



March 24, 2020 in [Coronavirus Chronicles](#)

# The COVID-19 Pandemic and the Stressed Blood Supply Chain

By Anna Nagurney

SHARE: [f](#) [in](#) [t](#) [✉](#)

PRINT ARTICLE:

<https://doi.org/10.1287/LYTX.2020.02.18>



Blood is essential to our nation's healthcare security. It is a life-saving product that cannot be manufactured and comes solely from volunteer donors. No substitute for blood has yet been invented. Blood transfusions are integral parts of major surgeries. Blood is a must for saving victims of accidents and natural disasters. Blood is also used in the treatment of certain diseases, including

certain cancers. In the United States, 36,000 units of red blood cells are needed daily as are 7,000 units of platelets and 10,000 units of plasma. A typical donation of one pint, which can be divided into red blood cells, plasma and platelets, can save up to three lives. Adults have 8-12 pints of blood.

Even in the best of times, the complex blood supply chain in the United States is under stress. Although 38% of the U.S. population is eligible to donate blood, less than 10% actually does so in a year. Furthermore, issues of seasonality come into play with flu and colds cutting donations; the same for weather-related events and holidays. To further complicate matters, blood is perishable; platelets last five days and red blood cells have a shelf life of 42 days.

The blood banking industry, entrusted with maintaining a sufficient supply of blood, is facing a battle of the century with the COVID-19 pandemic. The timing could not be worse with this year's heavy flu and cold season, and the blood banking industry having recently undergone a massive transformation due to both economics and changes in medical procedures [1]. For example, there is increased competition among blood service organizations for donors [2]. The American Red Cross has closed some testing facilities and even eliminated mobile collection units in parts of the country. There have also been mergers and acquisitions of blood service organizations [3]. On the other hand, hospitals are now requiring less blood for certain procedures as compared to a few years ago because of changes in medical practices. This has resulted in requests for lower prices for blood from blood banks, who still have to cover costs, and some of the new costs include higher testing costs due to diseases such as Zika. And now, because of the COVID-19 pandemic, a major source of blood donations – schools – is removed.

The critical blood supply chain is unique from others that we study in operations research (O.R.) because it requires altruistic donations, collection, testing, processing and distribution to hospitals and medical centers. The blood supply chain can be visualized, modeled and studied as a network [4]. The coronavirus can disrupt the links in the blood supply chain network through a variety of means. If donors are ill, they cannot donate; if the staff is ill, they cannot collect, test, process and distribute blood. If our healthcare workers are compromised, they cannot transfuse.

In China, specifically Wuhan where the coronavirus is generally thought to have originated, blood donations have been drying up as the coronavirus outbreak disrupts giving, with medical professionals – who themselves are under major stress – donating to reduce the major shortages. Blood reserves in China are now at historic lows [5]. Iran, also severely affected by the coronavirus, is experiencing blood shortages, and medical officials are calling for donations as they mark the Persian New Year [6].

U.S. Surgeon General Jerome Adams called on young people [7] to donate blood as the American Red Cross (ARC) faces a severe blood shortage amid social distancing guidelines and an immense number of blood drive cancellations. The ARC notes that the lack of blood can lead to another complex catastrophe on top of the coronavirus. Already, many hospitals have canceled elective surgeries. In our recent study on the blood supply chain [1], we developed a multitiered competitive supply chain network model for the blood banking industry, with a focus on the United States. The model addressed the very relevant scenario of a major disease, with the number of donors dropping

significantly. We also investigated the impacts of decreased capacity associated with testing, processing and storage, as can happen if staff are adversely impacted because of the coronavirus.

The analysis reveals that blood service organizations may gain by cooperating rather than competing. This result was also supported by another study in which we investigated the potential synergy associated with the teaming of blood service organizations in times of disaster [3]. We believe that we can all benefit from cooperation among blood service organizations, which will be essential with the coronavirus. There is no data or evidence that COVID-19 can be transmitted by blood transfusion, and there have been no reported cases of transmissions for any respiratory virus, including this coronavirus, worldwide. This was the case for other major coronaviruses such as SARS (Severe Acute Respiratory Syndrome) and MERS-CoV causing Middle East Respiratory Syndrome. However, blood service organizations, erring on the side of caution, have instituted new blood donation deferrals for those who have traveled to certain affected countries and/or who may have been in contact with someone with the coronavirus [8]. They are also engaged in extra cleaning for disinfection purposes.

