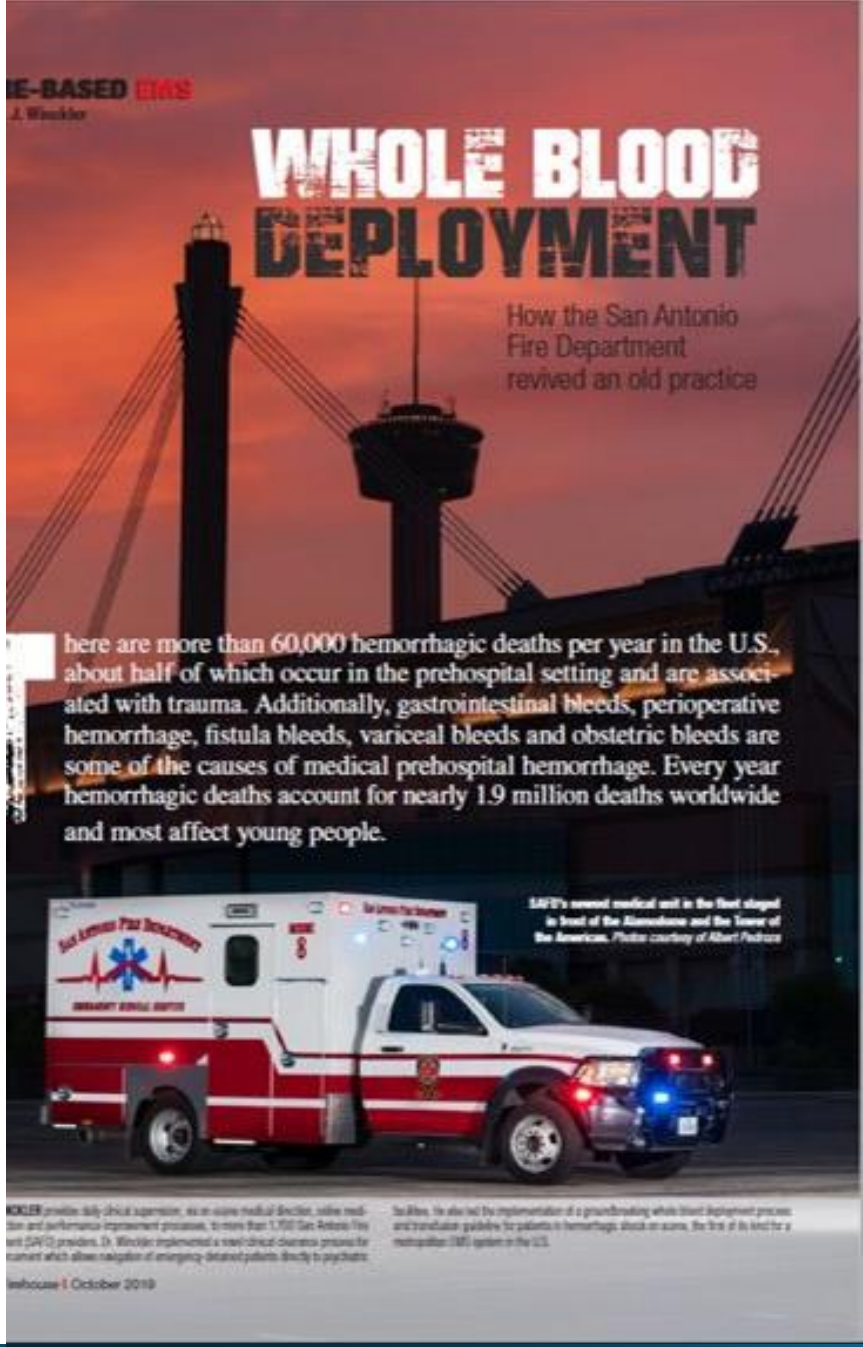
Building and Sustaining a Regional Prehospital Whole Blood Program

- C. J. Winckler MD, LP, FAEMS
  - *Associate Professor University of Texas Health San Antonio*
  - *Associate Professor Texas A&M College Station*
  - *Deputy Medical Director San Antonio Fire Department*
  - *Medical Director Wilson County ESD 3 and ESD 1*
  - *Medical Director North Channel EMS*
  - *Medical Director Cloverleaf Fire Department*
  - *Medical Director Texas Emergency Medical Task Force Region 8*
  - *Chair -Governor's EMS Trauma Advisory Council EMS Medical Directors Committee*
  - *Vice-Chair -Governor's Prehospital Whole Blood Task Force*
  - *Immediate Past Chair Texas Chapter - National Association of EMS Physicians*

