

# JOINT TRAUMA SYSTEM CLINICAL PRACTICE GUIDELINE



## Transfusion of Type A Whole Blood for the Role 3

The intent of this CPG is to provide guidance on the expanded use of Type Specific, (Group A) Whole Blood provided by the ASBP at Role 3 Military Treatment Facilities. It provides background and utilization recommendations on using type A specific whole blood in the expeditionary environment.

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## INTRODUCTION

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Whole blood (WB) is the preferred resuscitation fluid for bleeding patients.<sup>1</sup> As of 2025, there are currently two types of WB available in the deployed setting: (1) WB from a Walking Blood Bank that is either ABO-group specific or Low-Titer O Whole Blood (LTOWB) and (2) Blood donor center produced LTOWB that is tested according to the FDA standards and shipped to deployed locations. Up until 2016, the only WB transfused on the battlefield was type specific warm fresh whole blood (FWB) from Walking Blood Banks (WBB). In April 2016, the Armed Services Blood Program (ASBP) started to deliver fully tested LTOWB to forward deployed environments. Since then, LTOWB has become the transfusion product of choice for the initial resuscitation of hemorrhaging casualties. The adoption (or re-adoption, see below) of LTOWB has also occurred in civilian trauma centers with nearly 300 trauma hospitals in the U.S. using LTOWB.<sup>1,35</sup> LTOWB is limited in its availability. Adopting Type A WB will increase the donor pool and create a more resilient blood supply for current and future operations.<sup>2</sup>

Approximately 45% of the U.S. population is group O and 40% is group A. Therefore, having ASBP produced group A WB available in the deployed setting for combat casualties will significantly increase the availability of stored WB in the deployed environments. Given the concerns regarding future large scale combat operations, it can be anticipated that there will be a shortage of LTOWB. Therefore, the intent of this CPG is to provide guidance on the expanded use of type specific, particularly Type A WB provided by the ASBP to forward deployed locations. **This is a new practice for the DoD's deployed trauma system** and is being adopted by the ASBP and the Joint Trauma System (JTS) in anticipation of blood shortages in the future and for contingency planning. This JTS-ASBP CPG is meant to inform, educate and guide on the expanded practice of including ASBP provisioned Type A Whole Blood to the deployed environment.

The ASBP is the official blood program of the U.S. Military. The ASBP is responsible for providing quality blood products to Service Members and their families all around the world. Their primary mission is to support deployed operations, but the ASBP also supplies blood to Military Treatment Facilities (MTFs) in Continental U.S. (CONUS) and outside the Continental U.S. (OCONUS). The ASBP blood donor centers are FDA compliant. In the U.S., the other nationally regulated blood product sources are the American Red Cross, the members of the American Blood Centers, and other hospitals and small blood collectors. Other nations have national blood centers as well, but the U.S. is one of the few countries with a dedicated military blood program that exclusively provides full spectrum blood services for the military.

The Armed Services Blood Program supplies Combatant Commands (CCMDs) with blood, sourced from volunteer donors. Seasonal variability and a high demand for LTOWB influence supply and distribution strategies. There is a potential for lack of LTOWB supply to meet future demand signals based on the operational activities in the CCMDs. Augmenting the blood supply by expanding the procurement and use of group A WB can mitigate risk of lack of blood availability. Additionally, since 40% of the U.S. population is group A—expanding the ASBP inventory to include group A whole blood that has been approved by the ASBP or another nation's National Blood Bank (NBB) will improve whole blood supply to the CCMDs.

## HISTORY & EVOLUTION OF WHOLE BLOOD USE IN COMBAT CASUALTY CARE

The benefits of WB in resuscitating bleeding patients have been a lesson learned, forgotten, and relearned over the past century.<sup>1,3</sup> Type O WB was the primary blood product used in World War I and the early part of World War II (WWII). LTOWB was the primary blood product in the latter parts of WWII, the Korean War, and the early Vietnam War.<sup>1,4-6</sup> WB fell out of favor in the decades since, due to the advent of WB manufacturing techniques, where the ability to manufacture WB into components was thought to optimize the use of each donated unit while minimizing the risk of excessive transfusions, thereby reducing the potential for infections and transfusion reactions.<sup>7-9</sup> In 1976, Shires and his collaborators introduced another paradigm shift by proposing crystalloids as a bridge to WB for restoring circulating blood volume in trauma resuscitation by resuscitating the interstitial space.<sup>10</sup>

When the U.S. entered the conflicts in Iraq and Afghanistan, the resuscitation standards were crystalloid and component therapy, starting with red blood cells (RBCs) and adding plasma and platelets in a serial fashion when clinical or laboratory data confirmed coagulopathy was present. With advancing knowledge, this "unbalanced" strategy transitioned toward component ratios designed to closely mimic WB<sup>11</sup> and the principles of Damage Control Resuscitation (DCR) were adapted and advocated. This strategy emphasized prompt surgical bleeding control, transfusion of RBCs, plasma, and platelets in a balanced 1:1:1 ratio, prioritization of fresh RBCs, restriction of excessive crystalloid infusion, and measures to prevent

acidosis and hypothermia.<sup>12-18</sup> In casualties receiving RBCs, plasma, and platelets in a 1:1:1 ratio, a mortality benefit was demonstrated in a large retrospective cohort study examining transfusion practices during Operations Iraqi Freedom and Enduring Freedom.<sup>19</sup>

