NATIONAL WHOLE BLOOD ACADEMY

SAN ANTONIO, TX

Whole Blood in EMS

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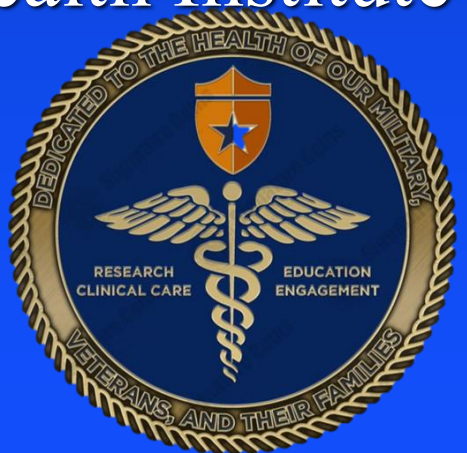
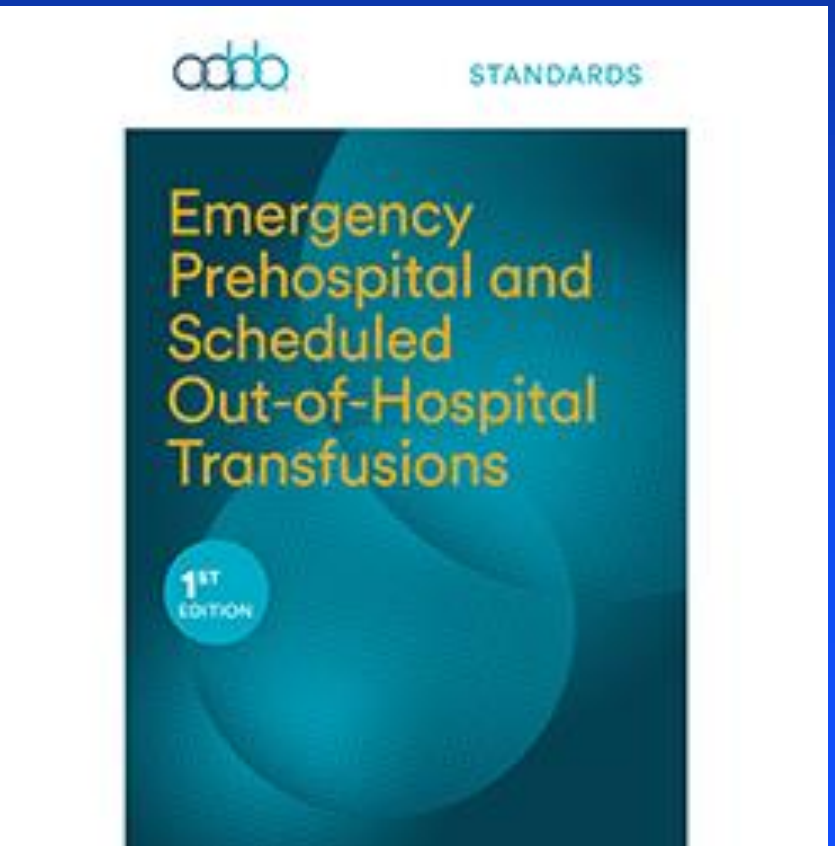


Disclosures

- None



Regional Whole Blood Consortium

Acknowledgements

- STRAC (Epley, Schaefer, Rose and team) including all EMS, HEMS, SRFTAC and trauma centers of South Texas
- COL John Holcomb
- Jim Stubbs, MD, Lisa Button Cathy Berns APRN, CNS, MS, David Morris and Scott Zietlow MD, Mayo Clinic, Rochester
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- COL Andre Cap, James Bynum USAISR
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- Bothers in Arms/Heroes in Arms donors

Regulatory Process for Whole Blood

- Whole blood was the original and only blood product for over 50 years
- It has been approved before there was an FDA
- It has been approved before there was an AABB
- It fell out of favor in deference to component transfusion during the 1970's
- Over a million units of cold stored whole blood were shipped from the US to Vietnam during that war
- Over 10,000 units were given in the recent conflict
- Houston 2013 ESD 48 Bank, Holcomb and Cotton

REVIEW ARTICLE

Whole blood for hemostatic resuscitation of major bleeding

Philip C. Spinella,[1,2] Heather F. Pidcoke,[2] Geir Strandenes,[3,4] Tor Hervig,[4] Andrew Fisher,[5] Donald Jenkins,[6] Mark Yazer,[7] James Stubbs,[8] Alan Murdock,[9] Anne Sailliol,[10] Paul M. Ness,[11] and Andrew P. Cap[2]

Trans 2016

- Logistical, economic and clinical benefits of cold stored low titer type O whole blood
- Cold stored for up to 21 days
  - Platelets OK
- Improved function compared to 1:1:1

Multi-disciplinary and Multi-National Review

SHOCK, Vol. 41, Supplement 1, pp. 70–75, 2014

LOW TITER GROUP O WHOLE BLOOD IN EMERGENCY SITUATIONS

Geir Strandenes,[*†] Olle Berséus,[‡] Andrew P. Cap,[§] Tor Hervig,[*‖] Michael Reade,[¶] Nicolas Prat,[§] Anne Sailliol,[††] Richard Gonzales,[‡‡] Clayton D. Simon,[§§] Paul Ness,[‖‖] Heidi A. Doughty,[¶¶] Philip C. Spinella,[§***] and Einar K. Kristoffersen[*‖]**

[*]Department of Immunology and Transfusion Medicine, Haukeland University Hospital; and [†]Norwegian Naval Special Operation Commando, Bergen, Norway; [‡]Department of Transfusion Medicine, Örebro University Hospital, Örebro, Sweden; [§]US Army Institute of Surgical Research, FT Sam Houston, Texas; [‖]Institute of Clinical Science, The University of Bergen, Norway; [¶]Australian Defense Force Joint Health Command, Canberra, Australian Capital Territory; [**]French Military Medical Service, Clamart, France; [††]Commander French Military Blood Transfusion Center, Clamart, France; [‡‡]Director, US Army Blood Program and [§§]US Army Transfusion Medicine Consultant to the Surgeon General San Antonio Military Medical Center, JBSA–Fort Sam Houston, Texas; [‖‖]Transfusion Medicine Division, Johns Hopkins Medical Institutions, Baltimore, Maryland; [¶¶]NHS Blood and Transplant, Birmingham, England, United Kingdom; and [***]Division of Pediatric Critical Care, Department of Pediatrics, Washington University in St Louis, St Louis, Missouri

Conclusion: Low titer Group O is preferred alternative for emergency transfusions where safe ABO identical transfusions cannot be ensured

Lactate Clearance

- Time to clearance clinically and statistically significantly shorter with LTO+WB than with component therapy
  - 8 vs 13 hours

Clinical outcomes among low-titer group O whole blood recipients compared to recipients of conventional components in civilian trauma resuscitation
Seheult , Anto, Alarcon, Sperry, Triulzi, and Yazer TRANSFUSION 2018;9999;1–8
doi:10.1111/trf.14779

Caroline S Zhu, Danielle Cobb, Rachelle B Jonas, Douglas Pokorny, Meenakshi Rani, Tracy Cotner-Pouncy, Jenny Oliver, Andrew Cap, Ramon Cestero, Susannah E Nicholson, Brian J Eastridge, Donald H Jenkins. Shock index and pulse pressure as triggers for massive transfusion Journal of Trauma Acute Care Surg 2019 Apr;87(1S):S159-S164.

  - SI $\geq$ 1 and pulse pressure $\leq$ 45 = transfusion trigger

Regional Transfusion Recommendations

Penetrating Trauma

Requires 1 Physiologic Parameter

OR

Blunt Trauma or Medical

Requires 2 Physiologic Parameters

Physiologic Parameters

- *SBP <90mmHg*
- *HR >120*
- *Shock Index >1*
- *ETCO2 <25*
- *Point of care Lactate > 5.0 mg/dl*
- *Pulse Pressure <45*
- *Positive Focused Assessment with Sonography in Trauma (FAST)*
- *Known or presumed anticoagulant use, or dual anti-platelet therapy*
- *Patient age <u>> 2</u>*

STRAC

Southwest Texas Regional Advisory Council

Trauma Surgery & Acute Care Open

Prehospital blood transfusion coalition clinical practice guideline for civilian emergency medical services

Matthew J Levy ,[1] Randall M Schaefer,[2] Holly Obyrne,[3] Jon R Krohmer,[4] Eric A Bank,[5] John B Holcomb [6]

► Additional supplemental material is published online only. To view, please visit the journal online (https://doi.org/10.1136/tsaco-2025-001931).

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PURPOSE

This Clinical Practice Guideline (CPG) provides essential instructions for prehospital blood product transfusion in civilian emergency medical service (EMS) systems. This guideline supports early resuscitation with blood products for patients experiencing hemorrhagic shock, regardless of etiology, with the objective of reducing mortality and improving clinical outcomes. Implementation of a prehospital blood transfusion program requires careful planning, appropriate training, quality control measures, adherence to regulations, close physician medical oversight, and coordination with regional blood suppliers and receiving facilities.