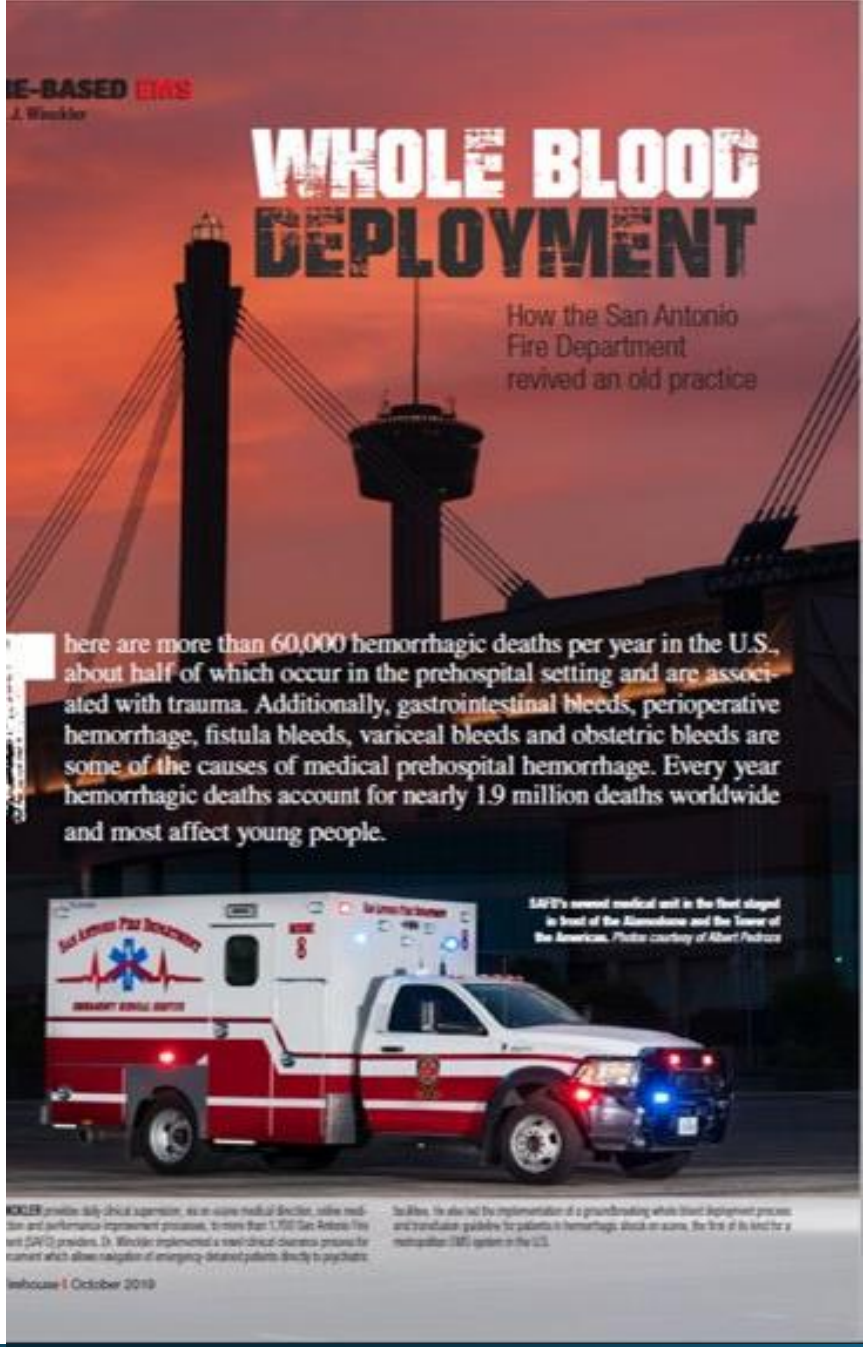
A mature prehospital blood program requires far more than writing a protocol

- **The Required Work of the EMS Medical Director**
  - System design and implementation
  - Clinical governance
  - Education and competency
  - Continuous quality improvement
  - Research and publication
  - Operation oversight
  - Regional and national collaboration
  - Blood stewardship and regulatory compliance



