A New Standard of Transfusion Care: Appropriate use of O-negative red blood cells

Background
Recent significant advances in transfusion medicine and healthcare in general have led to corresponding changes in the standards of transfusion care. New evidence-based data shows us that some of the “basic rules of transfusion” followed for decades are in need of revision. An example is automatically providing two units of red blood cells (RBCs) as the standard minimum dose. This is not always in the best interests of patients. Instead, transfusing one unit of RBCs and then evaluating the need for additional units in non-urgent cases has become the standard. This provides patients with the greatest benefit and the lowest risk.

Another example of an old standard being updated is the use of O Rh negative (a.k.a. ORh-, O D-negative, O D-, O NEG and O-negative) RBC units. It is no longer considered acceptable to transfuse O-negative RBCs to non-O-negative patients other than children under the age of 18 and females of reproductive potential¹ who are of unknown blood group and who require urgent transfusions. These patients should be switched to type-specific RBCs as soon as their blood type is known.

New standards of transfusion practice
In order to effectively maintain an ample supply of O-negative RBCs, the following has become the new standard of transfusion practice in the United States:

- Use O-positive red blood cells in emergency situations for adult males, adult females of non-reproductive potential and any other patient groups who meet hospital indications
- Switch to O-positive red blood cells except for females of reproductive potential, once it becomes clear that there will be large transfusion requirements (i.e. greater than 6 units in 24 hours or according to your MTP)
- Use type-specific phenotyped red blood cells whenever available instead of using O-negative
- Change to type-specific units immediately when the patient’s ABO type becomes known
- Consult the transfusion service medical director for alternatives to O-negative red blood cells
- Explore ways to shorten hospital turnaround time for ABO/Rh typing in urgent transfusion cases
- Collect and monitor usage data to confirm only appropriate use of O-negative units

¹ Special attention must be given to women of childbearing potential to reduce the risk of provoking alloimmunization against Rh antigens, because red cell antibodies can cross the placenta and cause hemolytic disease of the newborn – or rarely, erythroblastosis fetalis.
0-negative red cell resources

Type O-positive is the most common blood type in the U.S. at approximately 38% (Figure 1). In contrast, O-negative is found only in 6-8% of the population depending upon the ethnic makeup of the geographic region (Table 1).

Table 1: Blood Types by Ethnicity

<table>
<thead>
<tr>
<th></th>
<th>Caucasians</th>
<th>African Americans</th>
<th>Hispanics</th>
<th>Asians</th>
<th>Total Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>O-positive</td>
<td>37%</td>
<td>47%</td>
<td>53%</td>
<td>39%</td>
<td>38.4%</td>
</tr>
<tr>
<td>O-negative</td>
<td>8%</td>
<td>4%</td>
<td>4%</td>
<td>1%</td>
<td>7.7%</td>
</tr>
<tr>
<td>A-positive</td>
<td>33%</td>
<td>24%</td>
<td>29%</td>
<td>27%</td>
<td>32.3%</td>
</tr>
<tr>
<td>A-negative</td>
<td>7%</td>
<td>2%</td>
<td>2%</td>
<td>0.5%</td>
<td>6.5%</td>
</tr>
<tr>
<td>B-positive</td>
<td>9%</td>
<td>18%</td>
<td>9%</td>
<td>25%</td>
<td>9.4%</td>
</tr>
<tr>
<td>B-negative</td>
<td>2%</td>
<td>1%</td>
<td>1%</td>
<td>0.4%</td>
<td>1.7%</td>
</tr>
<tr>
<td>AB-positive</td>
<td>3%</td>
<td>4%</td>
<td>2%</td>
<td>7%</td>
<td>3.2%</td>
</tr>
<tr>
<td>AB-negative</td>
<td>1%</td>
<td>0.3%</td>
<td>0.2%</td>
<td>0.1%</td>
<td>0.7%</td>
</tr>
</tbody>
</table>

Rh-negative blood in general is seen in just about 16% (Figure 2). Currently, between 11 and 12 percent of red cells are collected from O-negative donors despite the fact that they represent a considerably smaller proportion of the population. These donors are especially generous with their time and are encouraged to donate as soon as they are next eligible. As this donor population ages, and as more longtime donors move into the age range where they are increasingly likely to be transfusion recipients, maintaining this level of O-negative cells becomes impossible.

Figure 1: Type O in the Population

Figure 2: Rh Negative in the Population

The approaches to the use and inventory management of O-negative RBCs described above are now commonly practiced in institutions both large and small across the United States. An article from 2007 evaluated the risk of giving Rh-positive blood to Rh-negative patients and found that only about one in five Rh-negative recipients of Rh-positive red cells made anti-D.

(Yazer MH, Triulzi DJ. Detection of anti-D in D− recipients transfused with D+ red blood cells. Transfusion 2007;47:2197-2201)
The new standard for smaller hospitals that are distant from their blood suppliers is to **maintain only enough O-negative units to use in emergency situations to stabilize and safely transport a patient indicated for its use** (primarily children and females of reproductive potential whose ABO type is unknown) to a facility that can treat them more effectively. In all other cases, transfusions can be performed using type-specific or O-positive RBCs. Protocols for securing replacement inventory quickly must be put in place and followed as supplies of O-negative RBCs are utilized. Trauma patients who are not children or females of reproductive potential can be safely transfused with O-positive blood without fear of adverse effects.

**Benefits of the New Standard**

1. Avoids unnecessary utilization of hard-to-find resources
2. Guarantees that patients who really need O-negative blood have access to an ample supply
3. Saves hospital funds when units are not transfused unnecessarily
4. Ensures right outcomes when the right patient receives the right product at the right dose at the right time for the right reasons

Using O-negative red cells for transfusion recipients who do not necessarily require them and maintaining an unnecessarily high O-negative inventory places a large strain on the blood supply and on the O-negative donors who help support it. It also reduces the availability of O-negative units for recipients who should receive only this type.

Conservation of O-negative red blood cells benefits both the hospital and the blood center. Using the most commonly available RBCs, O-positive, as the starting point for all patients except those indicated can re-balance a community’s blood supply by better matching collections from donors to transfusions to patients.

Our mutual goal must be to ensure that all use of O-negative RBCs is necessary and appropriate and to optimize O-negative inventories so that all patients receive the best transfusion support possible.

**What your hospital can do**

Begin by reviewing with us your hospital’s historical data for ABO type usage.

Next, take advantage of our wide variety of materials designed to educate physicians on appropriate O-negative use and to help your clinical leadership teams consider evidence-based alternatives to O-negative red blood cell transfusion. Doing so can lead to transfusion policy changes that will not compromise patient safety or outcomes.
Indications for appropriate and necessary use of O-negative red blood cells

- **Group O-negative patients with anti-D**

- **Group O-negative females of reproductive potential**

  Unknown blood group females of reproductive potential in emergent transfusions. *Switch patients to type-specific red blood cell support as soon as the blood type is determined.*

- **Group O-negative neonates and children (males and females < 18 years of age)**

  All intrauterine transfusions

  Any patient with antibodies when the only phenotype-compatible blood available is group O-negative. *Type-specific phenotype-compatible products should be used whenever possible.*

- **Group O-negative patients in non-emergent, lower volume (less than 6 units in any 24-hour period) transfusion. Switch patients other than females of reproductive potential and neonates/children to O-positive red blood cells when there is the expectation of larger volume transfusions (greater than 6 units in any 24-hour period).*