Due to observations that warm fresh whole blood had superior clinical results, starting in October 2004, warm fresh whole blood was prioritized to be used on the sickest patients at the 31<sup>st</sup> Combat Support Hospital at Ibn Sina. While waiting for the blood from the Walking Blood Banks, component therapy was used in a 1:1 ratio of RBC:plasma.<sup>20-22</sup> FWB quickly demonstrated a survival benefit compared to component therapy (CT) both empirically and in observational studies.<sup>23,24</sup> The FWB from WBB was almost always Type Specific Fresh Whole Blood but on rare occasions, Group O whole blood was administered to non-group O recipients.<sup>24</sup> This FWB survival advantage rekindled interest in the re-utilization of LTOWB provided directly from the ASBP, thereby providing a fully tested, safe and efficacious option for resuscitation.

Starting in April 2016, the ASBP began providing LTOWB that had been fully screened according to FDA standards to forward deployed forces in Iraq and Afghanistan.<sup>25</sup> Simultaneously, the 75th Ranger Regiment's Ranger O Low Titer (ROLO) Whole Blood Program was instituted to augment point of injury WB resuscitation. The program identifies all blood group O members of the unit and then screens them for low anti-A and anti-B antibodies. This form of LTOWB is from a WBB, or WBB-LTOWB which is not FDA approved.<sup>26</sup> In April 2018, the Association for Advancement of Blood and Biotherapies (AABB) changed their standards to permit the use of LTOWB for recipients of unknown ABO types who need emergency transfusion, and that the definition of 'low titer' would be made by each local transfusion service (the DoD uses a titer cutoff of <1:256).<sup>27</sup>

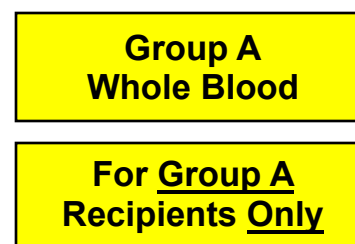
Potential benefits of WB include improved hemostatic capacity and decreased overall volume of preservative when compared to an equivalent volume of component therapy.<sup>1,28</sup> Additionally, civilian data continues to emerge that LTOWB is associated with a significant reduction in mortality.<sup>29,30</sup> LTOWB offers the benefit of a quicker time to balanced transfusion compared to using CT because LTOWB offers balanced resuscitation therapy in one bag instead of having to use up to three bags to achieve balanced resuscitation.<sup>4</sup> Additionally, the lack of need for a cross match allows LTOWB, a universal donor product, to be used in scenarios where crossmatching is not feasible, such as in the prehospital environment.<sup>36</sup>

Given the rapid adoption of LTOWB secondary to improved clinical outcomes as well as the logistical feasibility of transporting one product compared to a balanced component therapy resuscitation that requires up to three units, there is a concern that in future operating environments that the supply of LTOWB will be limited. This supply concern, combined with the proven benefits of the long-standing use of Type Specific Whole Blood (TSWB) from WBB, has led the ASBP to decide to bring back TSWB that has been tested and meets FDA standards As a reminder: 1) TSWB from WBB is not an FDA approved product; and 2) prior to the technology to separate whole blood into components, all blood products were either TSWB or LTOWB for emergencies. Given that the U.S. population is 40% Type A, Type A Whole Blood is going to be collected by ASBP for the operational environments. As this practice becomes implemented, Type A Whole Blood will only be used at Role 3 MTFs upon confirmation of the patient's ABO group. These facilities must have blood banking capabilities that can perform pretransfusion testing specifically ABO blood group determination. This will allow LTOWB to be reserved for prehospital and Role 2 resuscitation and for patients at the Role 3 during the initial phase of resuscitation, when their ABO-group is unknown.<sup>31</sup>

The ASBP will designate TSWB that is drawn and processed in their facilities as National Blood Bank (NBB) Type Specific Whole Blood (NBB-TSWB). The nomenclature was chosen to be interoperable with other nations that will adopt this practice, given that while the U.S. must comply with FDA standards, other countries use their national standards to indicate the blood has been donated, tested, processed, stored, and shipped in a manner compliant with their regulatory agencies.

NBB-TSWB will be supplied to facilities with laboratories capable of determining recipient blood types, therefore, it will only be available at Role 3 and above and shall only be transfused at those facilities. Additionally all Type A NBB-TSWB will have yellow labels to indicate: 1) that it is Group (Type) A; 2) that it is Whole Blood; and 3) that it is intended for transfusion to Group A recipients only (In the future, other nations may adopt this practice, but at the time of publication of this CPG, the yellow label refers specifically to Type A Whole Blood processed and distributed by the ASBP, meaning that it meets FDA standards).