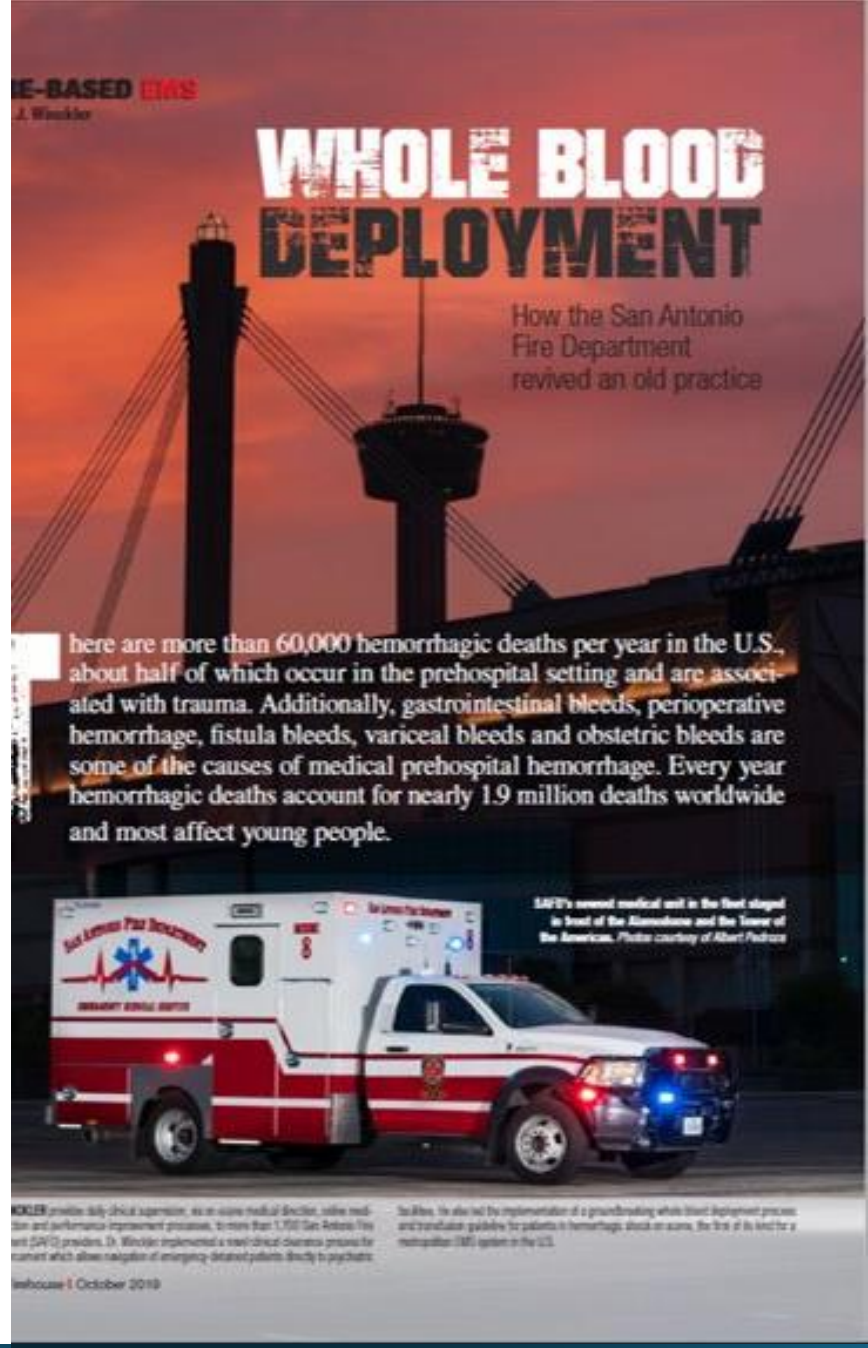
EMS Medical Director Role in Prehospital Blood Program

- **Program Development**
  - Evidence Review
  - Protocol Development
  - Medical Oversight
  - Hospital and Blood Center Collaboration