INTRODUCTION

Early administration of blood products to patients experiencing hemorrhagic shock, irrespective of etiology, has been demonstrated to improve survival.[1–7] Research indicates that patients who receive blood products within the initial minutes after injury or onset of hemorrhagic shock exhibit significantly decreased mortality compared with those who receive delayed transfusion.[2 3] Prehospital transfusion programs are, by their nature, resuscitation programs intended for patients with clear evidence of hemorrhagic shock. The body of evidence surrounding prehospital transfusion continues to evolve. When creating this CPG, the recent literature was reviewed, including, but not limited to, the 2025 Prehospital Trauma Compendium: Transfusion of Blood Products in Trauma–A Position Statement and Resource Document of the National Association of Emergency Medical Services Physicians (NAEMSP) by Brown *et al*. 1

This CPG represents the current position of the prehospital blood transfusion coalition and is meant to complement existing recommendations, while building on established principles. It is based on current evidence and best practices and is expected to evolve as the body of evidence expands. These guidelines serve to reaffirm the importance of robust clinical planning and implementation while addressing evolving needs in prehospital transfusion programs. As such, this CPG represents a living document intended to outline the indications, procedures, equipment, and monitoring required to safely administer blood products in the prehospital setting. [8 9] The coalition expects to review this document semi-annually. Updates to this CPG can be found at https://prehospitaltransfusion.org. Blood products encompass therapeutic substances derived from human blood, including components such as red blood cells (RBCs), plasma, platelets, and whole blood (WB), which are considered safe and effective treatments for hemorrhagic hemodynamically unstable patients.[10 11]

Effective team communication and coordination constitute the cornerstone of successful resuscitation from hemorrhagic shock. Team members are often tasked with multiple urgent interventions occurring in parallel; therefore, effective communication is essential to ensure positive patient outcomes and to prevent adverse effects. Structured handoffs between prehospital clinicians and hospital resuscitation teams are essential to ensure that relevant information is conveyed without delaying critical interventions. EMS systems seeking to implement prehospital blood transfusion are encouraged to implement standardized team communication and structured handoff procedures to enhance patient care continuity from the prehospital environment to definitive care.

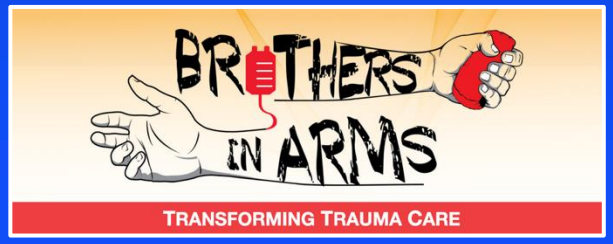
These guidelines should be implemented in concert with local medical oversight and are not intended to supersede local protocols or medical direction. Successful prehospital blood programs must be thoughtfully planned, incorporate multiple safeguards, ensure adequate training and credentialing processes, and involve responsible stewardship of blood resources. Implementation requires clear indications for transfusion, both clinical and programmatic accountability, and appropriate documentation procedures.[12]

PREHOSPITAL PRINCIPLES OF RESUSCITATION AND TRANSFUSION

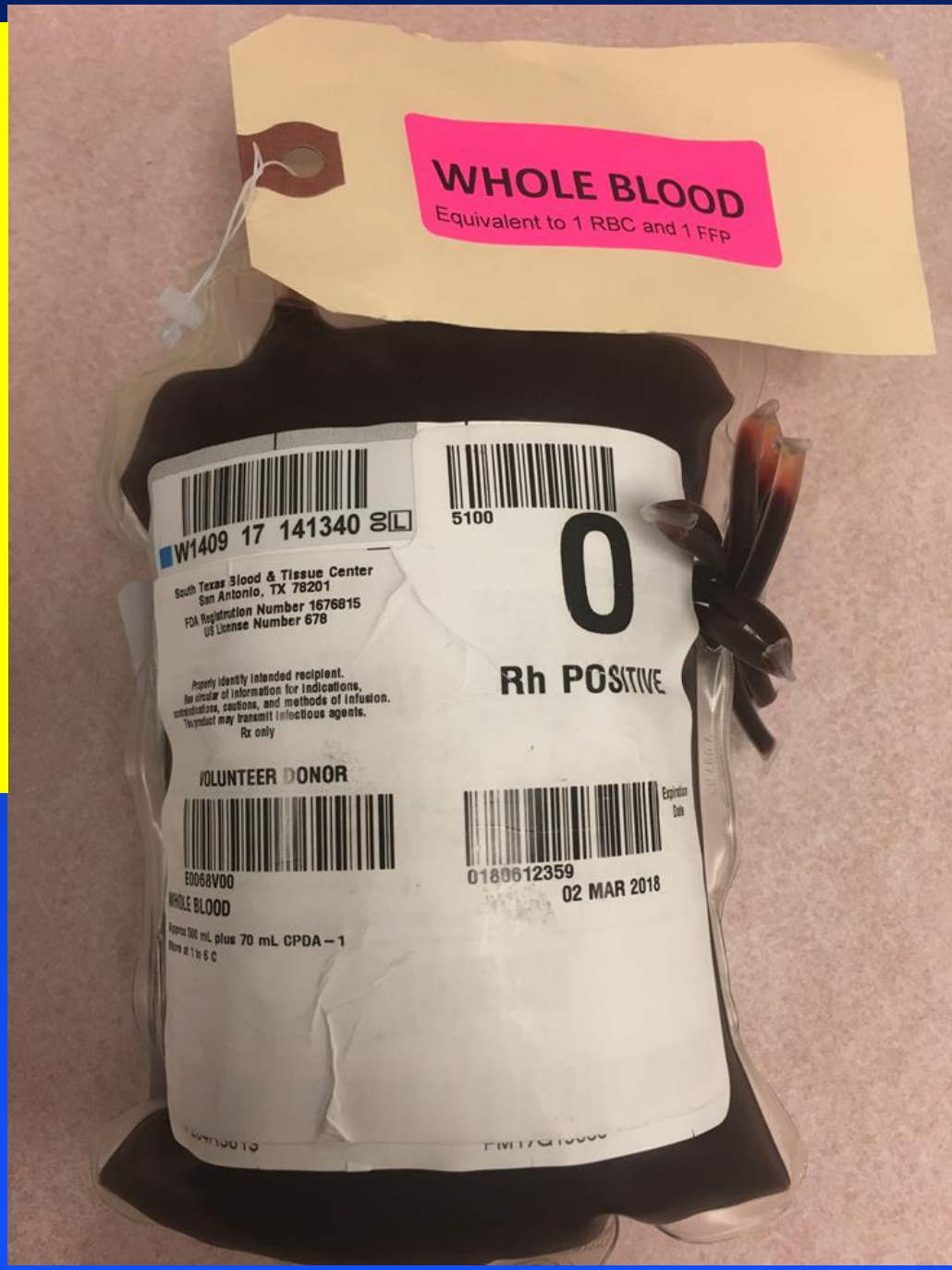
1. Rapid recognition of life-threatening hemorrhagic shock[1]:
   - Clinical assessment remains the cornerstone for recognition, including physiological parameters such as vital signs, shock index, end-tidal carbon dioxide ($ETCO_2$), and others.
   - Consider point-of-care testing devices if available, such as lactate measurement.
2. Hemorrhage control with appropriate adjuncts [13]:
   - Pressure dressings and wound packing (preferably with hemostatic products) for severe wounds.
   - Tourniquets for significant extremity hemorrhage.
   - Pelvic binders for suspected pelvic fractures.

Prehospital Cold Stored O+ Whole Blood in San Antonio

- Kicked off January 29, 2018
- 3000 new male LTO+WB donors (1:256)
- 18 helicopters, 2 units each
- 16 ground ambulances, 1 unit each
- Pre-determined criteria for transfusion
- Pediatric patients ≥5 yo included
- Women of childbearing age included
- Rh isoimmunization risk versus bleeding to death

