



## Transfusing O-Negative Blood: Good Stewardship of a Precious Resource

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### Key Points

- It is critically important to transfuse O-negative red blood cells (RBCs) wisely to protect availability of this limited resource.
- Hospital transfusion services should monitor O-negative blood usage and develop policies to optimize its use, including promotion of a culture of patient blood management to mitigate blood shortages which are an important public health issue.
- O-negative blood should be reserved for:
  - Females of childbearing potential before their blood type is known;
  - Individuals who are group O-negative, especially females of child-bearing potential;
  - Females who are Rh-negative requiring transfusion when type-specific blood is unavailable; and
  - O-negative individuals with anti-D antibodies.

**Background:** Blood shortages lead to corresponding reductions in the surge capacity needed to ensure that hospitals can meet their patients' transfusion needs. This applies especially to group O and particularly to O-negative red blood cell units (RBCs), since this is the blood type of choice for emergency transfusions when the patient's blood type is unknown. While temporary blood shortages are not uncommon, the challenges of the downward trend in blood collections nationwide remain with anticipated chronic blood shortages that will require additional mitigation strategies.<sup>1</sup>

As good stewards of the blood supply, hospitals must be conscientious about promoting best practices so that blood components are available for all patients in need. AABB has previously published information and provided recommendations on the use of group O RBCs given that group O RBCs are routinely in high demand and most susceptible to being in short supply.<sup>2</sup> Since only 6.9 percent of the population is group O-negative, optimal blood usage is especially important. Hence, this *Blood Bulletin* aims to summarize key recommendations for hospitals to transfuse O-negative RBCs wisely.

When possible, O-negative blood should be provided to females of childbearing potential before their blood type is known; group O-negative individuals, especially females of child-bearing potential; Rh-negative females when type-specific blood is unavailable; and O-negative individuals with anti-D antibodies. In addition, O-negative individuals who need to receive repeated transfusions or are likely to become transfusion-dependent should also receive O-negative blood whenever possible.

**Transfusion service strategies to optimize use of O-negative RBCs:** Optimizing O-negative RBCs for the transfusion service requires consideration of several factors.<sup>3,4</sup> An initial step is an assessment of the number of units currently in your inventory and number transfused on a daily or weekly basis including emergency release units. Next, determine where O-negative units are stored inside and outside the transfusion service. Evaluate need; consider reducing the number of units stored outside the transfusion service. Other factors include the services provided by your hospital (e.g., cardiovascular surgery, obstetrics, trauma, and hematology/oncology), distance from the blood supplier, and the frequency of deliveries.

The use of emergency-release, O-positive RBCs for males and/or females of non-childbearing potential has been instituted at many hospitals and trauma services.<sup>2</sup> Collaborate implementation with emergency department/trauma surgery providers. Evaluate the number of emergency release RBCs in a trauma pack, the number of packs prepared, and frequency of use. Determine if it is possible to reduce the number of group O RBCs in each pack. Prepare trauma packs with RBCs with various expiration dates. When rotating the non-transfused trauma units back into general inventory, the various expiration dates increase the ability of the blood bank to issue these units to group O patients thus reducing transfusion to a non-group O patient and/or reducing outdate wastage.

Other strategies include use of 2<sup>nd</sup> ABO confirmatory sample collected separately from the first and electronic crossmatch.<sup>5</sup> Use of an ABO confirmatory sample can boost issue of type-specific RBCs. By having historical patient results, electronic crossmatch can rapidly compare ABO and Rh types of product and patient for compatibility. When searching for compatible RBC units for patients with antibodies, start with type specific units rather than O-negative units. Request a type-specific, antigen negative unit from your blood supplier.

**What can blood suppliers do?**

- Communicate with customers about actual RBC inventory especially if orders will only be partially filled.
- Provide type specific, antigen negative RBCs whenever possible.
- Offer education for customer hospitals about best use of O-negative and O-positive RBCs.
- Establish realistic goals for usage of O-negative RBCs and provide data on a monthly or quarterly basis.
- Encourage hospital customers to host blood drives for employees and community donors.
- Recruit new donors and retain repeat donors; match donor appointments with blood types/products needed.

**Group O use for specific situations (Trauma and Mass Casualties):** Group O RBCs are administered during the initial resuscitation of massively hemorrhaging patients of unknown ABO type.<sup>6</sup> Administering uncrossmatched RBCs in this setting is serologically safe, i.e., hemolysis is unlikely to occur even in recipients with RBC alloantibodies against antigens on the uncrossmatched RBCs.<sup>7</sup> Switching to type-specific RBCs should be accomplished once pretransfusion testing is complete.