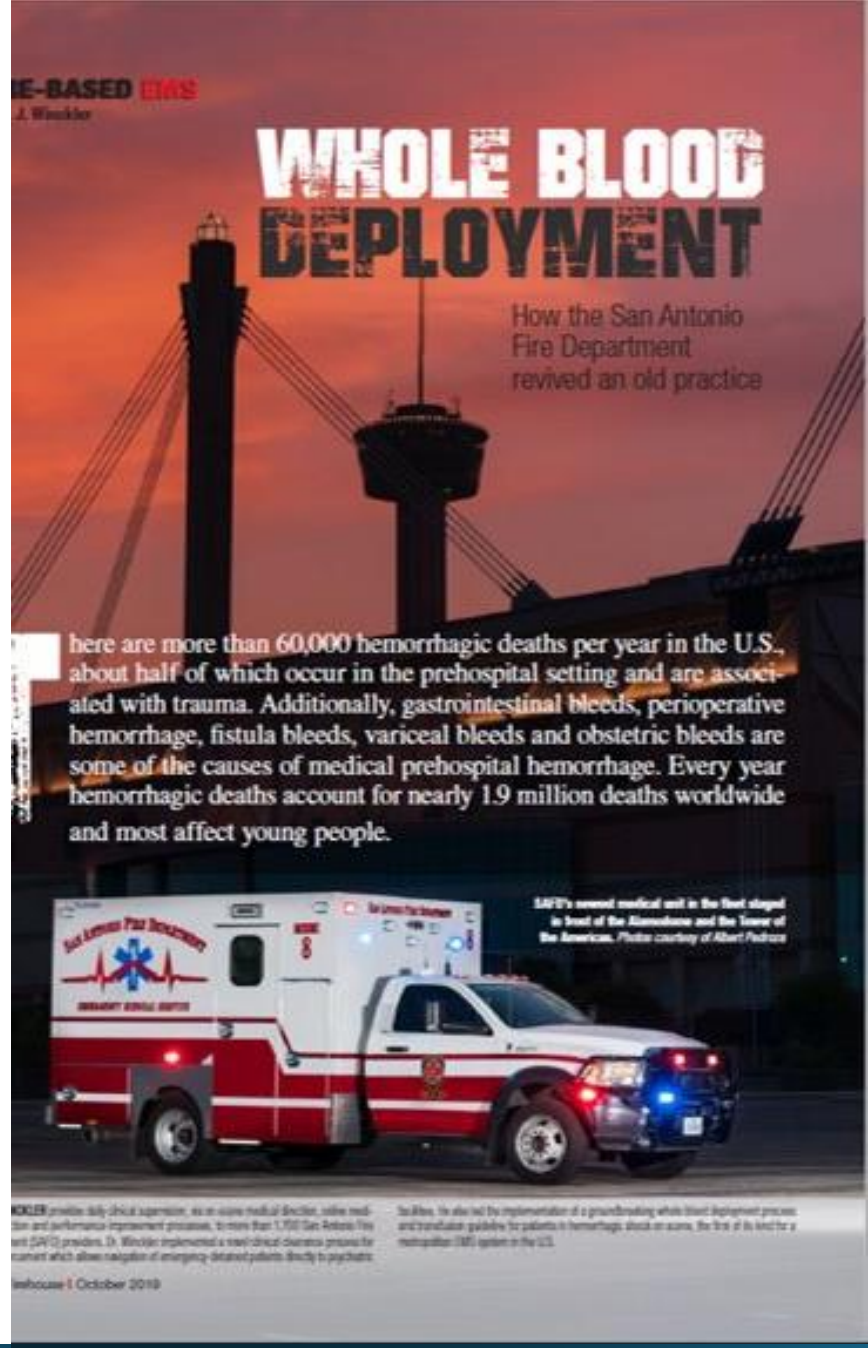
EMS Medical Director Role in Prehospital Blood Program

- **Clinical Operations**
  - Patient Selection
  - Blood Stewardship
  - Inventory Oversight
  - Case Review