**Figure 1. Example of labels attached to Group A Whole Blood for quick identification**



**Table 1. JTS-ASBP Definitions of Types of Whole Blood**

Blood Product	Definition
<b>National Blood Bank** - Type Specific Whole Blood (NBB-TSWB)</b>	Whole blood collected at a nationally regulated collection facility (e.g., FDA licensed blood donor center). Must be ABO identical with the recipient, tested for all required transfusion transmitted diseases, and therefore utilization will be limited due to the restriction of being able to transfuse it to ABO-identical recipients.
<b>National Blood Bank** - Low Titer O Whole Blood (NBB-LTOWB) <sup>34</sup></b>	Whole blood collected at a nationally regulated collection facility (e.g., FDA licensed blood donor center) that is donor type O, tested for all required transfusion transmitted diseases, and has been confirmed to have low titers of anti-A and anti-B antibodies (<1:256).
<b>Walking Blood Bank - Type Specific Whole Blood (WBB-TSWB)</b>	Whole blood collected in theater from a screened donor and may be used immediately or stored at room temperature for up to 24 hours (and then destroyed if not used) or refrigerated within 8 hours of collection (and stored to expiration date based on anticoagulant used). * Utilization will be limited due to the restriction of being able to transfuse it to ABO-identical recipients.
<b>Walking Blood Bank - Low Titer O Whole Blood (WBB-LTOWB)</b>	Whole blood collected in theater from a screened blood group O donor with previously determined low titers of anti-A and anti-B antibodies (<1:256) tested within 12 months of donating; may be used immediately or stored at room temperature for up to 24 hours (and then destroyed if not used) or refrigerated within 8 hours of collection (and stored to expiration date based on anticoagulant used). *

*\*Whole blood collected in CPD anticoagulant has up to a 21-day shelf life. Whole blood collected in CPDA1 anticoagulant has up to a 35-day shelf life*

*\*\*National Blood Bank refers to countries which provide national regulatory oversight of blood collection establishments. Blood products provided by these nationally regulated collection centers are fully screened and tested per respective national guidelines.*

*These definitions were adopted after adjudication with regional, national, and international blood experts to ensure there is a clear and descriptive lexicon for the types of Whole Blood and to promote interoperability.*

**The intent of this CPG is to provide guidance on the expanded use of Type Specific, particularly Type A, Whole Blood provided by the ASBP to forward deployed locations. This will be referred to as National Blood Bank-Type Specific Whole Blood (NBB-TSWB) indicating that it has been donated, tested, processed, stored, and distributed by a FDA licensed blood center.**

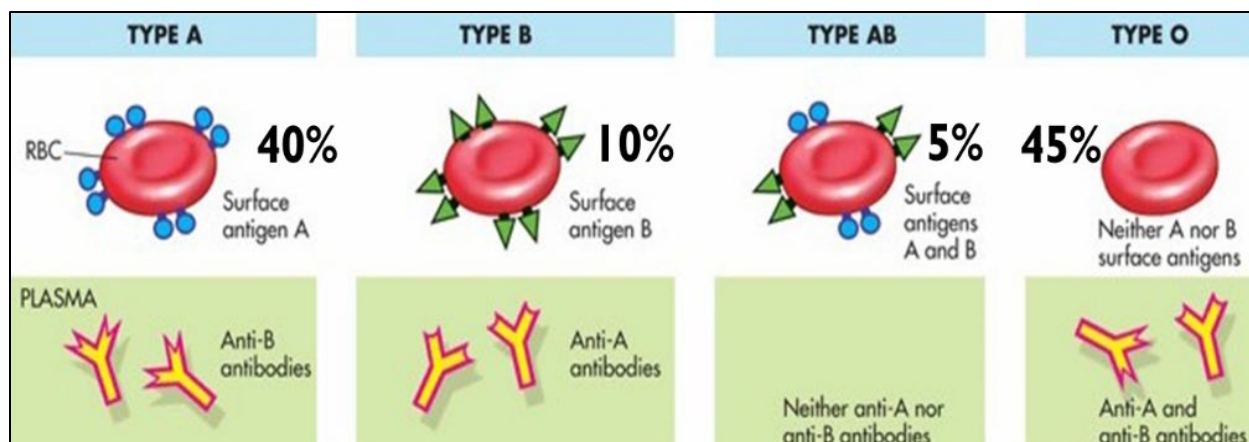
**The ASBP will expand the quantity of whole blood sent to deployed theaters from LTOWB to also include Type A Whole Blood given that 40 % of the US population is Type A.**

**Type A whole blood can only be given to Type A patients.**

## WHY TYPE & TITERS MATTER

An ABO mismatch during transfusion can be lethal. Blood transfusion should be considered a form of organ transplantation – administering an ABO incompatible RBC transfusion can result in massive hemolysis, renal failure, respiratory failure and death. **Due to this, LTOWB transfusion is always the safest option if the recipient's blood type is unknown.** Type O blood is the universal donor because the red blood cells (RBCs) do not express the A and B antigens to which the recipient might have naturally occurring hemolytic antibodies. While this CPG is not meant to make everyone a transfusion expert – understanding the basics on blood types and titers will help to ensure that this life-saving capability (blood transfusion) is implemented safely.

**Figure 2. Comparison of blood types**



**Type O Blood** – comprises approximately 45% of the US population. Type O RBCs do not express A and B antigens, which is what makes it the ‘Universal Donor’ type. Type O blood contains both anti-A and anti-B antibodies in the plasma. Type O patients can only receive Type O WB or LTOWB.

