

JOINT TRAUMA SYSTEM



WHOLE BLOOD TRANSFUSION

CLINICAL PRACTICE GUIDELINE (CPG) TRAINING

Joint Trauma System Trauma Care Educational Program



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AGENDA



- ◆ Purpose
- ◆ Summary
- ◆ Background
- ◆ Definitions
- ◆ Using Whole Blood (WB)
- ◆ Using Low-titer-o Whole Blood (LTOWB)
- ◆ WB Benefits & Risks
- ◆ Walking Blood Bank (WBB)
- ◆ Special Considerations
- ◆ Performance Improvement (PI) Monitoring
- ◆ References
- ◆ Appendices in CPG
- ◆ Contributors

PURPOSE



- ◆ These slides are based on the JTS Whole Blood Transfusion CPG which provides guidelines for WB transfusion, including but not limited to product definitions, indications, collection, storage, testing, transfusion, and documentation.
- ◆ Date of CPG publication: 15 May 2018
- ◆ JTS CPGs are evidence-based guidelines developed by subject matter experts in the military and civilian communities. CPGs are compiled from DoD Trauma Registry data, health data abstracted from patient records and after action reports.
- ◆ Information contained in this presentation is only a guideline and not a substitute for clinical judgment.

SUMMARY



- ◆ Whole blood, and in particular, low-titer-O whole blood, is the preferred resuscitation product for the pre-hospital treatment of patients in hemorrhagic shock.
- ◆ Fresh whole blood should be reserved for casualties, when stored whole blood or optimal component therapy is unavailable, or stored component therapy is not adequate.



Transfusion during transport.
*Courtesy of Defense Visual Information
Distribution Service.*

BACKGROUND



WB transfusion to treat hemorrhage results in outcomes that are at least as favorable as expected outcomes with component therapy.

- ◆ Component therapy is nearly equivalent to whole blood when administered in a 1:1:1 ratio (platelets:plasma:RBC).
 - ◆ Multiple products and storage modalities required.
 - ◆ Delivers a dilute blood mixture due to presence of anticoagulants and red cell additive solution.



Component therapy for a massive transfusion

BACKGROUND



Whole blood provides a physiologic blood mixture.

- ◆ Single product requiring only one storage modality.
- ◆ At least one study has shown a survival benefit of fresh whole blood over component therapy.



Training to save lives.

Photo by Lance Cpl. Ashley Lawson, Courtesy of Defense Visual Information Distribution Service.

WHOLE BLOOD DEFINITION



Whole Blood

- ◆ Collected in anticoagulants CPG (21-day use) or CPDA-1 (35-day use) and stored at 1-6 °C.
- ◆ FDA approved when appropriately collected, stored, and tested for transfusion-transmitted disease.
- ◆ Contains all components of blood products, with smaller volume of anticoagulant, and maintains in-vitro hemostatic capability for two weeks in storage.

FRESH WHOLE BLOOD DEFINITION



Fresh Whole Blood (FWB)

- ◆ Blood collected on an emergency basis from a “walking blood bank.”
- ◆ Stored at room temperature and useable within 24 hours.
- ◆ If stored within 8 hours in appropriate refrigeration, becomes Stored Whole Blood, it is good for 21-35 days, depending on anticoagulant.



Walking Whole Blood Bank

Photo by 2nd Lt. Jorge Intriago, Courtesy of Defense Visual Information Distribution Service

LTOWB DEFINITION



LTOWB

Patients with low Anti-A and Anti-B antibodies (< 1:256 saline dilution).

- ◆ Preferred resuscitation product for the pre-hospital treatment of patients.
- ◆ Donors should be re-titered every 90 days, but given limitations of battlefield testing, titering prior to deployment or least annually acceptable.

USING WHOLE BLOOD



- ◆ Stored Whole Blood (SWB) is the preferred product for resuscitation.
 - ◆ LTOWB is the most collected and used.
- ◆ SWB or component therapy in appropriate ratio can be used for damage control resuscitation.
- ◆ FWB should be reserved for casualties with clinically significant shock/coagulopathy when SWB or optimal component therapy is unavailable.
 - ◆ Appropriate when stored component therapy does not adequately resuscitate a patient with life-threatening injuries.
 - ◆ Rh negative blood should ideally be given to females of child-bearing age who are Rh negative.

USING WHOLE BLOOD



- ◆ If given whole blood, patients with an unknown blood group will require LTOWB or group O red blood cells for any acute transfusion requirements for 1 month.
 - ◆ Impossible to definitively identify blood group with field equipment if blood tested after patient receives LTOWB.
- ◆ Rh negative blood should ideally be given to females of child-bearing age who are Rh negative.

USING LTOWB



- ◆ LTOWB or group O red blood cells will be given to patients with an unknown blood group receiving whole blood.
 - ◆ Obtaining pre-transfusion blood sample can establish patient's original blood group.
 - ◆ Once patient receives LTOWB, impossible to definitively identify blood group with field equipment.
 - ◆ These patients will therefore require LTOWB or group O red blood cells for any acute transfusion requirements for up to one month after admission.