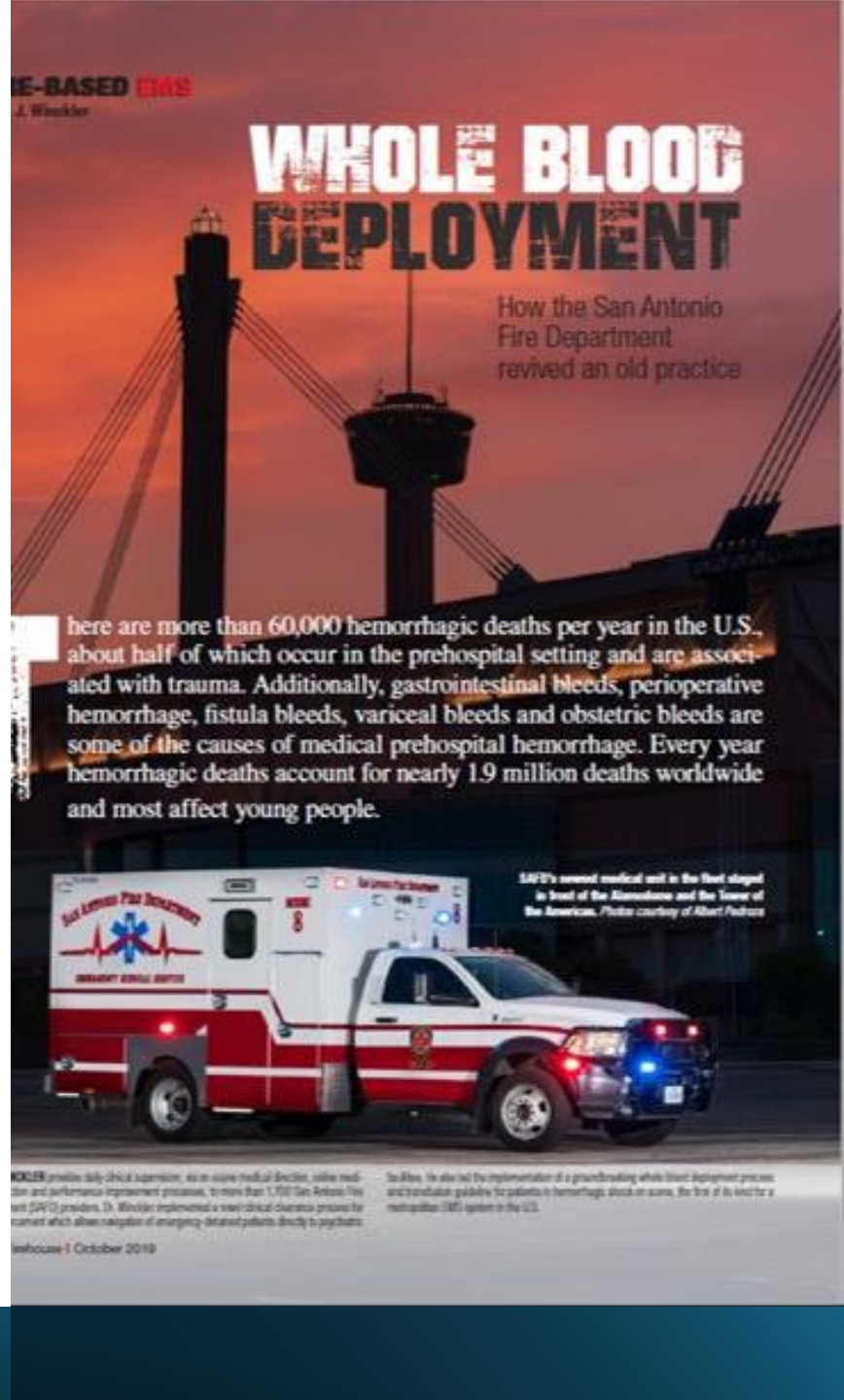
EMS Medical Director Role in Prehospital Program

- **Education**
  - EMS Workforce Education
  - Whole Blood Academy
  - Resident and Fellow Education
  - State/National/International Presentations



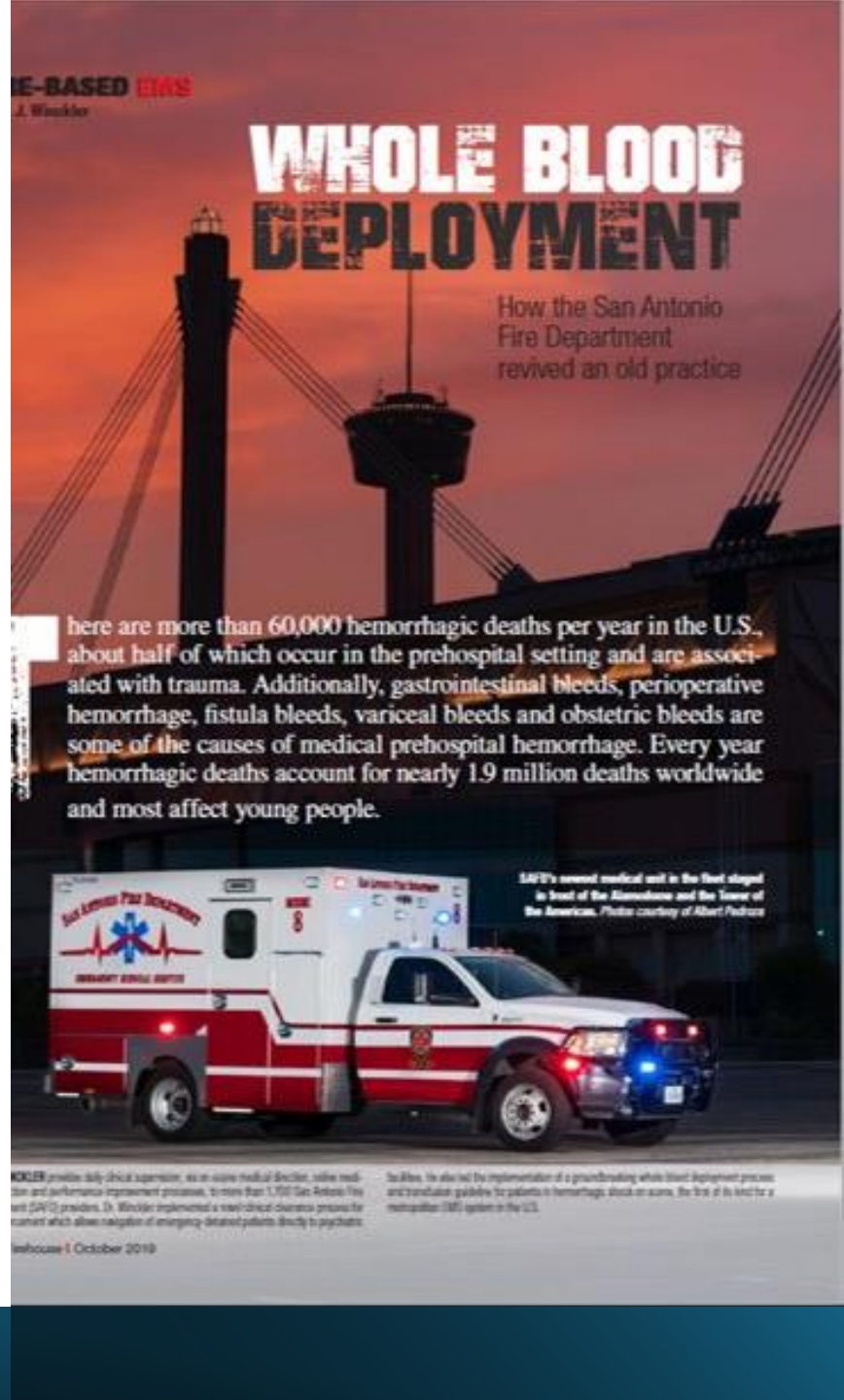
EMS Medical Director Role in Prehospital Program