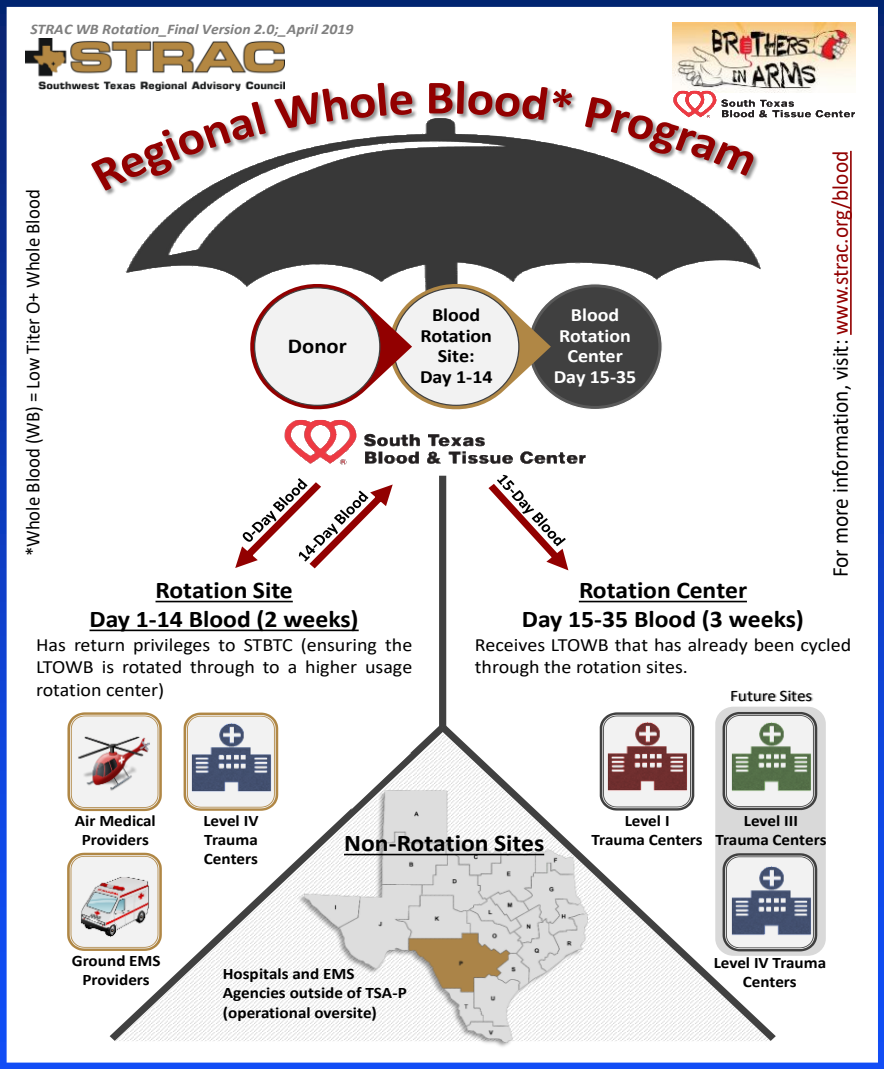


- O+ only
- TRALI Mitigated
- Titer of anti-A & Anti-B of 1:256 (IgG)
- Non-Leukoreduced
- CPD-A1 (35- day expiration)
- Cold stored
- Waste < 1%



Methods

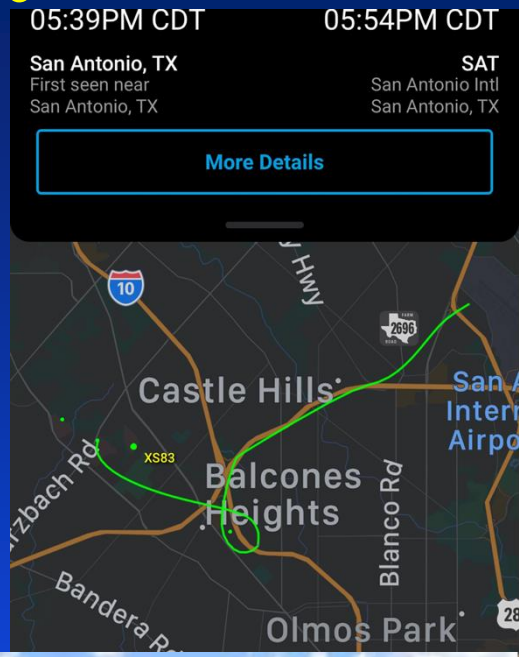
- LTOWB Rotation System to push DCR capability to all geographic areas, minimize costs to EMS agencies, and be good stewards of the "gift of life"
- Standardized transfusion criteria
- Regionally approved equipment list
- Region wide clinical documentation and data collection processes
- Develop a robust, loyal blood donor population



PAR Levels and Use

- STBT >/= 60 units
- UHS >/= 50 units
- Distributed across EMS/rural hospitals=72
- Daily use EMS =2+
- Rotated units = 4/day
- STBT = 25 donors/day
- Overall use 1/20,000 population/day
- Waste = ~<2.5%

Real-time Resupply



- The immediate blood resupply of ground and helicopter EMS units, instead of waiting hours or, in some cases, days, have led to a second patient surviving that same evening on several occasions….also note that there have been several instances of ‘mutual aid’, wherein more blood would benefit a patient, an EMS agency on the route from scene to hospital is requested to rendezvous and provide their unit of whole blood

74 total Program units

- 4 Hospitals with a Total of 24 Units (Par Levels)
  - UH (20)
  - CSR-NB (1)
  - Frio (1)
  - Peterson Memorial (2)
- 3 Air Medical Agencies with a Total of 18 Units
  - Air Evac/MAC (14)
  - AirLife (2)
  - Apollo/Sky Care1 (2)
- 20 Ground EMS with a total of 32 Units
  - Acadian (2)
  - Allegiance (1)
  - Bandera (1)
  - Bexar Co ESD 2 (2)
  - Bexar Co ESD 7 (1)
  - Bulverde Spring Branch EMS (1)
  - Canyon Lake (1)
  - Community EMS (1)
  - Converse EMS (1)
  - Gonzales EMS (1)
  - Karnes Co EMS (1)
  - Kerrville Fire/EMS (1)
  - La Salle Co EMS (2)
  - Leon Valley EMS (1)
  - New Braunfels EMS (2)
  - SAFD (8)
  - Schertz EMS (1)
  - Seguin EMS (1)
  - Wilson Co ESD 2 (1)
  - Wilson Co ESD 3 (1)
  - UT Fellow (1)

Current State

Collection Information *(through 06/30/2026)*

Heroes in Arms units collected since program inception: **45168**

Heroes in Arms units collected in 2026: **5035**

Heroes in Arms units from male donors in 2026: **3781**

Heroes in Arms units from female donors in 2026: **1254**

Heroes in Arms units collected in June 2026: **904**

Heroes in Arms units collected in June from male donors: **695**

Heroes in Arms units collected in June from female donors: **209**

Donor Information

Total number of Heroes in Arms donors since program inception: **9112**

Total number of Heroes in Arms female donors since program inception: **1681**

Total number of Heroes in Arms male donors since program inception: **7431**

Total number of active Heroes in Arms donors (12 Months): **4107**

University Hospital Distribution

LTOWB units sent to University Hospital since program inception: **17142**

LTOWB units sent from STBT to University Hospital 2026 (YTD): **1305**

LTOWB units returned to STBT from University since program inception: **478**

LTOWB units returned to STBT from University 2026 (YTD): **31**

The Impact of Prehospital Whole Blood on Hemorrhaging Trauma Patients: A Multi-Center Retrospective Study

Journal of Trauma and Acute Care Surgery
DOI:10.1097/TA.0000000000003908 Apr 2023 Maxwell A Braverman, Steven G Schauer, Erika Brigmon, Donald H Jenkins, et al

- total of 171 pWB and 1391 non-pWB patients
- Prehospital WB patients had a lower median Injury Severity Score (17 vs. 21, < 0.001) but higher prehospital Shock Index
- Prehospital WB improvement in SI (-0.04 vs. 0.05, p = 0.002)
- Mortality and (LOS) were similar
- Prehospital WB patients received fewer packed red blood cells, fresh frozen plasma, and platelets units across their LOS
- Prehospital WB patients had fewer MTPs (22.6% vs. 32.4%, p = 0.01)

14 centers n=1623
WB=1180 vs 493 CT
9% decrease complications
48% decrease death

Observational Study > Ann Surg. 2022 Oct 1;276(4):579-588.

doi: 10.1097/SLA.0000000000005603. Epub 2022 Jul 18.

Use of Cold-Stored Whole Blood is Associated With Improved Mortality in Hemostatic Resuscitation of Major Bleeding: A Multicenter Study

Joshua P Hazelton [1], Anna E Ssentongo [2], John S Oh [1], Paddy Ssentongo [1], Mark J Seamon [3], James P Byrne [3], Isabella G Armento [4], Donald H Jenkins [5], Maxwell A Braverman [5], Caleb Mentzer [6], Guy C Leonard [6], Lindsey L Perea [7], Courtney K Docherty [8], Julie A Dunn [9], Brittany Smoot [9], Matthew J Martin [10], Jayraan Badiee [10], Alejandro J Luis [11], Julie L Murray [12], Matthew R Noorbakhsh [13], James E Babowice [13], Charles Mains [14], Robert M Madayag [14], Haytham M A Kaafarani [15], Ava K Mokhtari [15], Sarah A Moore [16], Ka[illegible] Allen Tanner 2nd [17], Diane Redmond [17], David J Millia [18], Amber Bra[illegible] Vernon Chinchilli [2], Scott B Armen [1], John M Porter [4]

1 center n=1377over 4 years
physiology worse in WB
higher SI/lactate lower SBP
No change in complications
4x greater survival
60% decr in transfusion

Observational Study > J Am Coll Surg. 2022 Apr 1;234(4):408-418.

doi: 10.1097/XCS.0000000000000086.

Impact of Incorporating Whole Blood into Hemorrhagic Shock Resuscitation: Analysis of 1,377 Consecutive Trauma Patients Receiving Emergency-Release Uncrossmatched Blood Products

Jason B Brill [1], Brian Tang [1], Gabrielle Hatton [1], Krislynn M Mueck [1], C Cameron McCoy [2], Lillian S Kao [1], Bryan A Cotton [1]

Affiliations + expand

PMID: 35290259 DOI: 10.1097/XCS.0000000000000086

Pitt helicopter n=86
40 WB vs 48 CT
Mortality unchanged
Decrease in transfusion

Randomized Controlled Trial > J Trauma Acute Care Surg. 2022 May 1;92(5):839-847.
doi: 10.1097/TA.0000000000003551. Epub 2022 Jan 25.