WHOLE BLOOD BENEFITS



Fresh Whole Blood Benefits

- ◆ Used when other blood products cannot be delivered at an acceptable rate to sustain resuscitative efforts.
- ◆ No identified degradation in donor performance.
- ◆ May be more readily available than SWB.

WHOLE BLOOD RISKS



Specific Risks of Using Fresh Whole Blood

- ◆ Increased risk of transfusion-transmitted infections
 - ◆ Possible case of transmission of Hepatitis C
 - ◆ One possible Human T-Lymphocyte Virus seroconversion
- ◆ Increased risk of clerical errors
 - ◆ One fatal case of graft vs host disease
- ◆ Unsanitary conditions in field.
- ◆ Not FDA approved

WALKING BLOOD BANK



WBB Program should be established at all forward-deployed medical treatment facilities (MTF).

- ◆ WBB used to collect FWB.
- ◆ Requires identification and pre-screening of donors.
- ◆ Coordination required with the Area Joint Blood Program Officer.
- ◆ Follows specific guidelines for pre-screening of donors and collecting whole blood in only authorized equipment. (See CPG for standard operating procedures and WBB Supply List.)

WALKING BLOOD BANK



WBB Ideal Donors

- ◆ Preferably composed of active duty/guard/reserves and other DoD beneficiaries.
- ◆ Pre-screened, Low Titer O donor.
 - ◆ Group-specific donors may be appropriate for group-specific transfusion (e.g., A to A).
 - ◆ Group O FWB of unknown titer safer than attempting to match donor-recipient blood group in emergency situations.



Preferred donors for FWB are pre-screened.

Photo by Petty Officer 2nd Class Charles Oki, Courtesy of Defense Visual Information Distribution Service.

WALKING BLOOD BANK



Decision to use FWB

- ◆ Not completely screened to international and national standards.
- ◆ Used only after thorough consideration of risks and benefits.
- ◆ Must be thoroughly documented in casualty record.
- ◆ Blood type on identification tags is about 4% inaccurate.
- ◆ Coalition forces are not routinely utilized as donors;
- ◆ Non-coalition force foreign nationals are used as a last resort.