- **Research**
  - Registry Development
  - Publications
  - Grants
  - IRB Oversight
  - Quality Improvement



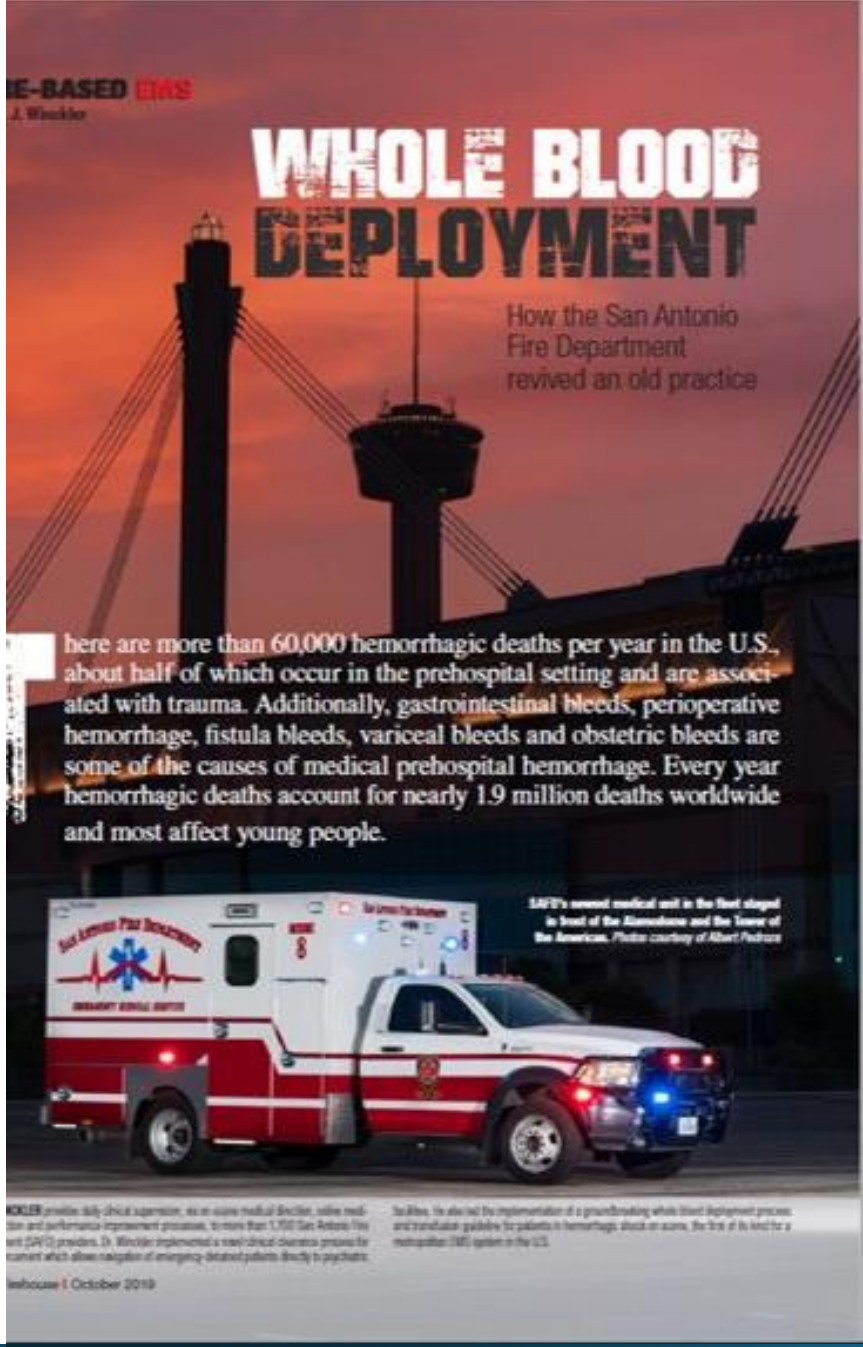
EMS Medical Director Role in Prehospital Program