Prehospital low titer group O whole blood is feasible and safe: Results of a prospective randomized pilot trial

Frank X Guyette [1], Mazen Zenati, Darrell J Triulzi, Mark H Yazer, Hunter Skroczky, Barbara J Early, Peter W Adams, Joshua B Brown, Louis Alarcon, Matthew D Neal, Raquel M Forsythe, Brian S Zuckerbraun, Andrew B Peitzman, Timothy R Billiar, Jason L Sperry

> Transfusion. 2020 Jun;60 Suppl 3:S2-S9. doi: 10.1111/trf.15696. Epub 2020 Jun 1.

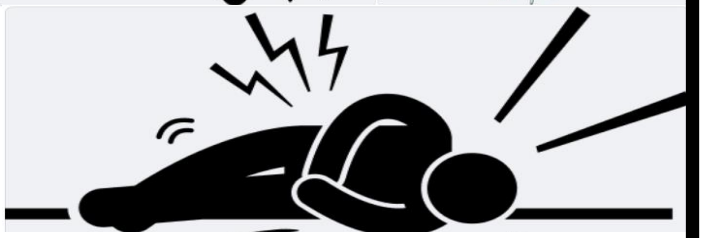
The use of low-titer group O whole blood is independently associated with improved survival compared to component therapy in adults with severe traumatic hemorrhage

Susan M Shea [1], Amanda M Staudt [2], Kimberly A Thomas [1], Douglas Schuerer [3], James E Mielke [1], Danielle Folkerts [1], Ethan Lowder [1], Callista Martin [1], Grant V Bochicchio [3], Philip C Spinella [1]

Affiliations + expand

PMID: 32478896 DOI: 10.1111/trf.15696

St Louis n=86 43 WB/CT
Incr 24 hr and 28d survival
Clot formation improved by ROTEM in WB

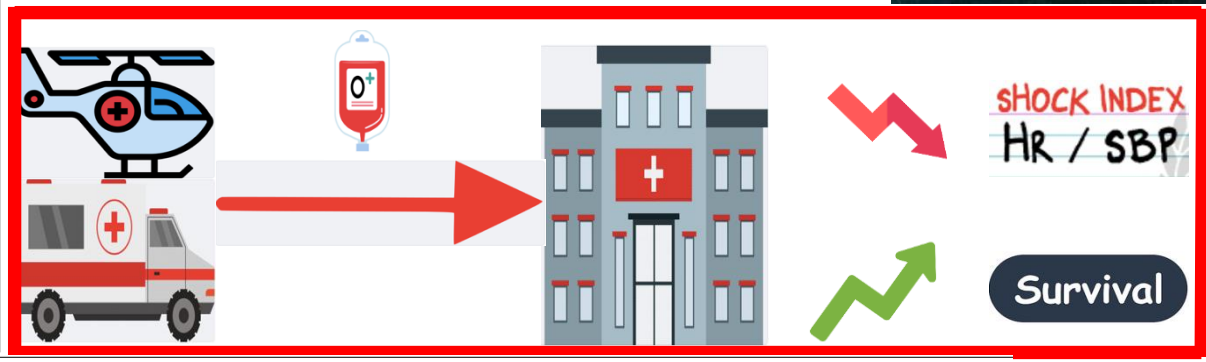


Prehospital Whole Blood Improves Probability of Survival & Shock Physiology

419 total patients (241 in prehospital WB group)

- **2.2x (54% vs 34%)** higher odds of improved survival probability
- **2.7x (10% vs 4%)** higher odds of being an unexpected survivor with severe injury
- **2.5x (34% vs 16%)** higher odds of improved shock index from >1 to <1

$15,725 spent on prehospital whole blood (17 patients each transfused one unit of WB) will produce 1 unexpected survivor



Original Research Article

Prehospital whole blood transfusion improves probability of survival over transfusion within one hour of arrival to a trauma center ☆

Aashish Rajesh [a], Lauran Barry [a], Conor Giersch [a], Katherine L. Danko [a], Alexander Bowers [a], Maxwell Braverman [b], Eric Epley [c], Traceee Rose [c], San Antonio Whole Blood Consortium [a,f], Bryan Cotton [d], Brian Eastridge [e], Donald Jenkins [a]

Massive Transfusion Adjunct Therapy

Aim to optimize physiology and minimize adverse effects during massive transfusion in trauma patients

Background

Trauma hemorrhagic shock -> needs blood administration

- Citrate in stored blood chelates calcium
- Additional calcium loss from cellular shifts and blood loss from large volume hemorrhage

- TXA – reduces hyperfibrinolysis (major contributor to trauma-induced coagulopathy)
- TXA has mortality benefit when administered <3 hours from post-injury

Inclusion criteria

- Adults ≥ 18 years of age
- Hypotension with SBP≤90 mmHg*
- Patients with traumatic injuries being evaluated by trauma team

Exclusion Criteria

- Non-trauma patients needing standard blood transfusion

MONITORING

iStat (arterial or venous) or serum iCal – ensure completion upon arrival to new unit (ie Trauma resuscitation unit > operating room or intensive care unit))

TEG within 4 hours

Continuous telemetry and blood pressure monitoring

Observe for seizure activity up to 8 hours

Administration

Calcium

Calcium chloride should be diluted via 100 mL normal saline bag and infused over at least 10 minutes

Rapid administration associated with clinically significant **bradycardia**

Central line preferred – if central line not available, may administer in large bore (≥ 18G) peripheral IV

Tranexamic Acid

Administer via slow IV push over 1-2 minutes

May be diluted in 100 mL normal saline bag, if necessary

Treatment Plan

CALCIUM

- $CaCl_2$ – 2g IV x 1 at initiation of rapid transfusion
- Subsequent doses – 1g $CaCl_2$ per 2 units of WB
- If iCal < 1.2 at any point during resuscitation/massive transfusion, additional 1-2 g of $CaCl_2$ may be considered

TXA

- 2g slow IV push if not given prehospital
- If administered prehospital, 1g additional in TRU if meeting inclusion criteria
- Further doses based on TEG

THE JOURNAL OF MATERNAL-FETAL & NEONATAL MEDICINE
2022, VOL. 35, NO. 25, 6455–6460
https://doi.org/10.1080/14767058.2021.1915275

Taylor & Francis
Taylor & Francis Group

ORIGINAL ARTICLE

Whole blood transfusion reduces overall component transfusion in cases of placenta accreta spectrum: a pilot program

Jessian L. Munoz[a,b], Alison M. Kimura[a,b], Elly Xenakis[a,b], Donald H. Jenkins[c], Maxwell A. Braverman[c], Patrick S. Ramsey[a,b] and Kayla E. Ireland[a,b]

[a]Division of Maternal Fetal Medicine, University of Texas Health Sciences Center at San Antonio, San Antonio, TX, USA; [b]Department of Obstetrics & Gynecology, University Health System, San Antonio, TX, USA; [c]Division of Trauma and Emergency Surgery, The University of Texas Health Science Center at San Antonio, San Antonio, TX, USA

ABSTRACT

Objective: Placenta accreta spectrum (PAS) is a group of placental invasion pathologies associated with significant morbidity to both mother and fetus. The majority of patients with PAS will require a blood transfusion at time of delivery and subsequent cesarean hysterectomy. The optimal approach to maternal acute blood loss resuscitation is currently unknown.

Methods: Here, we present a cohort analysis of 34 patients with pathology-confirmed PAS treated with either whole blood ($n = 16$) or component therapy ($n = 18$) for initial intraoperative resuscitation.

Results: We observed comparable results in post-operative outcomes with fewer overall transfusions and subsequently, lower volumes of resuscitation ($p = .03$) with whole blood initial resuscitation.

Conclusions: Whole blood transfusion may represent a viable option for initial resuscitation with lower resuscitation volumes and transfusion-associated complications without directly effecting post-operative outcomes in cases of PAS.