The provision of uncrossmatched blood for transfusion in air and/or ground ambulances is an increasingly common aspect of planning for trauma care. The use of group O-positive RBCs should be considered for these settings as most patients in this setting are either males, or females of no childbearing potential.<sup>8</sup>

With regard to mass casualty events (MCEs) and disaster preparedness, it is recommended to have a realistic number of group O RBCs in stock per admission.<sup>9</sup> When faced with a large number of patients simultaneously, prioritize uncrossmatched group O-negative RBCs for females presumed to be of childbearing potential. Identification of such patients in the format of the hospital emergency medical record numbering system has been suggested to facilitate allocation of group O-negative RBCs.<sup>10</sup>

**Group O use for specific situations (Neonatal and Pediatric Patients):** Isohemagglutinins (anti-A, anti-B) present in neonates are passively acquired from the maternal circulation and usually disappear by two months of age,<sup>11</sup> therefore testing neonatal ABO type is all that is required. Further, these patients are thought to be at low risk of forming red cell alloantibodies. According to AABB, either the maternal ABO group must be compatible with the donor RBCs, or the neonatal serum or plasma must be tested for anti-A or anti-B to detect isohemagglutinins.<sup>12</sup> Because both tests present logistical challenges, it is often easier to issue group O RBCs to neonates.

**Conclusions:** Blood suppliers have dealt with an overall reduction in the demand for RBCs, but the pressure to maintain sufficient group O-negative inventory continues to grow. Group O-negative volunteers make up 6.9 percent of the donor base, but their RBCs are often used for patients of other ABO types simply because it is safe and convenient. Taking steps to implement some of the recommended changes in practice can reduce the collective dependence on group O-negative use and avert potential shortages that could affect patient safety. Working together, collection facilities and hospital transfusion services can develop a mutually beneficial program that safely reduces group O usage.<sup>2</sup>

**References:**

1. Cohn CS, Pagano MB, Allen ES, *et al.* How do I manage long term component shortages in a hospital transfusion service? *Transfusion* 2020; 60:1897-1904.
2. Murphy M, BenAvram D. Recommendations on the use of group O red blood cells. *AABB Association Bulletin* #19-02. 2019.
3. Blood Inventory Management Best Practices for Hospital Transfusion Services August 2020 Available at: [https://transfusionontario.org/wp-content/uploads/2020/08/InventoryManagementToolkit\\_02Oct2020final.pdf](https://transfusionontario.org/wp-content/uploads/2020/08/InventoryManagementToolkit_02Oct2020final.pdf) (Accessed May 15, 2021)
4. 10 Tips to help manage your blood product inventory. National Blood Authority, Australia, 30 March 2016. Available at: <https://www.blood.gov.au/system/files/NBA-A3-Poster-10-tips-to-inventory.pdf> (Accessed May 15, 2021)
5. Alquist CR, Harm SK. Transfusion Service-Related Activities. In: Cohn CS *et al* (editors). Technical Manual 20th edition. Bethesda, MD: AABB Press; 2020: 533-535.
6. Flommersfeld, S, Mand, C, Kühne, CA, *et al.* Unmatched type O RhD+ red blood cells in multiple injured patients. *Transfus Med Hemother* 2018; 45:158-61.
7. Yazer, MH, Waters, JH, Spinella, PC, *et al.* Use of uncrossmatched erythrocytes in emergency bleeding situations. *Anesthesiology* 2018; 128:650-6.
8. Meyer, E, Uhl, L. A case for stocking O D+ red blood cells in emergency room trauma bays. *Transfusion* 2015; 55:791-5.
9. Disaster operations handbook: Coordinating the nation's blood supply during disasters and biological events. Bethesda, MD: AABB; 2008. Available at: [https://www.aabb.org/docs/default-source/default-document-library/about/disaster-operations-handbook.pdf?sfvrsn=619c092c\\_0](https://www.aabb.org/docs/default-source/default-document-library/about/disaster-operations-handbook.pdf?sfvrsn=619c092c_0) (accessed May 12, 2021)).
10. Quillen, K, Luckey, CJ. Blood and bombs: Blood use after the Boston Marathon bombing of April 15, 2013. *Transfusion* 2014; 54:1202-3.
11. Shaikh, S, Sloan, SR. Clearance of maternal isohemagglutinins from infant circulation. *Transfusion* 2011; 51:938-42.
12. Gammon RR, ed. Standards for blood banks and transfusion services, 32<sup>nd</sup> edition. Bethesda, MD: AABB Press;2020.

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