- **Leadership**
  - State Committees
  - National Organizations
  - Consultation with EMS Agencies
  - Future Product Evaluation



EMS Medical Director Extenders Role in Prehospital Program

- **Responsibilities for Operational Leadership**
  - Blood Logistics
  - Equipment Implementation
  - Training Coordination
  - Blood Center Relationships
  - Operational Consultation
  - Blood Center Relationships
  - Program Sustainment
  - Operations Support



A successful prehospital blood program is not an event—it is a continuously managed clinical system

Physician Leadership

Physician	Primary Role	Documented Professional Effort (hrs)
Christopher Winckler, MD	EMS Medical Director	**~9,500**
David Miramontes, MD	EMS Medical Director	**~4,500**
Yevgeny Maksimenko, MD	EMS Medical Director / OMD Faculty	~1,550
Evan M. Baines, MD	EMS Medical Director	~1,500*
Rachel Ely, MD	EMS Fellowship Program Director	~1,100
Jessica Wentling, MD	EMS Medical Director	~800
Eric Kretz, MD	EMS Fellow	~738
Craig Cooley, MD	EMS Medical Director	~700
Nick Studer, MD	EMS Fellow	~200*

Estimated Physician Workforce Investment: ~20,600 hours

A successful prehospital blood program is not an event—it is a continuously managed clinical system

Operational & Administrative Leadership

Contributor	Primary Role	Documented Professional Effort (hrs)
William "Bill" Bullock	Operational Program Lead	**~9,840**
Mark Dieterle	Chief of Staff	**~8,450**

Operational Leadership Investment: ~18,290 hours

Prehospital Whole Blood Program Success

- Whole blood programs succeed because multidisciplinary teams invest thousands of house over many years—Not because a protocol was written

Does Prehospital Blood Work?

I, Dr. Winckler, feel this is a moral/ethical question

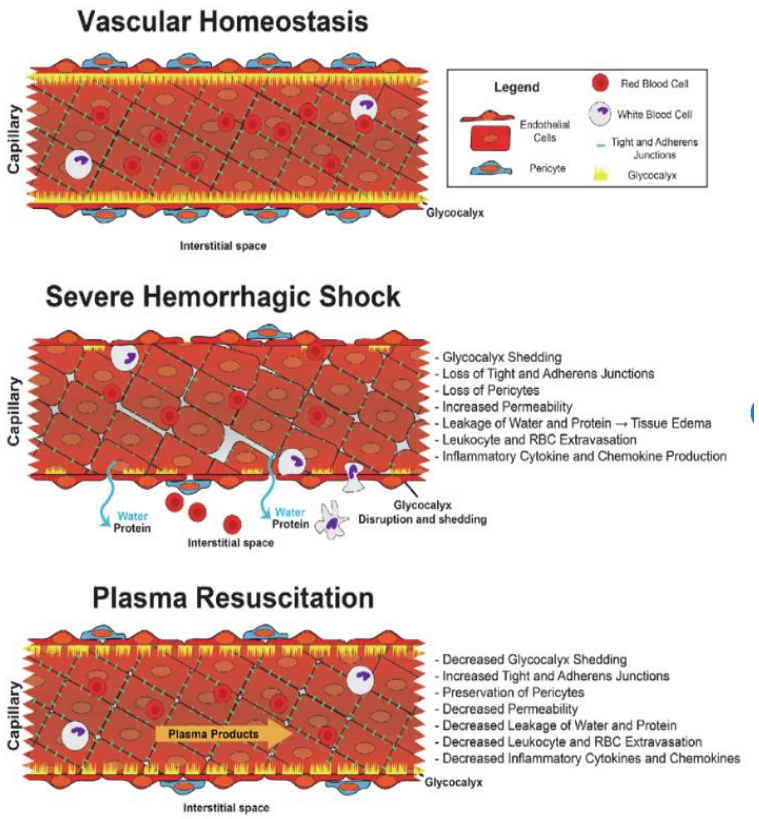
- Prove Blood Works in the Hospital…no seriously show me the study comparing blood to saline or permissive hypotension in the hospital
  - I’m still waiting for someone to show me one study RCT, retrospective, case series or otherwise showing blood was inferior to saline in a hospital setting
- There are however many good studies showing delaying blood in the hospital increases mortality