**Type A Blood** – comprises 40% of the US population. Type A individuals express the A antigen on the RBCs and anti-B antibodies in the plasma. Type A patients can receive Type A WB or LTOWB.

**Type B Blood** – comprises 10% of the US population. Type B individuals express the B antigen on the RBC and anti-A antibodies in the plasma. Type B patients can receive Type B WB or LTOWB.

**Type AB Blood** – comprises just 5% of the US population. Type AB RBCs express both Type A and Type B antigens and therefore do not have circulating anti-A or anti-B antibodies in their plasma. This makes Type AB the ‘Universal Recipient’ for RBCs and the universal donor for plasma because their plasma does not contain anti-A or anti-B. Type AB patients can receive Type AB WB or LTOWB.



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## BACKGROUND

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In deployed settings there are currently two broad types of whole blood available (as of 2025):

- 1 Whole Blood (WB) from a Walking Blood Bank (WBB-TSWB and WBB-LTOWB), and
- 2 National Blood Bank produced LTOWB (NBB-LTOWB) which is FDA approved and shipped to deployed locations. New in 2025 is ASBP produced Type A Whole Blood (NBB-TSWB), which will have a yellow label designating it as Group A Whole Blood.

Management of NBB-LTOWB and WBB-LTOWB/TSWB are discussed in the [Damage Control Resuscitation and Whole Blood CPGs](#).<sup>1,31</sup> This current CPG focuses specifically on use of NBB-TSWB, particularly the use of Type A WB.

The primary difference for the providers when using NBB-TSWB vs. NBB-LTOWB is that the recipient's blood type **must be known** when performing a type-specific transfusion. The recipient's blood type is inconsequential during the initial resuscitation when using LTOWB (either NBB or WBB) because LTOWB is a universally compatible product; however, to avoid a potentially lethal transfusion reaction during a **type-specific transfusion, the blood type of the recipient must be identical to the blood type of the donor blood.**

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***Administering an incompatible blood type can have devastating consequences for a patient. It is crucial to ensure a specimen for ABO type determination is submitted to the blood bank promptly for accurate and timely blood type verification.***  
***Hypervigilance to avoid administrative errors is a must.***

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## REASONS TO EXPAND TO ASBP PROVISIONED (NBB) TYPE SPECIFIC WB

The reason to expand to NBB-TSWB in the DoD's trauma system is multifactorial. NBB-TSWB has been used historically in the U.S. until the 1980s and is still used in certain countries that never adopted widespread component manufacture from whole blood. Using NBB-TSWB expands the donor pool and helps alleviate supply constraints associated with NBB-LTOWB.<sup>30</sup> However, as mentioned above, adopting NBB-TSWB requires careful recipient blood typing to ensure ABO compatibility and prevent acute hemolytic transfusion reactions.

Given the potential challenges of supply combined with the high demand of LTOWB there is risk of shortage of LTOWB to meet the demands of the future operating environment. Augmenting the blood supply with NBB-TSWB, particularly Type A Whole Blood, will mitigate the risk of running out of LTOWB. By having ASBP supplied whole blood (NBB-TSWB) for both Group O and Group A, the majority of the U.S. population's blood types will be covered given that 40% is Type A and 45% are Type O.

***The Armed Services Blood Program supplies Combatant Commands with blood sourced from volunteer donors. Seasonal variability and high demand for blood products, like LTOWB, influence supply and distribution strategies.<sup>2</sup> The prevalence of blood types in the general population influences the distribution and use of NBB-TSWB/LTOWB.***

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## CONSIDERATIONS

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- Transfusing an ABO-incompatible RBC unit can cause a potentially fatal hemolytic transfusion reaction. The current whole blood products provided by ASBP to military operations are: NBB-LTOWB and Type A Whole Blood (NBB-TSWB).
- Determination of a recipient's blood type must be done by directly testing their RBCs and plasma.

- Positive recipient identification must be completed prior to any TSWB transfusion.
- Do not rely on a potential recipient's dog tags, uniform badges, tattoos, proclamations, or any other external markings for recipient ABO type.
- Manual saline tube test or an automated analyzer that performs **both a forward and reverse test** must be used to determine the recipient's blood type prior to transfusion of NBB-TSWB. **If the Role 3 is not able to support manual saline tube or automated analyzer ABO testing, the facility will not provide NBB-TSWB (Type A Whole Blood) for transfusion.**
  - To increase patient safety, the Role 3 **should** perform blood type determination on a second independently collected patient sample before issuing NBB-TSWB.
  - There may be rare instances where patients possess an uncommon type A subgroup (e.g., A<sub>2</sub>). A small subset of these patients (1-8%) may produce antibodies to donor type A whole blood (e.g., anti-A<sub>1</sub>). Performing both forward and reverse blood typing is important in detecting these subgroups as the Role 3 blood banks do not have Type A subgroup identification capabilities. If a discrepancy between the forward and reverse blood type is observed, patients should receive LTOWB (NBB-LTOWB or WBB-LTOWB) or appropriate component therapy using universally compatible products.
- Type A patients are the only patients that can receive Type A NBB-TSWB.
- In situations where the recipient's blood type cannot be reliably determined (i.e., discrepancy between forward type and reverse type during testing), **LTOWB** or appropriate component therapy using universally compatible products including type O RBCs, type A plasma or Type AB plasma should be used instead.
- NBB-LTOWB can be given to all recipients, no matter the blood type.