ARTICLE HISTORY
Received 12 February 2021
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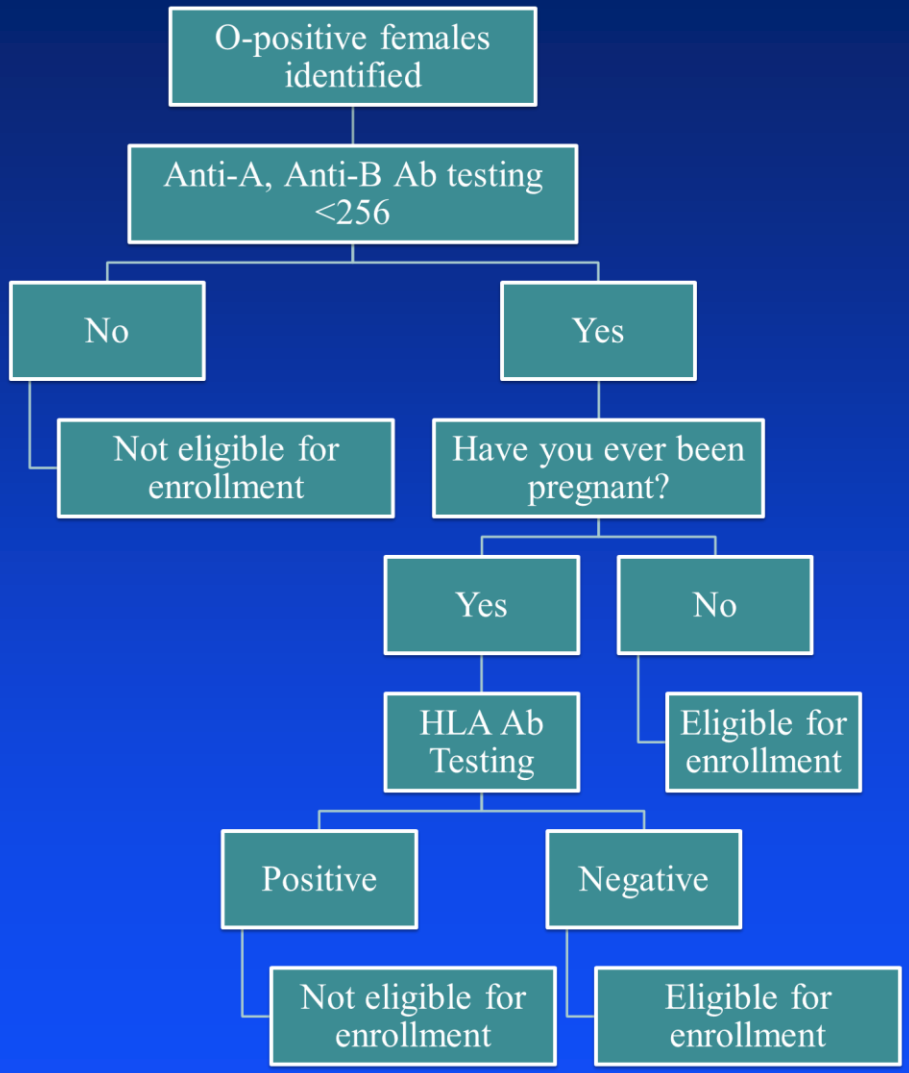
KEYWORDS
Placenta accreta; whole blood; blood transfusion; cesarean hysterectomy; abnormal placentation


O-positive females identified
Anti-A, Anti-B Ab testing <256
No
Yes
Not eligible for enrollment
Have you ever been pregnant?
Yes
No
HLA Ab Testing
Eligible for enrollment
Positive
Negative
Not eligible for enrollment
Eligible for enrollment

How to Double Your Donors

- **Heroes in Arms (re-named after the addition of female donors)**
- In the three months since adding women, the program has screened 352 women and has found that 69% of the women are considered low-titer and are thus eligible for the LTOWB program.
- Several of the women who have been enrolled were originally screened as positive for prior pregnancy and underwent the additional HLA testing prior to enrolment.
- South Texas Blood and Tissue Center screened 2,151 previously pregnant females in 2022 for HLA Ab testing and 1,789 (83%) tested negative while only 362 (17%) tested positive.
- As of today: 1097 O+ women screened
  771 low titer (70%) 146 h/o pregnancy 20+ HLA (14%)

RhD Positive

ABO and Rh status is often not known at time of transfusion

Risk of the following in those found to be RhD negative:

- Primary isoimmunization (Anti-D formation)
  - Concern in childbearing age females & subsequent development of Hemolytic Disease of the Fetus/ Newborn
    - Consider IVIG or red cell exchange
- Delayed hemolytic transfusion reaction in a patient with a preformed Anti-D

Why use RhD+ in potential child bearing females for trauma patients?

- Yazer et al - Modern-day probability of a D- FCP exposed to D+ blood products becoming alloimmunized to the D antigen and then experiencing either fetal death or significant developmental neurological morbidity in the child because of this anti-D antibody is calculated to be approximately 0.3%

- Retrospective study by UTHSCSA trauma surgery team and BB looked into 124 MTP activations over a 30-month period- only one FCP who underwent pre-transfusion testing and was D-.
  - 250 years for 100 D- FCPs to receive units of D+ LTOWB during trauma resuscitation
  - 500 traumatically injured FCPs could die from hemorrhage if they were not transfused with D+ LTOWB.
- Incorporating data
  - Fewer than one fetal death for every 300 D- FCPs who are transfused with D+ LTOWB in an emergency
  - 750 years for one fetus to die from a D alloimmunization event that occurred due the transfusion of D+ LTOWB to a D- FCP during traumatic hemorrhage.
  - The early provision of D+ LTOWB would result in saving 1500 women.

1. McGinity AC, Zhu CS, Greebon L, et al. Prehospital low-titer cold-stored whole blood: philosophy for ubiquitous utilization of O-positive product for emergency use in hemorrhage due to injury. J Trauma Acute Care Surg 2018;84:S115-s9.
2. Yazer MH, Delaney M, Doughty H, Dunbar N, Al-Riyami AZ, Triulzi DJ, et al. Is it time to reconsider the risks of transfusion RhD negative females of childbearing potential with RhD positive red blood cells in bleeding emergencies. Transfusion. 2019;59(12). doi.:10.1111/trf.15569[doi].

UT Health San Antonio

Transfusion. 2025 May:65 Suppl 1:S320-S327. doi: 10.1111/trf.18181. Epub 2025 Mar 27.

How I do it: An institutional protocol for the management of RhD negative women who receive RhD positive blood

Rahaf Alkhateb [1], Kirea Mazzolini [2], Vipulkumar Pravinbhai Prajapati [1], Chantal Harrison [1], Kayla E Ireland [3], Donald Jenkins [2], John Daniels [1], Leslie Greebon [1]

Adopted by State of Texas Whole Blood Task Force

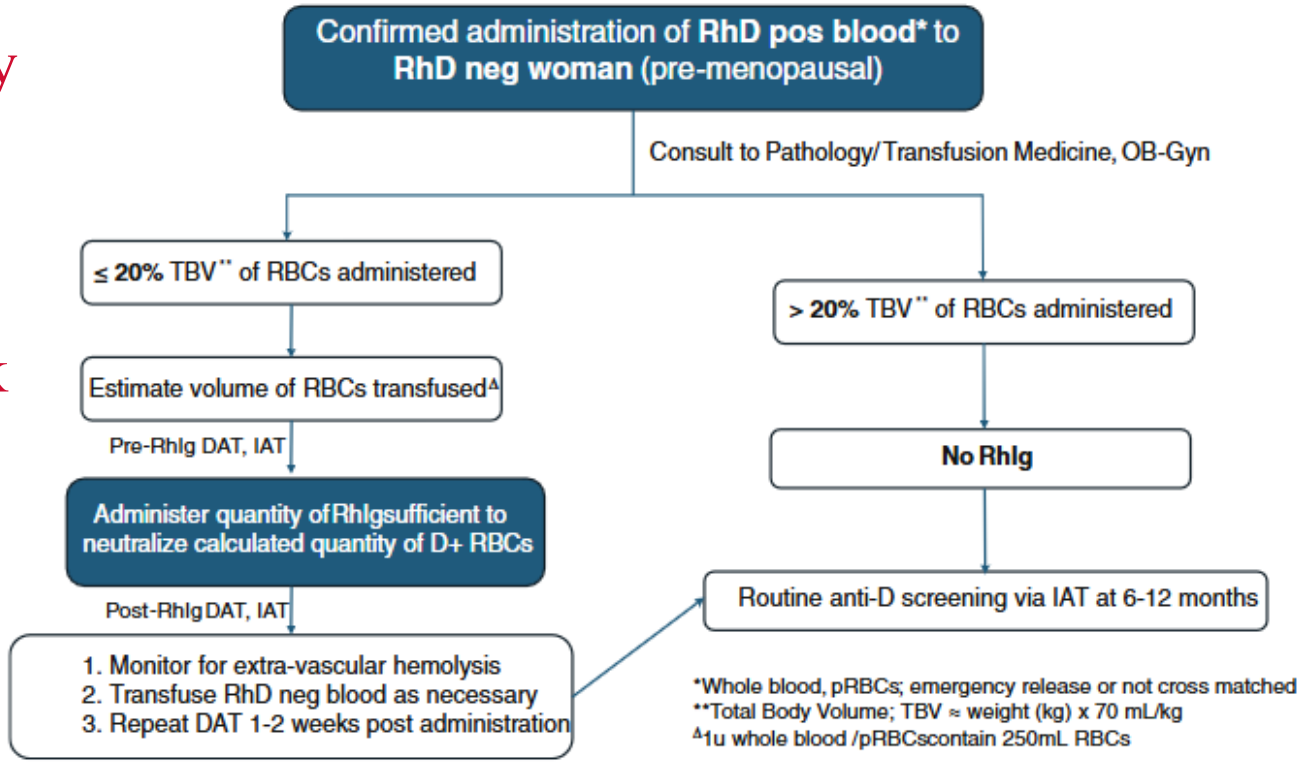


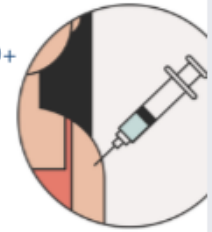
FIGURE 1 Protocol for management of RhD negative adult women <50 years old following RhD-mismatched transfusions.

Rho(D) Immune Globulin for Children

RHIG FOR CHILDREN

The Background

More children are being transfused emergently with RhD+ with blood products for trauma-related hemorrhagic shock before and upon their arrival to the emergency room.



These blood products are often RhD+, which means that RhD- children may develop antibodies as the result of their mismatched transfusion.

The Problem

Mismatched transfusions put female children of future childbearing potential (FFCP; <12 years old) at risk for alloimmunization and future pregnancy-related complications like hemolytic disease of the fetus and newborn (HDFN).

