

LETTERS

The use of low volume RBC units for transfusion

To the Editor,

Due to the COVID-19 pandemic that has led to the shortage of group O-packed red blood cells (RBCs), hospitals and transfusion services are inventing ways to conserve and use less RBC products. Association for the Advancement of Blood & Biotherapies (AABB), America's Blood Centers, and the American Red Cross have all issued a joint statement informing the public of the critical status of the national blood supply and urging all eligible people to consider blood donation.

Similar to other industries, the blood community is experiencing workforce challenges, thereby leading to a significantly reduced number of trained staff available to collect, test, manufacture, and transport blood products. In order to prepare for anticipated blood supply issues, AABB's recommendation to all hospital transfusion services includes developing strategies that address the risk for shortages, continuously assessing blood inventory and utilization needs, and informing physicians and providers ordering blood transfusion about critical blood supply issues.

Generally, whole blood should be collected into an anticoagulant volume calculated for 450 ± 45 ml or 500 ± 50 ml. According to the technical manual,¹ RBCs that are labeled as low volume units contains 300–404 ml when the whole blood is collected into 450 ± 45 ml bag or 333–449 ml when the whole blood is collected into 500 ± 50 ml bag. Other components such as platelets, plasma, and cryoprecipitate should not be manufactured from low volume whole blood units.

Previous studies have already demonstrated the quality of under collected blood for transfusion.^{2,3} These low volume RBC units are acceptable for transfusion, therefore, availability of these units would make an additional important contribution to the already depleted blood supply without involving additional expense. In many cases, these low volume units are discarded; however, utilization of these precious resources would be an important addition to the nation's blood supply.

We have been recently receiving these low volume RBC in additive solution (AS-3) units collected in 450 ± 45 ml bag from our blood supplier and have transfused

30 units to actively hemorrhaging trauma patients who need an emergency blood transfusion. We have also performed the hematocrit on 11 of the units with average unit hematocrit of 59.6%, range of (50.6%–67.7%). The average volume of each unit is 255 ml with a range of (237–278 ml). According to Davey et al.⁴ the higher concentration of dextrose and adenine in low volume RBC units collected in citrate phosphate dextrose adenine-1 (CPDA-1) units may improve posttransfusion red cell viability and subsequently posttransfusion RBC survival. This is similar to the concentration of dextrose and adenine in units collected with additive solutions.

The RBC low volume units have a collection volume of between 66% and 90% of a normal blood unit. It is expected that the dose of hemoglobin, if lower, would not fall below 66% of a standard RBC unit. According to the Circular of Information prepared jointly by the AABB, the American Red Cross, America's Blood Centers, and the Armed Services Blood program, RBCs, Low Volume “may not be an indication of a lower dose of hemoglobin.”

We are a level one trauma center and our main concerns were group O unit availability to support our trauma program. The use of these low volume units was initiated with careful consideration from members of our blood conservation and utilization team (transfusion medicine committee) when evaluating ways to meet the needs of our trauma program and protect the blood supply. These low volume units cost us 10% less than our standard unit cost. There are no regulatory codes or Food and Drug Administration (FDA) variance required prior to transfusing low volume units. There is also no regulatory reason on how you use these products because they are already licensed products. The patient's physician does not need to be notified and Institutional Review Board (IRB) approval is not needed to transfuse these units. These units have International Society of Blood Transfusion (ISBT) code E5242.

Based on our recent practice of transfusing low volume RBC, we are able to enhance our group O RBC inventory and make available these low volume RBCs to patients in need of emergency transfusions. Although we do not

know the proportion of low volume RBC units discarded per month, we believe that the destruction of these units is an unnecessary waste of a precious resource. Consideration should be given to make these units more broadly available for transfusion. In extreme times of nationwide blood shortages, low volume RBC units may be an important addition to the nation's blood supply.

CONFLICT OF INTEREST

The authors have disclosed no conflicts of interest.

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The burden of cyberattacks on blood management and conservation efforts

Cyberattackers are increasingly exploiting vulnerabilities in health security systems.¹ To encourage proactivity and contingency planning, some organizations have penned editorials describing the burden of cybersecurity breaches on the provision of their services.^{2–5} In this letter, we share the impact of cyberattacks on provincial blood management.

The Ontario Regional Blood Coordinating Network (ORBCoN) was introduced in 2006 to provide the resources and network to support appropriate hospital utilization of blood components and products. Funding for ORBCoN's blood management initiatives and resources is provided by the Ontario Ministry of Health and costs the Ministry \$1.55 million CAD annually. These resources are made publicly available on ORBCoN's high-traffic website (~300,000 page visits/year), www.transfusionontario.org. ORBCoN's resources have contributed to the negative provincial growth rates of red blood cells (RBCs), group O RhD negative RBCs, and immunoglobulin utilization.⁶

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DOI 10.1111/trf.16843

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REFERENCES

1. Cohn CS, Delaney M, Johnson ST, editors. Technical manual. 20th ed. Bethesda, MD: AABB; 2020.p. 144–5.
2. James B. AuBuchon implications of transfusion of “undercollected” units. *Transfusion*. 1985;25(3):291–2.
3. Button LN, Orlina AR, Kevy SV, Josephson AM. The quality of over- and Undercollected blood for transfusion. *Transfusion*. 1976;16(2):148–54.
4. Davey RJ, Lenex BL, Casper AJ, Demets DL. Adequate survival of red cells from units “undercollected” in citrate-phosphate-dextrose-adenine-one. *Transfusion*. 1984; 24(4):319–22.

Since 2006, website users including physicians, nurses, and technologists have experienced interruptions on nine occasions due to targeted cyberattacks (Figure 1). The mildest attacks left the website unscathed; other incidents resulted in severe resource outages. Surmounting the technical challenges of resource downtime has proven difficult.

Cyberattack 1 (February 25, 2013)—outdated plugin: At the website's launch, a third-party information technology (IT) company was outsourced to oversee website administration and security. The first cyberattack occurred eight years later, following a significant website redesign. Regular updates to the new WordPress plugin were being neglected, resulting in an otherwise preventable security breach. The website (and by server association, all electronic tools) was taken offline for 24 hours to investigate and resolve the security vulnerabilities.

Cyberattack 2 (June 27, 2013) —outdated content management system: Updates to the content management system (CMS) were also being disregarded. This