**Type A for Type A only**

**A4A**

**Low Titer Type O for Everyone Else**

**O4E2**

## WHEN TO USE NBB -LTOWB VS. NBB- TSWB VS. ACTIVATING THE WBB

The decision on what blood product to use depends on multiple factors: clinical status of the patient, supply, resupply, and the ability to activate the WBB. WBB activation and other resuscitation nuances are further discussed in the DCR<sup>32</sup> and WB Transfusion<sup>1</sup> CPGs, but in general, the WBB is reserved for situations where there are substantial supply limitations, or the senior surgeon believes the casualty's survival requires fresh whole blood from a WBB.

The choice to use Whole Blood from a WBB versus NBB-TSWB versus NBB-LTOWB should be based on the recipient's blood type (and ability to determine blood type), blood product availability, and the urgency of the situation. The below guidance is on the appropriate use of Type Specific Whole Blood to optimize patient outcomes while minimizing risks associated with ABO mismatch. Choices are numbered in order of preference.

- **If the patient's blood type is unknown** → 1) NBB-LTOWB or 2) WBB-LTOWB. If the patient can be accurately blood typed and they are group A, then can switch to Type A NBB-TSWB or WBB-TSWB once blood type is determined. \*
- **If the patient has confirmed Type A blood** → 1) Type A NBB-TSWB or 2) NBB-LTOWB or 3) WBB-TSWB or 4) WBB-LTOWB.\*
- **If the patient has confirmed Type O blood** → 1) NBB-LTOWB or 2) WBB-LTOWB or 3) WBB-TSWB. Only blood type O is acceptable to be transfused to Type O patients.
- If the patient has either confirmed Type B or Type AB blood → 1) NBB-LTOWB or 2) WBB-LTOWB or 3) WBB-TSWB.\*

*\*There is a theoretical, unproven risk of hemolysis when transfusing ABO group-specific blood following large volume LTOWB resuscitations that started with the misinterpretation of outdated and unreliable laboratory data during the Korean war, however, contemporary data do not justify a change in the above recommendations<sup>33</sup> **This underscores the importance of timely and accurate transfusion documentation.***

**Type Specific Whole Blood can ONLY be given to a recipient with the same blood type; this is true for both NBB-TSWB and WBB-TSWB. Type Specific Whole Blood carries a risk of acute hemolytic transfusion reaction if an ABO-incompatible unit is provided to the recipient. Meticulous blood typing of both the donor unit and the recipient, and care when identifying the recipient and donor unit, is essential to ensure compatibility.**

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## RECOMMENDATIONS

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- Type A Whole Blood (NBB-TSWB) will be stored and used only at MTFs which utilize anti-sera and red cell reagents to conduct forward and reverse blood typing. Currently in the deployed environment, this is only Role 3 MTFs.
- Type Specific Whole Blood, either NBB-TSWB or WBB-TSWB, is only used when the recipient's blood type has been determined in a laboratory as described above and exactly matches available type specific whole blood.
- Use LTOWB or appropriate component therapy featuring universal donor products when recipient's blood type is in doubt.
- Switch to NBB-TSWB or WBB-TSWB when able and only when appropriate testing capability is available.

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## PERFORMANCE IMPROVEMENT (PI) MONITORING

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### POPULATION OF INTEREST

- Patients resuscitated with blood products in deployed Role 3 Military Treatment Facilities.

### INTENT

- TSWB is only used when the recipient's blood type is confirmed and identical TSWB is available
- LTOWB or appropriate component therapy featuring universal donor products is used when TSWB is not appropriate
- WBB is activated when indicated by senior surgeon
- Proper documentation is completed for each unit transfused.
- Any transfusion reaction is appropriately documented.

### PERFORMANCE/ADHERENCE METRICS

- TSWB is used when blood type of the recipient has been confirmed by a laboratory
- LTOWB is used when the recipient's blood type is unknown or not confirmed by a laboratory.
- Type A whole blood is used at the Role 3 MTF for Type A recipients when appropriate pretransfusion testing has been completed.



- Frequency of hemolytic transfusion reactions due to blood typing error or clerical error is documented and reported as a CCIR.
- Documentation of all blood products transfused to include time of transfusion.