< 20%

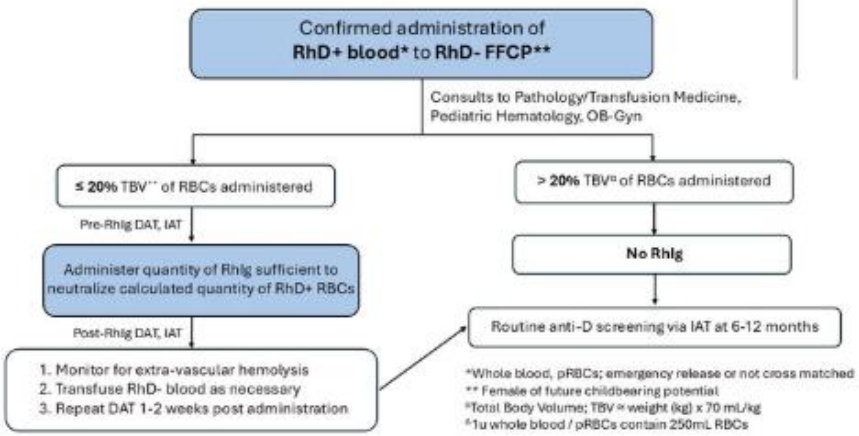
Approximate risk of RhD alloimmunization in an RhD-FFCP following mismatched transfusion, calculated from existing data

0 - 5%

Risk of future HDFN in RhD- FFCP who become alloimmunized as the result of their transfusion, calculated from existing data

Is there treatment available?

RhD- FFCPs transfused with less than <20% of their blood volume with RhD+ blood are eligible for treatment with **Rh immunoglobulin (RhIG).** See our algorithm below for more information.



All FFCPs and their families should be counselled about risks to their future pregnancies and followed longitudinally by either **Pediatric Hematology, OB-Gyn,** or **Maternal-Fetal Medicine**. Affected families should visit **allohopefoundation.org** for more information.

Rho(D) Immune Globulin for Women

RHIG FOR WOMEN

The Background

More female patients are being transfused emergently with RhD+ blood products for trauma-related hemorrhagic shock. Early transfusion has been shown to positively impact these patients' survival.

The Problem

Receiving mismatched transfusions put women at risk for alloimmunization and future pregnancy-related complications like hemolytic disease of the fetus and newborn (HDFN).

27%

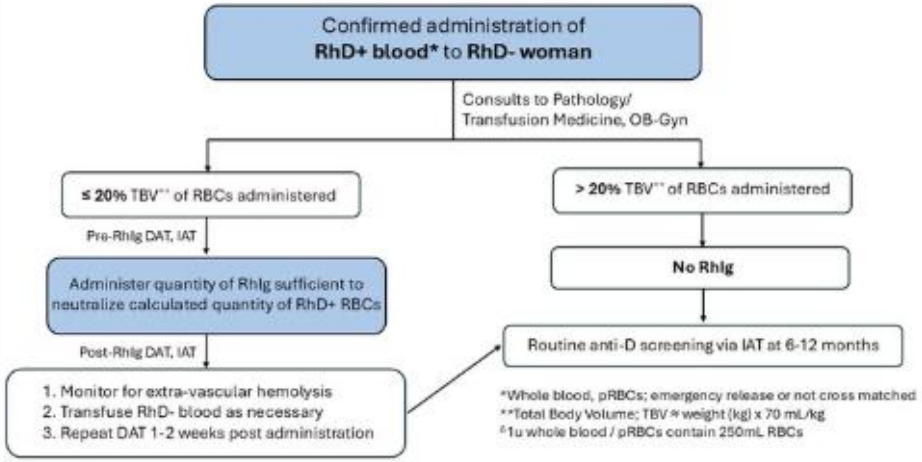
Average risk of alloimmunization following transfusion of RhD- woman with RhD+ blood following trauma

4%

Probability of having morbidity/mortality in pregnancies with RhD+ fetuses

Is there treatment available?

RhD- women transfused with less than <20% of their blood volume with RhD+ blood are eligible for treatment with **Rh immunoglobulin (RhIG).** See our algorithm below for more information.



All women should be counselled about risks to their future pregnancies and followed longitudinally by **OB-Gyn**. Affected women should visit **allohopefoundation.org** for more information.

National Highway Traffic Safety Administration (NHTSA) Motor Vehicle Crash Data Querying and Reporting

Persons Killed in Fatal Crashes

Filter Selected: Person Injury Type: Fatal

State: Texas

Years: 2020-2022

Persons Killed in Fatal Crashes [1]

Death Location	Land Use (Rural/Urban)			
	Rural	Urban	Unknown	Total
Died at Scene of Crash	3,666	4,540	8	8,214
Died at Unknown Location	2	5	0	7
Died en Route to a Hospital or Treatment Facility	0	1	0	1
Died at Other Location	1,260	3,296	6	4,562
Percent "Alive at Scene"	26%	42%	43%	36%
Total	4,928	7,842	14	12,784

Ground EMS Prehospital Blood Agencies as of October 2023

Randall M Schaefer, DNP

PREHOSPITAL BLOOD TRANSFUSION COALITION

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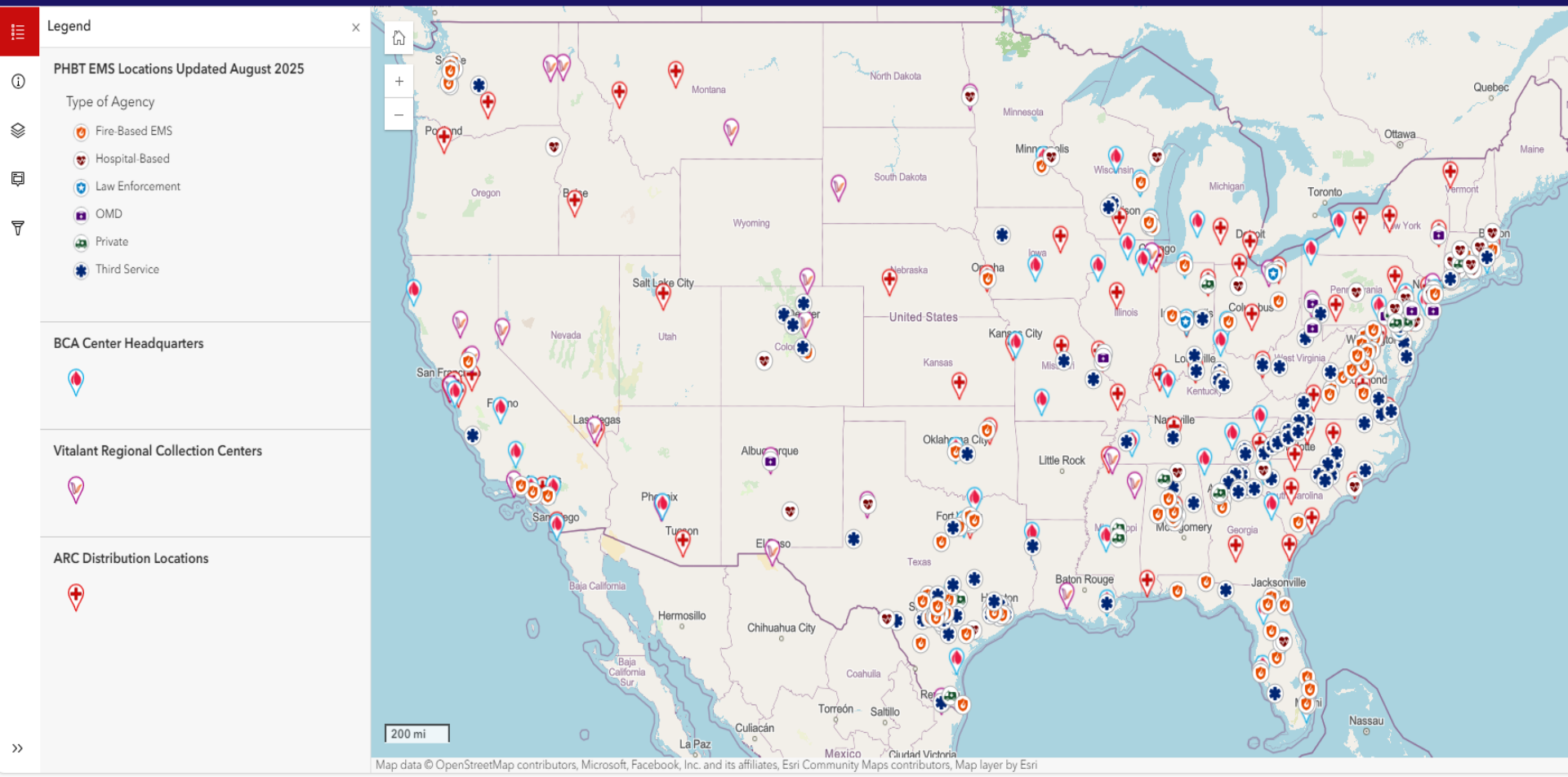
PHBTC Interactive Map



FFP & TXA IN SEVERE TBI

INDICATIONS

Severe TBI

FFP

Dose

2 units

Coagulopathy, stabilization of endothelium

TXA

Dose

2 g (total)

