Joint Trauma System

Whole Blood Transfusion
Agenda

- Contributors
- Purpose
- Summary
- Key Principles of CPG
- Performance Improvement (PI) Monitoring
- References
- List of Appendices in CPG
Contributors

- COL Andrew P Cap, MC USA
- LTC Andrew Beckett, MC CAF
- MAJ Avi Benov, MC IDF
- LTC Matthew Borgman, MC USA
- PROF Barbara Bryant, MD USA
- LTC Jacob Chen, MC IDF
- LTC Jason B Corley, MSC USA
- COL (ret) Heidi Doughty, MC UK
- MAJ Andrew Fisher, SP USA
- COL Elon Glassbert, MC IDF
- COL Jennifer Gurney, MC, USA
- COL (ret) Richard Gonzales, MSC USA
- COL Shawn F Kane, MC USA
- LTC (ret) Wilbur W Malloy, MSC USA
- COL Shawn Nessen, MC USA
- MAJ Nicolas Prat, MC France
- LTC Jose Quesada, MSC USA
- COL Michael Reade, MC ADF
- MG Anne Sailliol, MC France
- PROF Philip C Spinella, US
- CAPT Zsolt Stockinger, MC USN
- CDR Geir Strandenes, MC Norway
- COL Audra Taylor, MSC USA
- PROF Mark Yazer, MD USA

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Slides: Maj Andrew Hall, MC, USAF
This CPG provides evidence-based guidelines for whole blood transfusion in trauma patients.
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.
Key Principles of CPG

- Background
- Definitions
- Using Whole Blood (WB)
- Walking Blood Bank (WBB)
- Special Considerations
- References
- Appendices
Background

Whole blood 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.
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.

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.
Definition: Fresh Whole Blood

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 eight hours in appropriate refrigeration, becomes Stored Whole Blood (WBB-SWB) – good for 21 to 35 days, depending on anticoagulant.

Walking Whole Blood Bank
Photo by 2nd Lt. Jorge Intriago, Courtesy of Defense Visual Information Distribution Service
Definition: Low Titer O Blood

Low Titer O Blood (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.
  - In practice, LTOWB, is most commonly 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.
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

- Low Titer O Whole Blood 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**

**Fresh Whole Blood: Specific Risks**

- 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 (AJBPO).
- 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.
- Fully 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.
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.
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

1. Indications
   1a. Clinical determination of the need for FWB
   2a. Request/notification for emergency collection low titer O WB (prescreened donor pool, Form 148)

2. Request/Notification for emergency collection of type-specific FWB

3. ABO typing of the casualty (Form 147)*
   3a. Donor blood typing (Table 1)*
   4. Identification of potential donors
      4a. Blood donor criteria

5. Screening of donors (DD Form 572 & Form 145)

6. Collection of FWB

7. Processing of the collected sample (for shipment back to CONUS for retrospective testing of infectious disease)

8. Release of FWB (Standard Form 518)

9. Monitoring of ongoing requirements of FWB

10. Cessation of FWB (Form 151)

11. Donor notification and counseling of positive infectious disease (positive result matrix & notification letter)

12. Follow up testing at 3, 6, and 12 months and counseling required for recipients of emergency collected FWB

*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 unit from 8-10 donors.

Sources:
JTS CPG Whole Blood Transfusion, 15 May 2019
JTS CPG Damage Control Resuscitation, 03 Feb 2017
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.
Intent (Expected Outcomes)

- SWB, particularly LTOWB, is used when available for pre-hospital resuscitation.

- SWB or component therapy is routinely used for damage control resuscitation; FWB is reserved for casualties who meet one of these two criteria:
  1. Patients with clinically significant shock or coagulopathy (e.g., bleeding with associated metabolic acidosis, thrombocytopenia or INR >1.5) when SWB or optimal component therapy (e.g., PLTs and FFP) are unavailable.
  2. SWB or component therapy is not adequately resuscitating a patient with immediately life-threatening injuries.
Performance Improvement Monitoring

- **Performance/Adherence Measures**
  - SWB was used in prehospital resuscitation.
  - SWB or component therapy was routinely used for damage control resuscitation.
  - FWB was used for casualties who fall into one of these two criteria:
    1. Patients with clinically significant shock or coagulopathy (e.g., bleeding with associated metabolic acidosis, thrombocytopenia or INR >1.5) when SWB or optimal component therapy (e.g., PLTs and FFP) was unavailable;
    2. SWB or component therapy was not adequately resuscitating the patient with immediately life-threatening injuries.

- **Data Source**
  - Patient Record
  - DoD Trauma Registry
  - Blood transfusion databases


References (1 of 2)


Appendices in CPG

- 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