant monitoring and rapid assessment of the blood need and supply status; developing emergency blood sharing plans that contain sufficient operational details to reduce the risk of mistakes during crisis; and standardizing all aspects of the blood product collection and management practices between blood centers.

It is difficult to predict the unknown. What can be done is to continue to learn from each past experience and to collectively improve our preparedness for the next crisis. The impact of a newly emerging virus can have multifaceted and unpredicted ramifications on the blood supplies.

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