## DATA SOURCE

- Blood transfusion databases
- DoD Trauma Registry
- Patient Record

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## REFERENCES

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1. Cap A, Beckett A, Benov A, et al. Whole Blood Transfusion, Military Medicine, Volume 183, Issue suppl\_2, September-October 2018, Pages 44–51,
2. Comes R, Olsen C, Huang C, Carrillo M, Patton S, April MD, Hall JH, Kulis P, Hall A. Improving Expeditionary Blood Supply via Type-Specific Whole Blood. Mil Med. 2025 Apr 23;190(5-6):e914-e917.
3. Gurney, Jennifer M, Cap, Andrew Holcomb, John B, et al. The thin red line: Blood planning factors and the enduring need for a robust military blood system to support combat operations. Journal of Trauma and Acute Care Surgery 97(2S):p S31-S36, August 2024. | DOI: 10.1097/TA.0000000000004413
4. Association for the Advancement of Blood and Biotherapies. Highlights of Transfusion Medicine History. Available at: <https://www.aabb.org/news-resources/resources/transfusion-medicine/highlights-of-transfusion-medicine-history>. Accessed December 1, 2024.
5. Kalkwarf KJ, Cotton BA. Resuscitation for hypovolemic shock. Surg Clin North Am. 2017;97(6):1307–1321.
6. Hess JR, Thomas MJ. Blood use in war and disaster: lessons from the past century. Transfusion. 2003;43:1622–1633.
7. Oberman HA. The indications for transfusion of freshly drawn blood. JAMA. 1967;199:93–97
8. Giangrande PL. The History of Blood Transfusion. Br J Haematology. 2000;100:758–767.
9. Beal RW. The rational use of blood. Aust N Z J Surg. 1976;46:309–313.
10. Carrico CJ, Canizaro PC, Shires GT. Fluid resuscitation following injury: rationale for the use of balanced salt solutions. Crit Care Med. 1976 Mar-Apr;4(2):46-54. PMID: 819213.
11. Thompson P, Strandenes G. The history of fluid resuscitation for bleeding. In: Spinella PC, ed. Damage Control Resuscitation: Identification and Treatment of Life-Threatening Hemorrhage. Cham: Springer International Publishing, New York, New York; 2020:3–29.
12. Beekley AC. Damage control resuscitation: a sensible approach to the exsanguinating surgical patient. Crit Care Med. 2008;36(7 suppl):S267–S274. doi: 10.1097/CCM.0b013e31817da7dc.
13. Hess JR, Holcomb JB, Hoyt DB. Damage control resuscitation: the need for specific blood products to treat the coagulopathy of trauma. Transfusion. 2006;46:685–686. doi: 10.1111/j.1537-2995.2006.00816.x.
14. Holcomb JB, Jenkins D, Rhee P, et al. Damage control resuscitation: directly addressing the early coagulopathy of trauma. J Trauma. 2007;62:307–310. doi: 10.1097/TA.0b013e3180324124.
15. Borgman MA, Spinella PC, Perkins JG, et al. The ratio of blood products transfused affects mortality in patients receiving massive transfusions at a combat support hospital. J Trauma. 2007;63:805–813. doi: 10.1097/TA.0b013e3181271ba3.

16. Spinella PC, Perkins JG, McLaughlin DF, et al. The effect of recombinant activated factor VII on survival in combat-related casualties with severe trauma requiring massive transfusion. *J Trauma*. 2008;64:286–293. doi: 10.1097/TA.0b013e318162759f. discussion 293–294.
17. Stinger HK, Spinella PC, Perkins JG, et al. The ratio of fibrinogen to red cells transfused affects survival in casualties receiving massive transfusions at an army combat support hospital. *J Trauma*. 2008;64(2 suppl):S79–S85. doi: 10.1097/TA.0b013e318160a57b. discussion S85.
18. Gonzalez EA, Moore FA, Holcomb JB, et al. Fresh frozen plasma should be given earlier to patients requiring massive transfusion. *J Trauma*. 2007;62:112–119. doi: 10.1097/01.ta.0000250497.08101.8b.
19. Pidcock HF, Aden JK, Mora AG, et al. Ten-year analysis of transfusion in Operation Iraqi Freedom and Operation Enduring Freedom: increased plasma and platelet use correlates with improved survival. *J Trauma Acute Care Surg*. 2012 Dec;73(6 Suppl 5):S445–52.
20. Repine TB, Perkins JG, Kauvar DS, Blackburne L. The Use of Fresh Whole Blood in Massive Transfusion. *The Journal of Trauma: Injury, Infection, and Critical Care*. 60(6):p S59–S69, June 2006. | DOI: 10.1097/01.ta.0000219013.64168.b2
21. Spinella PC, Moore FA, Holcomb JB, et al. Fresh whole blood transfusions in coalition military, foreign national, and enemy combatant patients during Operation Iraqi Freedom at a US combat support hospital. *World J Surg*. 2008;32:255–261. doi: 10.1007/s00268-007-9201-5.
22. Spinella PC. Warm fresh whole blood: military and civilian applications. *Crit Care Med*. 2008;36:S340–S345. doi: 10.1097/CCM.0b013e31817e2ef9.
23. Spinella PC, Perkins JG, Grathwohl KW, et al. Warm fresh whole blood is independently associated with improved survival for patients with combat-related traumatic injuries. *J Trauma*. 2009;66(4 Suppl):S69–S76. doi: 10.1097/TA.0b013e31819d85fb
24. Nessen SC, Eastridge BJ, Cronk D, et al. Fresh whole blood use by forward surgical teams in Afghanistan is associated with improved survival compared to component therapy without platelets. *Transfusion*. 2013;53(Suppl 1):107S–113S. doi: 10.1111/trf.12044.
25. Fisher AD, Miles EA, Broussard MA, Corley JB, Knight R, Remley MA, et al. Low titer group O whole blood resuscitation: military experience from the point of injury. *J Trauma Acute Care Surg*. 2020;89:834–841.
26. Song KH, Winebrenner HM, Able TE, Bowen CB, Dunn NA, Shevchik JD. Ranger O Low Titer (ROLO): Whole Blood Transfusion for Forward Deployed Units. *Mil Med*. 2021 Nov 10:usab473. doi: 10.1093/milmed/usab473. Epub ahead of print. PMID: 34755846.
27. Standards for Blood Banks and Transfusion Services. 31st ed. Bethesda, MD: AABB; 2018.
28. Meizoso JP, Cotton BA, Lawless RA; et al. Whole blood resuscitation for injured patients requiring transfusion: A systematic review, meta-analysis, and practice management guideline from the Eastern Association for the Surgery of Trauma. *Journal of Trauma and Acute Care Surgery*. 97(3):p 460–470, September 2024. | DOI: 10.1097/TA.0000000000004327
29. Sperry JL, Cotton BA, Luther JF, et al, Shock, Whole Blood, and Assessment of Traumatic Brain Injury (SWAT) Study Group. Whole Blood Resuscitation and Association with Survival in Injured Patients with an Elevated Probability of Mortality. *J Am Coll Surg*. 2023 Aug 1;237(2):206–219. doi: 10.1097/XCS.0000000000000708. Epub 2023 Apr 11. PMID: 37039365; PMCID: PMC10344433.
30. Dorken-Gallastegi A, Spinella PC, Neal MD, et al. Whole Blood and Blood Component Resuscitation in Trauma: Interaction and Association With Mortality. *Ann Surg*. 2024 Dec 1;280(6):1014–1020. doi: 10.1097/SLA.0000000000006316. Epub 2024 May 6. PMID: 38708894; PMCID: PMC11538373.
31. Milford EM, Gurney JM, Beckett A, Strandenes G, Reade MC. Type-specific whole blood still has a role in the era of low-titer O universal donor transfusion for severe trauma hemorrhage. *J Trauma Acute Care Surg*. 2024 Sep 1;97(3):e23–e27. doi: 10.1097/TA.0000000000004369. Epub 2024 May 20. PMID: 38764142.