Fibrinolysis reversal

TIMING

Within 3 hours

FFP

Mechanism: Coagulation factor replacement

Action: coagulopathy, stabilizes glycocalyx

Benefit: Improves survival

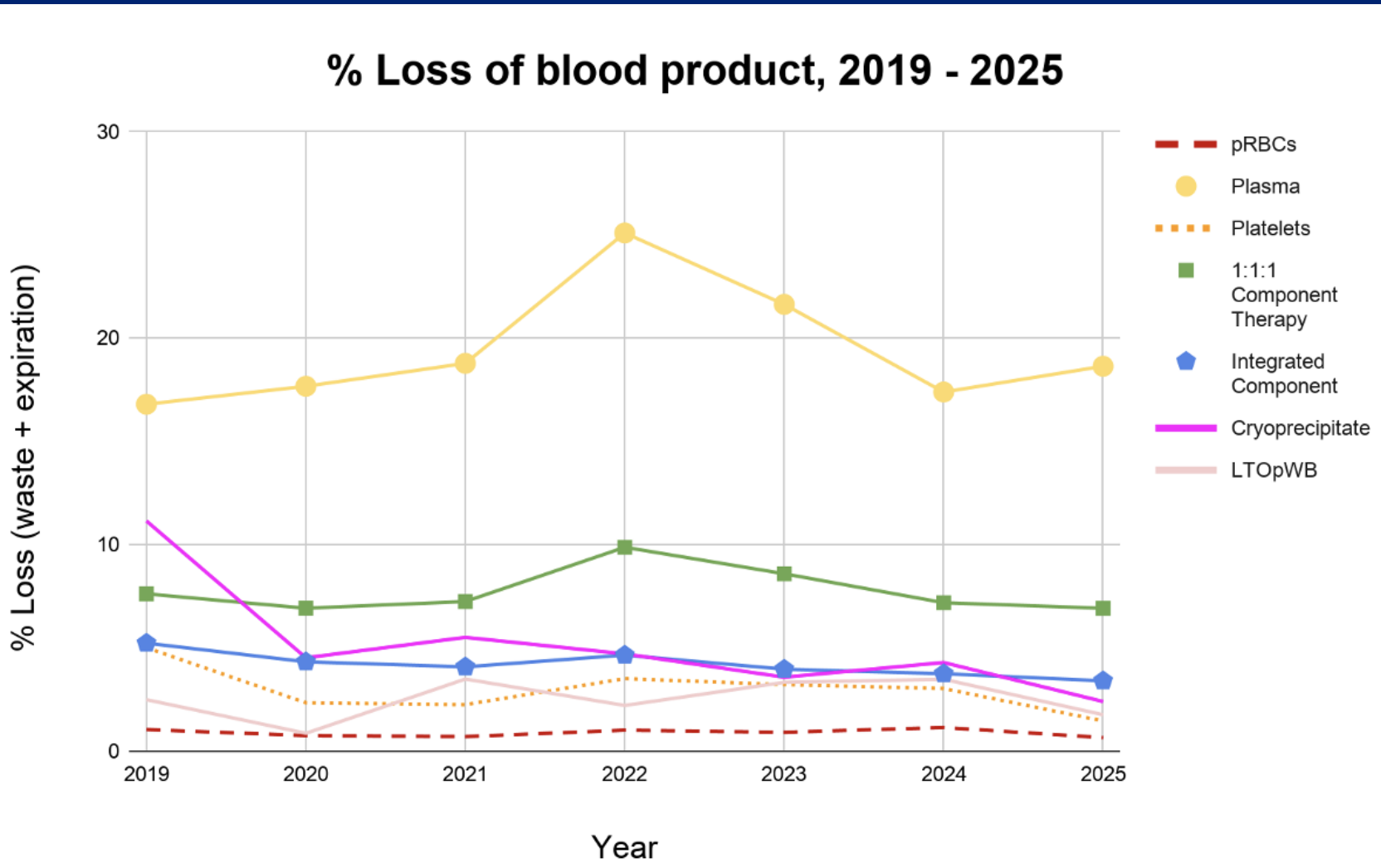
TXA

Mechanism: Anti-fibrinolytic

Action: Decreases bleeding

Benefit: Reduces mortality

University Health


% Loss of blood product, 2019 - 2025
% Loss (waste + expiration)
30
20
10
0
2019
2020
2021
2022
2023
2024
2025
Year
pRBCs
Plasma
Platelets
1:1:1 Component Therapy
Integrated Component
Cryoprecipitate
LTOpWB

Product	Metric	2019	2020	2021	2022	2023	2024	2025
pRBCs	Total Units	16,797	15,318	16,349	16,778	17,710	19,966	21,102
	Loss	173 (1.0%)	114 (0.74%)	113 (0.69%)	171 (1.0%)	158 (0.90%)	224 (1.1%)	136 (0.64%)
Plasma	Total Units	6,137	4,483	4,085	3,136	3,211	4,014	4,308
	Loss	1,031 (16.8%)	792 (17.7%)	767 (18.8%)	787 (25.1%)	695 (21.6%)	698 (17.4%)	803 (18.6%)
Platelets	Total Units	3,122	2,608	2,636	2,955	3,338	3,578	3,939
	Loss	156 (5.0%)	61 (2.3%)	59 (2.2%)	103 (3.5%)	107 (3.2%)	108 (3.0%)	57 (1.5%)
Cryoprecipitate	Total Units	1,284	1,130	1,254	1,480	1,374	1,707	1,964
	Loss	143 (11.1%)	51 (4.5%)	69 (5.5%)	69 (4.7%)	49 (3.6%)	73 (4.3%)	47 (2.4%)
LTOpWB	Total Units	1,208	1,761	2,336	2,362	2,199	2,648	2,509
	Loss	30 (2.5%)	15 (0.9%)	81 (3.5%)	62 (2.2%)	73 (3.3%)	92 (3.5%)	44 (1.8%)

STB&T LTOWB STATUS:			
Scheduled Appointments	Inventory		In-Process
17 Monday	111		38
14 Tuesday	3 DOS	2 DOS	1 DOS
8 Wednesday	78	52	26
12 Thursday	* DOS= Days of Supply		

7,712 Units Handled Total
Data reset November 1, 2022

2,196 Administered to Patients

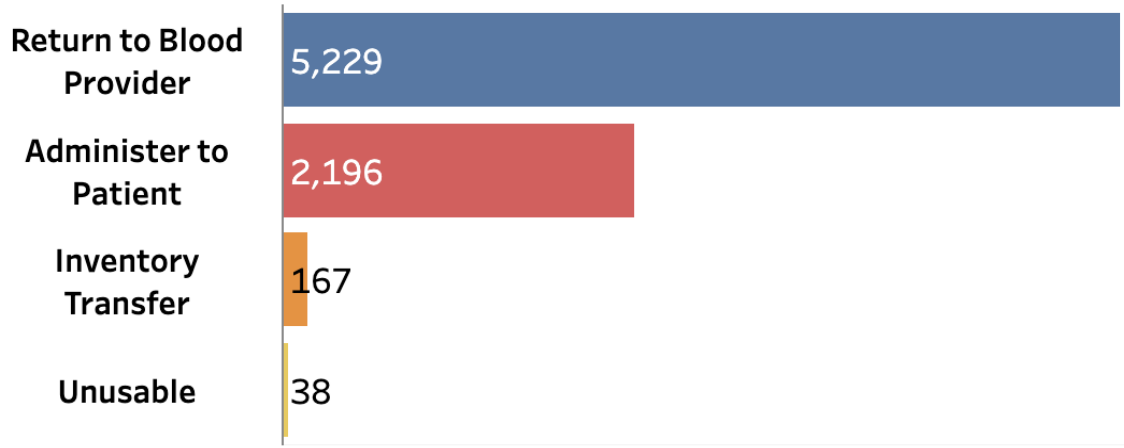
5,229 Returned to Blood Provider

167 Transferred to Another Unit

38 Unusable

81 On Hand

7,630 Units of Blood Used Data reset November 1, 2022
Adminstered, Transferred, Returned, or Unusable