At the time of this writing, there are no vaccines or approved medicines for COVID-19. But researchers at Johns Hopkins University in Baltimore are exploring the harvesting of virus-fighting antibodies from the blood of previously infected patients [9]. The use of what is called “convalescent serum,” is over a century old. Remarkably, during the Spanish flu epidemic of 1918, scientists reported that transfusions of blood products obtained from survivors led to a 50% decrease in deaths among the most critical patients. This approach has not been used widely in the United States for decades, but the new COVID-19 pandemic may require such measures.

We are in this together. Everything that we can do to support our outstanding healthcare professionals, as well as our colleagues, co-workers, friends, relatives and neighbors during this pandemic will help. Spreading the news about donating blood and donating, if possible, will help us all. Blood service organizations, working with medical centers and one another, should also make the donation process as comfortable and convenient as possible. Cooperation now is key.

To donate blood or find a blood drive near you, contact the [American Red Cross](#).

**Note:** The article is adapted from the author’s article, “How coronavirus is upsetting the blood supply chain” [10], which was published on March 12, 2020 in *The Conversation* and contains updated information.

## References

1. <https://supernet.isenberg.umass.edu/articles/MultitieredBSCcompetition.pdf>
2. <https://supernet.isenberg.umass.edu/articles/CompetitionforBloodDonations.pdf>
3. [https://supernet.isenberg.umass.edu/articles/Blood\\_Supply\\_Chain\\_Merger.pdf](https://supernet.isenberg.umass.edu/articles/Blood_Supply_Chain_Merger.pdf)
4. <https://supernet.isenberg.umass.edu/articles/BloodSupplyChains.pdf>
5. <https://www.reuters.com/article/us-china-health-blood/chinas-blood-donations-dry-up-as-coronavirus-outbreak-quells-giving-idUSKCN20K1DS>
6. <https://www.atlanticcouncil.org/blogs/iransource/iranian-new-year-begins-with-a-growing-coronavirus-crisis/>

7. <https://www.forbes.com/sites/alexandrasternlicht/2020/03/19/white-house-calls-on-millennials-gen-z-to-donate-blood-amid-severe-national-shortage/#60713b6c5e55> 🔍
8. <https://www.redcross.org/about-us/news-and-events/press-release/2020/red-cross-media-statement-on-2019-novel-coronavirus.html>
9. <https://www.nbcnews.com/health/health-care/doctors-push-treatment-coronavirus-blood-recovered-patients-n1158476>
10. <https://theconversation.com/how-coronavirus-is-upsetting-the-blood-supply-chain-133424>



**Anna Nagurney**

Anna Nagurney is the John F. Smith Memorial Professor in the Department of Operations and Information Management in the Isenberg School of Management at the University of Massachusetts Amherst and an INFORMS Fellow.

SHARE: [f](#) [in](#) [🐦](#) [✉️](#)

**Keywords:**

Coronavirus Chronicles; COVID-19; American Red Cross; blood supply; blood banking; blood donations; supply chain



## The Institute for Operations Research and the Management Sciences

5521 Research Park Drive, Suite 200  
Catonsville, MD 21228 USA

**phone 1** 443-757-3500

**phone 2** 800-4INFORMS (800-446-3676)

**fax** 443-757-3515

**email** [informs@informs.org](mailto:informs@informs.org)

## Get the Latest Updates

**Sign Up**

[Discover INFORMS](#)

[Explore OR & Analytics](#)

[Get Involved](#)

[Impact](#)

[Join Us](#)

[Recognizing Excellence](#)

[Professional Development](#)

[Resource Center](#)

[Meetings & Conferences](#)

[Publications](#)

[About INFORMS](#)

[Communities](#)

[PubsOnLine](#)

[2020 Annual Meeting](#)

[Certified Analytics Professional](#)

[Career Center](#)

[INFORMS Connect](#)