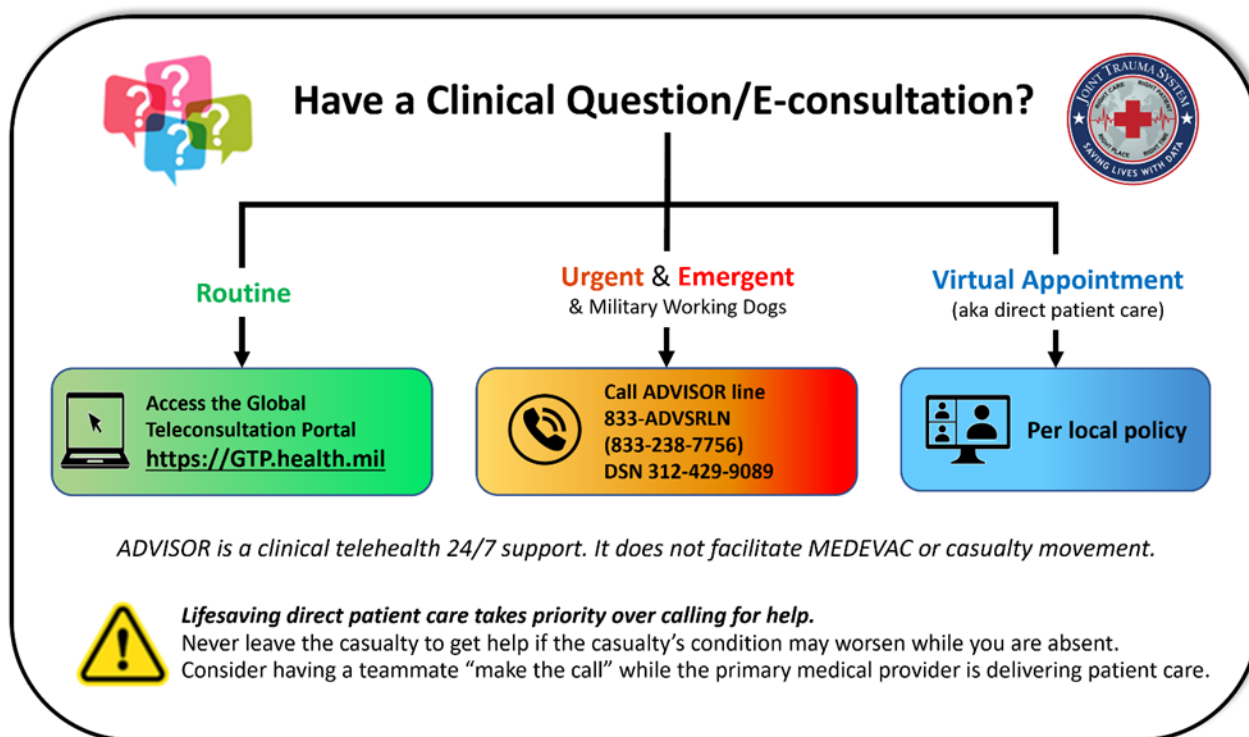
32. Cap AP, Pidcock HF, Spinella P, et al. Damage Control Resuscitation. *Mil Med.* 2018 Sep 1;183(suppl\_2):36-43. doi: 10.1093/milmed/usy112. PMID: 30189070.
33. Yazer MH, Spinella PC, Mayhew E, Hess JR, Gurney J, Van Gent JM, et al. A new look at an old warning: Transfusing ABO group-specific red blood cells after large-volume low-titer group O whole blood in trauma resuscitation. *Transfusion.* 2025. <https://doi.org/10.1111/trf.18189>
34. Schauer SG, Braverman MA, Rizzo JA, Nicholson SE, Yazer MH. An updated assessment of low titer O whole blood use in the Trauma Quality Improvement Program registry. *Transfusion.* 2025.
35. Morgan KM, Abou Khalil E, Feeney EV, et al. The efficacy of low-titer group o whole blood compared with component therapy in civilian trauma patients: A Meta-Analysis. *Crit Care Med.* 2024.
36. Leeper CM, Yazer MH, Cladis FP, Saladino R, Triulzi DJ, Gaines BA. Use of uncrossmatched cold-stored whole blood in injured children with hemorrhagic shock. *JAMA Pediatr.* 2018;172(5):491-492.

