Published in final edited form as:

Ann Surg. 2022 April 01; 275(4): 641–643. doi:10.1097/SLA.0000000000005393.

The National Blood Shortage—An Impetus for Change

Noelle N. Saillant, MD, FACS[*,✉], **Lucy Z. Kornblith, MD, FACS**[†], **Hunter Moore, MD, PhD**[‡], **Christopher Barrett, MD**[§], **Martin A. Schreiber, MD, FACS, FCCM**[¶], **Bryan A. Cotton, MD, MPH, FACS**[‖], **Matthew D. Neal, MD, FACS**[**], **Robert Makar, MD, PhD**[*], **Andrew P. Cap, MS, MD, PhD, FACP**[††]

[*]Massachusetts General Hospital, Harvard Medical School, Boston, MA;

[†]Zuckerberg San Francisco General Hospital, University of California San Francisco, San Francisco, CA;

[‡]University of Colorado Hospital, University of Colorado School of Medicine, Aurora, CO;

[§]Boston Medical Center, Boston University, Boston, MA;

[¶]Oregon Health and Science University Hospital, OHSU School of Medicine, Portland, OR;

[‖]University of Texas Health and Science Center at Houston, McGovern Medical School, Houston, TX;

[**]Trauma and Transfusion Medicine Research Center, Department of Surgery, University of Pittsburgh, Pittsburgh, PA;

[††]U.S. Army Institute of Surgical Research, Uniformed Services University, University of Texas Health Science Centers – San Antonio & Houston, TX.

Keywords

blood shortage; Covid 19; pandemic; transfusion

The coronavirus disease-2019 (Covid-19) pandemic has disrupted many vital supply chains, including the supply of blood products required for essential medical care. Blood products have joined a group of other critical medical necessities—ventilators, personal protective equipment, oxygen, and medications—where supplies have been dangerously depleted during the Covid-19 pandemic. Hospital disaster preparedness teams have not only been forced to reckon with the Covid-19 medical response but have also needed to urgently address these unforeseen vulnerabilities in the delivery of care. To date, the blood product shortage has not received the attention from the national media commensurate with its potential threat to healthcare delivery. The causes underlying the current blood product shortage are multifaceted and include limited donor sites, loss of staffing at blood centers, and a loss of donors due to the constraints mandated by Covid-19 safety.[1,2] In addition, there

✉ nsaillant@partners.org.

The opinions or assertions contained herein are the private views of the authors and are not to be construed as official or as reflecting the views of the Department of the Army or the Department of Defense.

The authors declare no conflicts of interest.

is a well-documented, long-term shrinkage of the donor population resulting from decreased participation by younger generations.[3] Traditional settings for blood drives—such as places of work or schools—have become unproductive as employees and students work from home. During the early months of the pandemic, the 50% reduction in supply was balanced by decreased demand for blood products due to restrictions on elective surgery. However, as the nation reopened and healthcare services resumed, a surge in blood consumption ensued. The increase in healthcare utilization combined with increased trauma activity and unprecedented rates of violence across the country depleted the available resources by an estimated 10% to 12% surplus usage.[1–6]

The American Red Cross (ARC) and America's Blood Centers (ABC) have tried to alert the public to the ongoing need for blood donations. For example, the American Red Cross (ARC) released a statement in June of 2021:

> "Today, the American Red Cross launched a nationwide emergency need appeal for blood and platelet donors. With less than half a day supply of Type O blood, there is a severe national blood shortage. The Red Cross is using local and national media and social media to raise awareness to the urgent need for blood donors."[2]

Despite the emergent call to donate blood, donation rates fell in September and October by an additional 10%. As it currently stands, the ARC will need to collect "10,000 additional blood products each week over the next month to overcome the current shortage and meet the needs of patients in hospitals across the country."[7,8]

While already daunting in scope, the blood product shortage is a critical symptom of an overburdened, over-consumed healthcare system. While it took the extremes of a pandemic to prematurely unearth the fragile healthcare ecosystem, the state of the industry has been problematic for some time. Unlike many areas of the world, healthcare providers in the United States have often practiced with little regard for resource utilization—perhaps until now.

Surgeons have an important role as stewards of blood delivery. The American College of Surgeons (ACS) has emphasized the leadership role that surgeons can play in overcoming the current blood product shortage. In the August Clinical Update, the ACS called for surgeons to lead the way in Patient Blood Management (PBM). The main tenets include optimizing preoperative strategies to enhance red cell mass, intraoperative strategies to reduce blood loss (such as intraoperative cell salvage), and thoughtful management of anemia.[9,10] Surgeons are uniquely positioned to provide the bedside decisions regarding product utilization and to have a larger engagement creating proactive policies to address a long-lasting sustainable supply. The onus is on clinicians to maintain the evidence-based transfusion recommendations. Adoption of evolving TQIP best practices should be more rapidly employed.[11] These include use of viscoelastic testing rather than traditional coagulation laboratory values and incorporating low-titer group O whole into the early resuscitation of hemorrhagic shock. A randomized trial from Denver demonstrated improved survival and decreased plasma and platelet use when patients were resuscitated with a viscoelastic algorithm compared to patients treated with conventional assays.[12] A randomized trial and a recent prospective study have both shown decreased blood

utilization with whole blood in patients presenting in hemorrhagic shock.[11–14] Further, we routinely overlook hemostatic adjuncts that may reduce blood loss during treatment of hemorrhagic shock. Many products, for instance anti-fibrinolytics and topical hemostatics, are independent of the donation supply chain. Other products such as RiaSTAP, Fibryga, and prothrombin complex concentrates are plasma derived and thus remain downstream of the donation process, but when indicated may decrease the use of other products (eg, RBCs).[15]