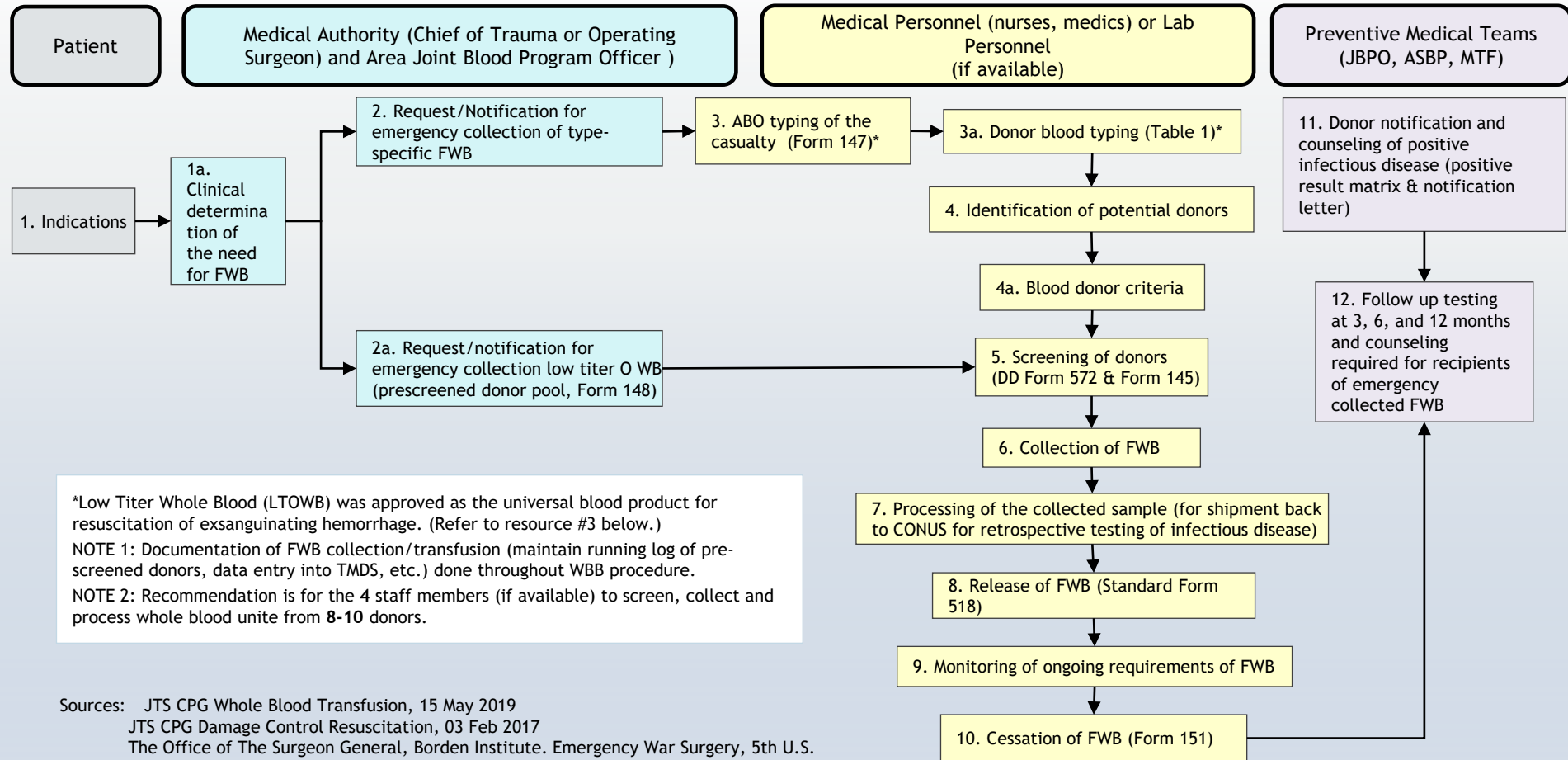
WALKING BLOOD BANK



Theater Medical Data Stores (TMDS) will be used to record donations and disease testing results.

- ◆ Prior to issuing FWB, blood type and approved rapid infection disease tests should be performed.
- ◆ Retrospective samples must be sent to a licensed laboratory for FDA-approved testing regardless of in-theater results.
 - ◆ FWB recipients will have follow-up advice and testing as soon as possible and at 3-, 6- and 12-months post transfusion.
 - ◆ Positive infectious disease results require informing the donor and recipient.
- ◆ Frequency of FWB donation must be tracked
 - ◆ WB units should not be collected from donors more frequently than every eight weeks to prevent injury to donor.
 - ◆ One unit collected per donor. Maximum of two in dire situations.

WALKING BLOOD BANK



*Low Titer Whole Blood (LTOWB) was approved as the universal blood product for resuscitation of exsanguinating hemorrhage. (Refer to resource #3 below.)
 NOTE 1: Documentation of FWB collection/transfusion (maintain running log of pre-screened donors, data entry into TMDS, etc.) done throughout WBB procedure.
 NOTE 2: Recommendation is for the 4 staff members (if available) to screen, collect and process whole blood unite from 8-10 donors.

Sources: JTS CPG Whole Blood Transfusion, 15 May 2019
 JTS CPG Damage Control Resuscitation, 03 Feb 2017
 The Office of The Surgeon General, Borden Institute. Emergency War Surgery, 5th U.S. Edition, 2018.

SPECIAL CONSIDERATIONS



Whole Blood and Pediatric Patients

- ◆ Whole blood has been administered to pediatric patients in recent conflicts, but has not been rigorously studied.
- ◆ There are no known contraindications, but no firmly established clinical criteria exist for transfusion.
- ◆ Recommendations include:
 - ◆ For patients < 40 kg, WB should be delivered in unit doses of 10-15 ml/kg.
 - ◆ Physiologic variables should be interpreted by age.

PI MONITORING



- ◆ Population of Interest
- ◆ All patients who receive blood product transfusion within 3 hours of injury
- ◆ All patients who meet criteria for blood transfusion (severe traumatic injury ($ISS \geq 16$ and ≥ 2 body regions injured with AIS severity ≥ 2 AND $SBP < 100$ OR $HR > 100$ OR hematocrit $< 32\%$ OR $pH < 7.25$ within 3 hours of injury)
- ◆ Intent (Expected Outcomes)
- ◆ LTOWB is used for prehospital resuscitation of casualties with life-threatening injuries and hemodynamic instability ($HR > 100$ or $SBP < 100$).
- ◆ For the population of interest, the first resuscitation fluid given after injury is a blood product, ideally cold-stored LTOWB.

PI MONITORING



◆ Performance / Adherence Metrics

- ◆ The number and percentage of patients in the population of interest who receive WB transfusion prior to arrival at first role of care.
- ◆ Number and percentage of patients in population of interest who received a blood product as the first resuscitation fluid.
- ◆ Number and percentage of patients in population of interest who received cold-stored LTOWB as the first resuscitation fluid.

◆ Data Source

- ◆ Patient Record
- ◆ DoD Trauma Registry
- ◆ Blood transfusion databases

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APPENDICES



- ◆ **Appendix A:** Walking Blood Bank Process Map
- ◆ **Appendix B:** Blood Donor Pre-Screening SOP
- ◆ **Appendix C:** Emergency Whole Blood Collection SOP
- ◆ **Appendix D:** Additional Information Regarding Off-label Uses in CPGs

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