## APPENDIX A: DOTMLPF-P CONSIDERATIONS

Transfusion is a lifesaving capability and early transfusion is a proven lifesaving battlefield intervention. However, an incompatible blood product transfused, especially with whole blood, could be lethal. Training, education and leadership are necessary ensure safe transfusion practices in the deployed environments.

<b>Doctrine</b>	<b>Joint Publication 4-02, Joint Health Services; TM 8-227-12, Joint Blood Program Handbook; TM 8-227-11, Operational Procedures for the Armed Services Blood Program. ASBP DODI 6480.04</b>
<b>Organization</b>	Units must be organized to support safe transfusion practices. Safety officers and an organized culture of safety and awareness of the risks and benefits of transfusion should be fully understood by the unit.
<b>Training</b>	Service units should have appropriate transfusion training for both LTOWB and TSWB.  Units have the appropriate training for necessary laboratory testing for blood type confirmation prior to NBB-TSWB transfusion.
<b>Materiel</b>	Manual saline tube test or automated analyzer
<b>Leadership</b>	Medical and ASBP leadership must ensure that units are prepared, trained, and understand the indications for the use of Type A Specific Whole Blood (NBB-TSWB). Incompatible blood transfusions can be lethal, therefore, leaders must understand this and educate the deployed medical units on primary transfusion products, as well as contingency and emergency options.
<b>Personnel</b>	Qualified personnel in the blood banks and assigned to support transfusion when the role of care does not have a blood bank.
<b>Facilities</b>	Role 3 - these echelons must have the laboratory equipment necessary for confirming blood type prior to transfusing NBB-TSWB. These facilities will also require refrigerators with appropriate temperature monitoring required to store NBB-TSWB.
<b>Policy</b>	ASBP DODI 6480.04, Section 1.2; local Role 3 standard operating procedures

## APPENDIX B: TELEMEDICINE / TELECONSULTATION



*Illustration by Raymond Samonte*

GTP: <https://GTP.health.mil>

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## APPENDIX C: INFORMATION REGARDING OFF-LABEL USES

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### PURPOSE

The purpose of this Appendix is to ensure an understanding of DoD policy and practice regarding inclusion in CPGs of “off-label” uses of U.S. Food and Drug Administration (FDA)–approved products. This applies to off-label uses with patients who are armed forces members.

### BACKGROUND

Unapproved (i.e. “off-label”) uses of FDA-approved products are extremely common in American medicine and are usually not subject to any special regulations. However, under Federal law, in some circumstances, unapproved uses of approved drugs are subject to FDA regulations governing “investigational new drugs.” These circumstances include such uses as part of clinical trials, and in the military context, command required, unapproved uses. Some command requested unapproved uses may also be subject to special regulations.

### ADDITIONAL INFORMATION REGARDING OFF-LABEL USES IN CPGS

The inclusion in CPGs of off-label uses is not a clinical trial, nor is it a command request or requirement. Further, it does not imply that the Military Health System requires that use by DoD health care practitioners or considers it to be the “standard of care.” Rather, the inclusion in CPGs of off-label uses is to inform the clinical judgment of the responsible health care practitioner by providing information regarding potential risks and benefits of treatment alternatives. The decision is for the clinical judgment of the responsible health care practitioner within the practitioner-patient relationship.

### ADDITIONAL PROCEDURES

#### Balanced Discussion

Consistent with this purpose, CPG discussions of off-label uses specifically state that they are uses not approved by the FDA. Further, such discussions are balanced in the presentation of appropriate clinical study data, including any such data that suggest caution in the use of the product and specifically including any FDA-issued warnings.

#### Quality Assurance Monitoring

With respect to such off-label uses, DoD procedure is to maintain a regular system of quality assurance monitoring of outcomes and known potential adverse events. For this reason, the importance of accurate clinical records is underscored.

#### Information to Patients

Good clinical practice includes the provision of appropriate information to patients. Each CPG discussing an unusual off-label use will address the issue of information to patients. When practicable, consideration will be given to including in an appendix an appropriate information sheet for distribution to patients, whether before or after use of the product. Information to patients should address in plain language: a) that the use is not approved by the FDA; b) the reasons why a DoD health care practitioner would decide to use the product for this purpose; and c) the potential risks associated with such use.