The adoption of PBM measures has shown promise. In a recent publication of the Mayo Rochester experience, the institution evaluated their graduated 7-year roll out of successive PBM strategies. The Mayo cardiac surgery team initiated PBM strategies to reduce blood transfusion. Early interventions included use of viscoelastic testing, early massive transfusion utilization, and the formulation of expert and evidence-based transfusion guidelines. As the study period progressed, Mayo extended the program to nonsurgical specialties. Additional interventions that developed included web-based decision support models, targeted education interventions to certain stakeholder groups, and data infrastructure for evaluation of transfusion practices at the practitioner level. The results of the interventions demonstrated a 22% reduction in the rate of allogeneic transfusions. The reduction was due to both overall transfusion avoidance and by progressive reductions in the number of units administered to recipients. Furthermore, the study demonstrates an important “proof of concept”—that surgical adoption of PBM can influence hospital-wide practice.[16]

Finally, and perhaps most difficult to rectify, is the prospect of blood product wastage in the setting of clinical futility and high resource utilization in the setting of predicted poor prognosis. In the setting of trauma or an acute patient deterioration, futile cases are often emergent, emotional, and filled with ethical ambiguity.[18] Insightfully, Doughty et al published a triage tool for the rationing of blood in massively bleeding patient in anticipation of the Covid-related blood shortage. The article aimed to provide a transparent, equitable, and ethical framework for the fair distribution of available blood resources. The National Blood Transfusion Committee in England proposed a tiered activation system in anticipation of a pandemic-related blood shortage. In the critical phases, defined as a less than 2-day national supply, each hospital would implement an Emergency Blood Management Group (EBMG). The EBMG would triage bleeding patients to transfusion or assess for futility at predefined increments. Predominant factors of the proposed assessment would include the patient’s Sequential Organ Failure Assessment (SOFA) score, the need for ongoing transfusion support and likelihood of hemorrhage arrest.[18] With continually improving technology for life support in the intensive care unit, resource utilization (including blood products) at the end-of-life is becoming increasingly unsustainable as patients with poor prognosis can be sustained for prolonged periods. Providing an ethical triage framework allows hospital systems to prioritize the ethics of fair allocation and transparency in times of scarcity.[17,18]

Our stewardship of blood products needs to be proactive for the very realistic possibility that future catastrophic events or even a continued pandemic/may worsen the problem. Surgeons and transfusion medicine must advance the research mission in transfusion medicine. Study into optimizing blood banking practices, extending shelf life to avoid

product wastage (ie, cold-stored platelets), and the potential for novel innovations such as synthetic blood component substitutes are crucial topics for research funding.[19–22] Perhaps products such as freeze-dried plasma, with demonstrated safety, extended shelf-life, and comparable hemostatic effects, should be given priority evaluation and approval by the FDA.[23,24] Investment in sophisticated, accurate, rapid, point-of-care infectious disease tests, and pathogen reduction technologies could facilitate emergency whole blood collections (ie, tapping the so-called “walking blood bank”), which have long been used by the military, could be critical in civilian mass casualty events. High-level guidance by experienced blood bankers, transfusion experts, clinicians, and health authorities has been proposed, but needs to be enacted and practiced as part of each region’s preparedness armamentarium.[24,25]

The current blood product shortage underscores the need to change, serving as the metaphorical “canary in the coal mine” to provide us with fair warning to the likely future at hand. Our current stance should be anticipatory rather than reactive as we follow the pursuit of high-quality care.

