ABSTRACT

Fresh whole blood (FWB) is increasingly being recognized as the ideal resuscitative fluid for hemorrhagic shock. Because of this, military units are working to establish the capability to give FWB from a walking blood bank donor in environments that are unsupported by conventional blood bank services. Therefore, many military units are performing autologous blood transfusion training. In this training, a volunteer has a unit of blood collected and then transfused back into the same donor. The authors report their experience performing an estimated 3408 autologous transfusions in training and report no instances of hemolytic transfusion reactions or other major complications. With appropriate control measures in place, autologous FWB training is low-risk training.

KEYWORDS: military personnel; blood transfusion, autologous; simulation training

Introduction

Currently, recommendations by both the Committee on Tactical Combat Casualty Care and the Joint Trauma System state that FWB is the ideal resuscitative fluid for hemorrhagic shock. Given that hemorrhage (exsanguination) continues to be the leading cause of potentially survivable death on the battlefield and that there is mounting evidence that demonstrate that delays in blood transfusion are associated with increased mortality, there has been an increased emphasis to give FWB closer to the point of injury (POI). The 75th Ranger Regiment implemented the Ranger O Low Titer (ROLO) Whole Blood Program in 2015. As part of this program, all soldiers are screened before deployment to identify individuals who are type O with an IgM anti-A/B titer <1:256 and also negative for transmission transmissible diseases. Soldiers who pass all these screening tests are identified as universal FWB “ROLO donors” and are thus able to serve as a battlefield walking blood bank. This program was recently recognized by the Army Materiel Command as the individual military winner of the annual Army’s Greatest Innovation Award. Subsequently, there has been great interest to expand FWB capability to additional US military units. Given this, XVIII Airborne and III Corps are currently working to establish this capability within their subordinate units. Additionally, the capability to give FWB from a walking blood bank has increased in importance with US military Servicemembers frequently serving in areas far removed from traditional blood bank services and with the increasing emphasis on training for a near peer conflict. This capability will decrease risk to the force and extend operational reach.

Training

As part of establishing the infrastructure to support giving FWB near the POI or in the prolonged field care/near-peer environments, many units have identified the requirement to train on the technical skill of collecting and transfusing FWB. The technical skill of collecting and transfusing FWB requires frequent training given the skill is perishable and difficult to simulate. Unfortunately, enlisted medical personnel and even providers frequently have limited ability to gain experience with FWB transfusions while working clinically at military treatment facilities. In an effort to close this capability gap, many units are using autologous blood transfusion training to gain competency in FWB collection and donation. During autologous FWB training, a volunteer has a unit of blood collected and then transfused back into the same donor.

In the hospital setting, transfusion of allogenic (nonautologous) blood is considered a high-risk event given that the transfusion of even small amounts of incompatible blood products can be rapidly fatal. However, experts suggest that autologous FWB transfusion in a hospital setting is low risk. Nonetheless, there is a perception by some that autologous FWB transfusion performed in a training environment is high risk. Many perceive the risk of autologous blood transfusion training in a controlled environment to be equivalent to the risk associated with hospital-based allogenic (nonautologous) blood transfusions frequently performed in chaotic clinical environments. The authors are aware of several instances where FWB training was canceled or not approved due to the perception that it is high risk. Unfortunately, there are no data in the literature of which the authors are aware that quantify the risks associated with autologous blood transfusion in a training environment. Because of this, the authors felt compelled to publish their experience during autologous FWB training.

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Results

In total, the authors have conservatively performed an estimated 3408 autologous blood transfusions in training and have not experienced any instances of major or minor hemolytic transfusion reactions. In addition, no instances of anaphylactic allergic reaction occurred or were there any complications that required an emergency department visit or required follow-on care. The authors do report several minor complications that include 2 instances of ocular blood exposure, 1 minor allergic reaction that resulted in urticaria, and 14 instances where individuals had a vasovagal reaction to venipuncture unassociated with blood donation or transfusion (Table 1). The FWB collection kits do include citrate as a preservative, and the authors do report that with rapid infusion (pressure infused) of autologous blood there is high rate of perioral paresthesia that resolve without intervention. We realize these data suffers from significant recall bias and thus do not contribute to generalizable knowledge. However, given the lack of information on the topic, we believe it is important to discuss our experience to guide future risk assessment.

<table>
<thead>
<tr>
<th>Complication</th>
<th>n (%)</th>
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<tbody>
<tr>
<td>Vasovagal episode (syncope/near syncope)</td>
<td>14 (0.41)</td>
</tr>
<tr>
<td>Ocular blood exposure</td>
<td>2 (0.06)</td>
</tr>
<tr>
<td>Minor allergic reaction (urticaria)</td>
<td>1 (0.02)</td>
</tr>
<tr>
<td>Anaphylactic allergic reaction</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Anaphylactic allergic reaction</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Major hemolytic transfusion reaction</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Minor hemolytic transfusion reaction</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>

Although different organizations have diverse protocols for conducting autologous FWB training, there are several universal control measures in place to ensure the training is conducted safely. In order to prevent allogenic (nonautologous) transfusion, participants are instructed to ensure that they receive only their own blood during transfusion and that this is a “no fail” task. In addition, they are instructed to label their blood collection bag with their name. Other methods include writing a unique mark on the donor arm and the bag. Prior to transfusion, there is a safety or final time out where the instructor verifies that an autologous transfusion is taking place. To limit the impact of any vasovagal syncope during venipuncture, students are laid supine during venipuncture. To prevent ocular blood exposure, students are instructed to insert with needle bevel down if using a bare metal needle and to use eye protection. A medical kit with an epinephrine pen and Benadryl is accessible in the event there are any minor allergic reactions to the preservative in the FWB collection bag. The authors recommend a 1:5 trainer:student ratio.

The primary feared complication of autologous FWB training is major hemolytic transfusion reaction that could occur if participant accidentally did not receive his own blood during transfusion (i.e., inadvertent allogenic [nonautologous] transfusion). Although this complication would be considered catastrophic by the Army’s Composite risk management, it is unlikely to occur and without control measures would be considered medium-risk training. The other observed complications the authors experienced while performing autologous FWB training represent marginal risk and seldom occurred and thus are low risk. After implementation of appropriate control measures as described here, we assess the overall residual risk to be low.

Conclusion

Autologous fresh whole blood training when conducted with appropriate control measures infrequently results in complications and is low-risk training. This training is critical to be able to provide the capability to give FWB in far forward locations not supported by conventional blood bank such as the POI or prolonged field care environments.

Disclosure

The authors have nothing to disclose.

References