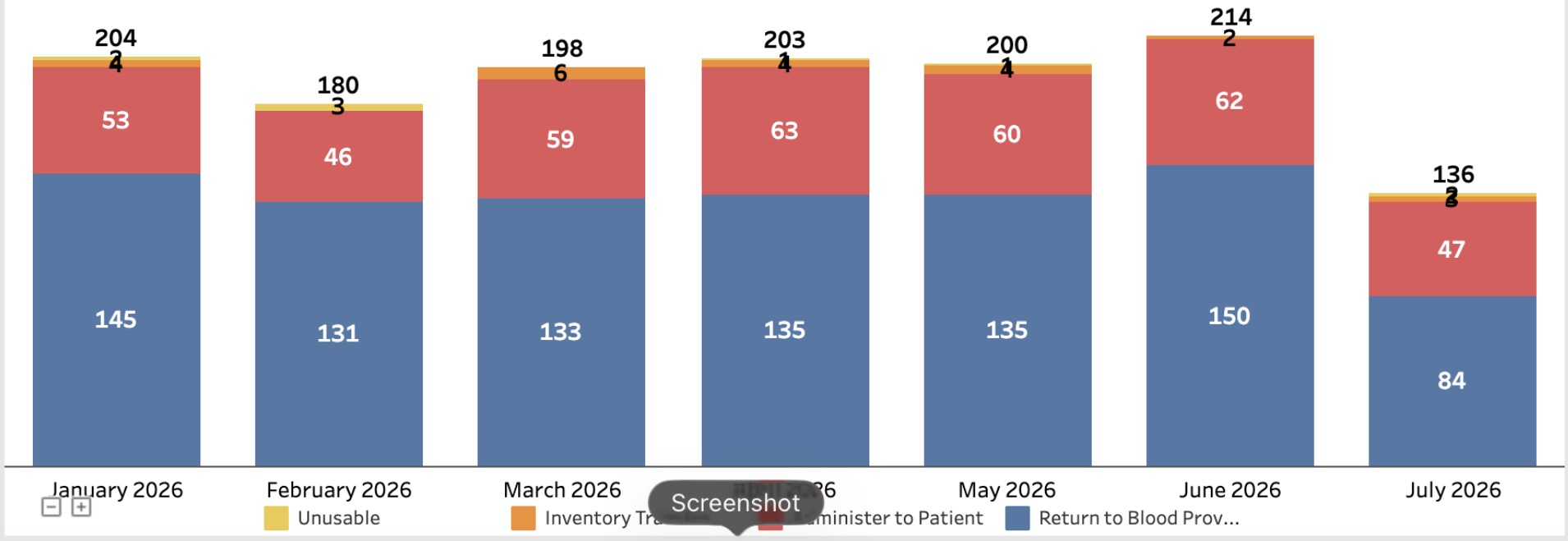


12.2 Days
Average Until Used

0 Days
Least Until Used

202 Days
Most Until Used

Blood Units Used Last 6 Months (Excludes On Hand Units)



Screenshot

Process Improvement Data
(April)

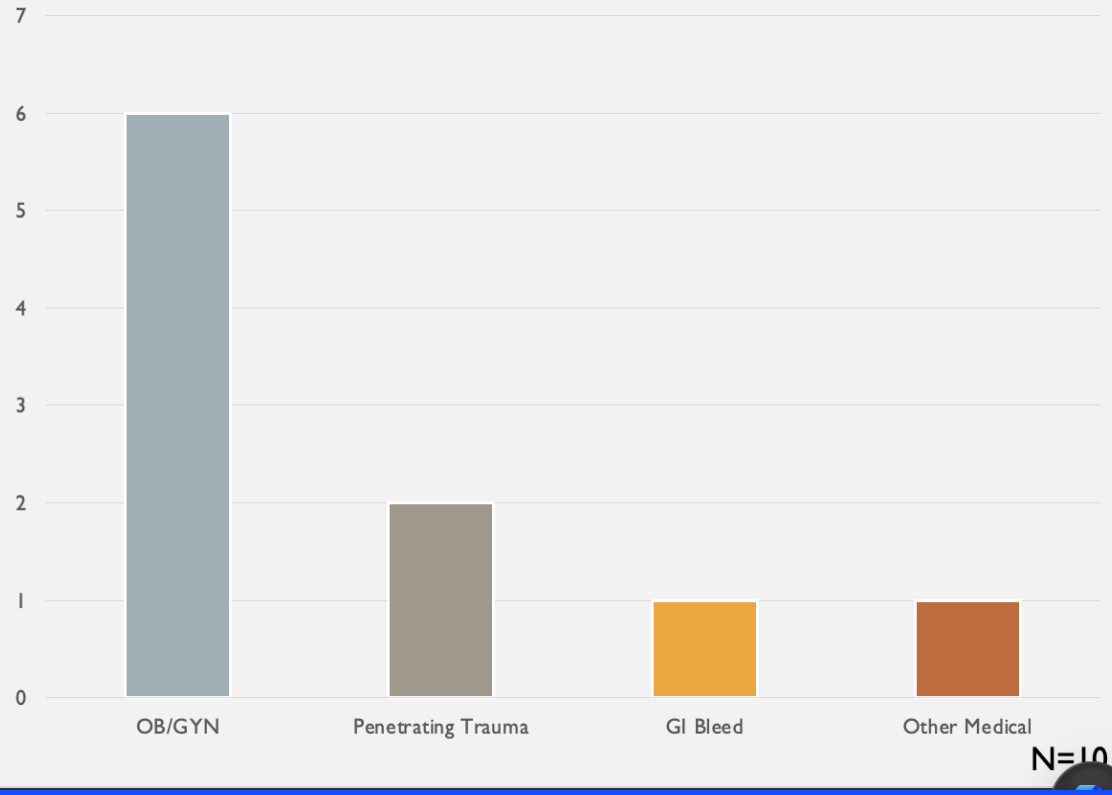
FEMALES LESS THAN 55 INDICATIONS

OB/GYN:

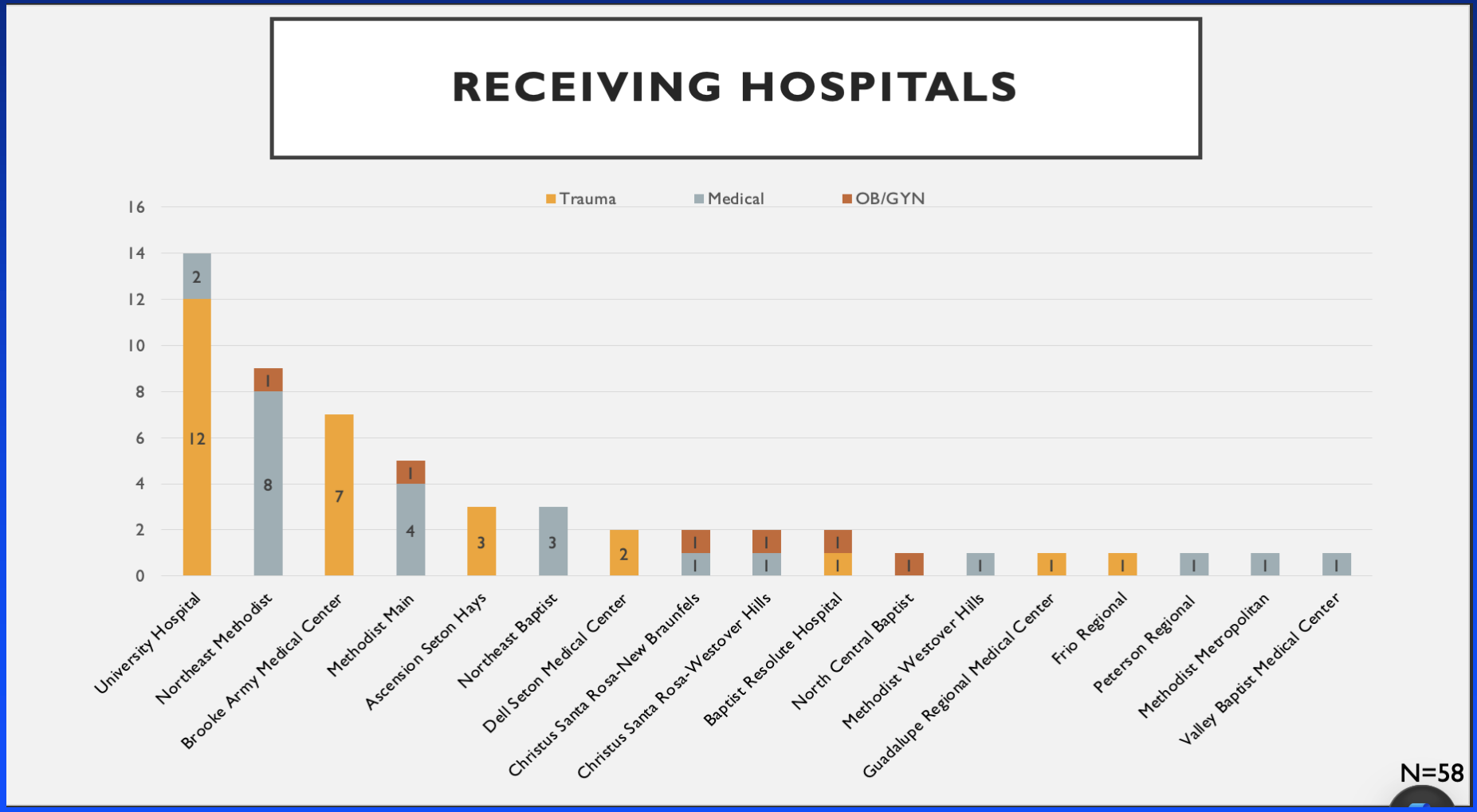
- 39/F pregnant; vaginal hemorrhage; taken to CSR-WH OR for emergent D&C.
- 47/F unknown origin of bleeding; blood in toilet and dried blood on furniture; taken to CSR-NB.
- 26/F miscarriage with low BP and decreasing LOC; taken to NC Baptist.
- 20/F vaginal bleeding (unknown pregnancy); ETCo2<25 and BP<70; taken to NE Methodist.
- 31/F vaginal bleeding; SI>1 and PP<45; taken to Baptist Resolute.
- 38/F OB/GYN taken to Main Methodist; SI>1 and MAP 51.

Other Medical:

- 34/F esophageal varices w/ LOC; taken to NE Methodist; Med Control Orders (pt had recent blood transfusions).



Process Improvement Data
(April)



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