REFERENCES

1. Ngo A, Masel D, Cahill C, et al. Blood banking and transfusion medicine challenges during the COVID-19 Pandemic. Clin Lab Med. 2020;40:587–601. [PubMed: 33121624]
2. American Red Cross Press Release. Available at: https://www.redcross.org/local/california/los-angeles/about-us/news-and-events/press-releases/redcross–emergency-need-for-donors.html. Accessed August 29, 2021.
3. Shaz BH, James AB, Hillyer KL, et al. Demographic patterns of blood donors and donations in a large metropolitan area. J Natl Med Assoc. 2011;103:351–357. [PubMed: 21805814]
4. Lyall MJ, Lone NI, Lyall MJ, et al. Higher clinical acuity and 7-day hospital mortality in non-COVID-19 acute medical admissions: prospective observational study. Emerg Med J. 2021;38:366–370. [PubMed: 33658271]
5. Mathay ZA, Kornblith AE, Matthay E, et al. The DISTANCE study: Determining the impact of social distancing on trauma epidemiology during the COVID −19 epidemic – an interrupted time – series analysis. J Trauma Acute Care Surg. 2021;90:700–707. [PubMed: 33252457]
6. Braun AL, Gorlin J, Peters S, et al. The effect of the SARS-CoV-2 pandemic and civil unrest on massive transfusion protocol activations in Minneapolis. Transfusion. 2020;61:2250–2254.
7. American Red Cross: Emergency Blood Shortage- Donor Turnout reaches lowest levels of the year amid delta variant outbreak. Press release. Available at: https://www.redcross.org/about-us/news-and-events/press-release/2021/emergency-blood-shortage-donor-turnout-reaches-lowest-levels.html. September 27, 2021. Accessed November 15, 2021.
8. ARC Press release: Blood and Platelet Donors Critically Needed to Support Patients This Fall as Shortage Persists. Available at: https://www.redcross.org/about-us/news-and-events/news/2021/blood-and-platelet-donors-critically-needed.html. October 20, 2021. Accessed November 15, 2021.
9. ACS Clinical Update Addressing the Blood Shortage: The Surgeon’s Role in Patient Blood Management. Available at: https://www.facs.org/publications/bulletin-brief/081021/clinical. Accessed August 19, 2021.
10. Spahn DR, Munoz M, Klein AA, et al. Patient blood management: effectiveness and future potential. Anesthesiology. 2020;133:212–222. [PubMed: 32108683]
11. American College of Surgeons. Massive Transfusion in Trauma Guidelines. 2017. Available at: https://www.facs.org/-/media/files/quality%20programs/trauma/tqip/transfusion_guildelines.ashx. Accessed September 21 2021.
12. Gonzalez E, Moore EE, Moore HB, et al. Goal-directed hemostatic resuscitation of trauma-induced coagulopathy: a pragmatic randomized clinical trial comparing a viscoelastic assay to conventional coagulation assays. Ann Surg. 2016;263:1051–1059. [PubMed: 26720428]

13. Cotton BA, Podbielski J, Camp E, et al. Early Whole Blood Investigators. A randomized controlled pilot trial of modified whole blood versus component therapy in severely injured patients requiring large volume transfusions. Ann Surg. 2013;258:527–532. [PubMed: 23979267]
14. Williams J, Merutka N, Meyer D, et al. Safety profile and impact of low-titer group O whole blood for emergency use in trauma. J Trauma Acute Care Surg. 2020;88:87–93. [PubMed: 31464874]
15. Spahn DR, Bouillon B, Cerny V, et al. The European guideline on management of major bleeding and coagulopathy following trauma: fifth edition. Crit Care. 2019;23:98. [PubMed: 30917843]
16. Warner MA, Schulte PJ, Hanson AC, et al. Implementation of a comprehensive patient blood management program for hospitalized patients at a large, United States medical center. Mayo Clin Proc. 2021;22: S0025–6196.
17. Mathay ZA, Hellmann ZJ, Callcut RA, et al. Outcomes after ultramassive transfusion in the modern era: an Eastern Association for the Surgery of Trauma multicenter study. J Trauma Acute Care Surg. 2021;91: 24–33. [PubMed: 34144557]
18. Doughty H, Green L, Callum J, et al. , National Blood Transfusion Committee. Triage tool for the rationing of blood for massively bleeding patients during a severe national blood shortage: guidance from the National Blood Transfusion Committee. Br J Haematol. 2020;191:340–346. [PubMed: 32436251]
19. Luc NF, Rohner N, Girish A, et al. Bioinspired artificial platelets: past, present and future 2021. Platelets. 2021;1–13.
20. Reddock-Cardenas KM, Bynum JA, Meledea MA. Cold-stored platelets: a product with function optimized for hemorrhage control. Transfus Apher Sci. 2019;58:16–22. [PubMed: 30704925]
21. Cap AP. Platelet storage: a license to chill! Transfusion. 2016;56:13–16. [PubMed: 26756706]
22. Cap AP, Cannon JW, Reade MC. Synthetic blood and blood products for combat casualty care and beyond. J Trauma Acute Care Surg. 2021;91(2S suppl 2):S26–S32. [PubMed: 34324470]
23. Zur M, Glassberg E, Gorenbein P, et al. Freeze-dried plasma stability under prehospital field conditions. Transfusion. 2019;59:3485–3490. [PubMed: 31568580]
24. Naumann DN, Boulton AJ, Sandhu A, et al. Fresh Whole blood from Walking blood banks for patients with traumatic hemorrhagic shock: a systematic review and meta-analysis. J Trauma Acute Care Surg. 2020;89: 792–800. [PubMed: 32590558]
25. Holcolmb JB, Spinella PC, Apelseth TO, et al. Civilian walking blood bank emergency preparedness plan. Transfusion. 2021;61:S313–S325. [PubMed: 34269450]