Hemorrhagic Shock is Blood Failure

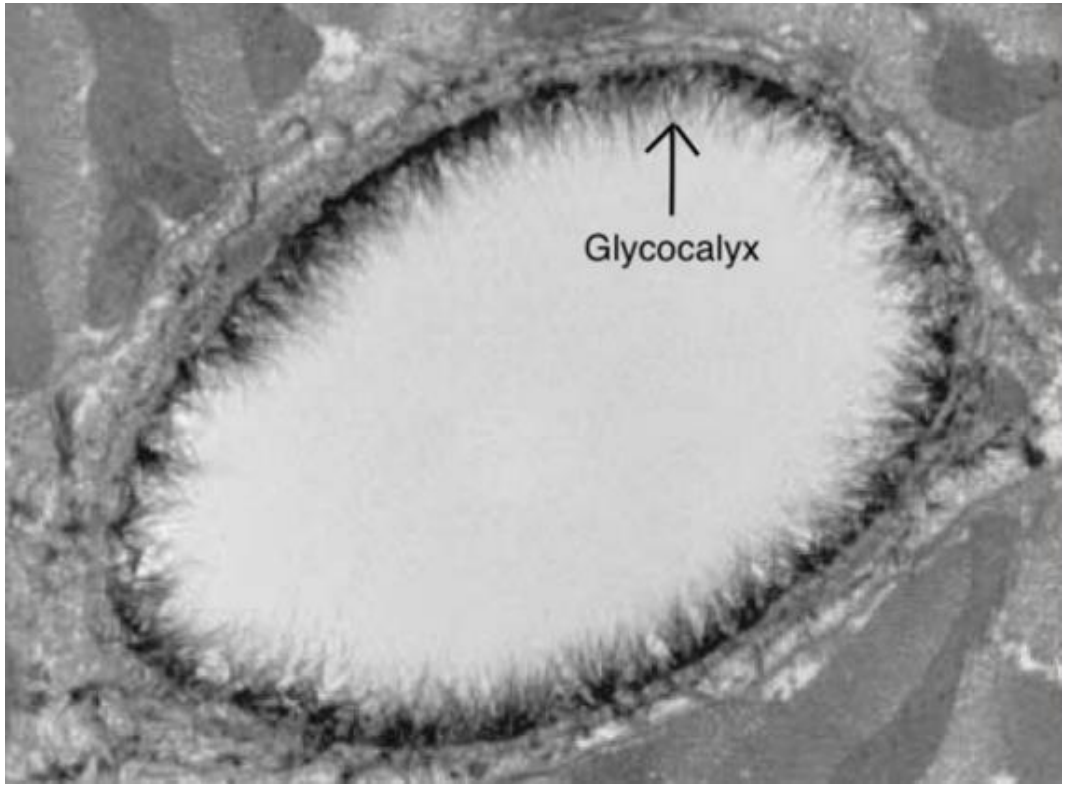
- Oxygen Debt
- Endotheliopathy
- Platelet Dysfunction
- Coagulaopathy

The Greatest of These is Endotheliopathy?

Lost in 5 minutes
Repair take 5 days



- Glycocalyx
  - Maintains vascular barrier
  - Regulates fluid exchange
  - Provides anticoagulant properties
  - Scavenges radicals
  - Regulates inflammaition



THE JOURNAL OF AABB

transfusion.org

TRANSFUSION

CASE REPORT

Prehospital blunt traumatic arrest resuscitation augmented by whole blood: a case report

Julian G. Mapp, Craig A. Manifold, Alberto M. Garcia, Jason L. Aguilar, Michael L. Stringfellow, Christopher J. Winckler

First published: 10 March 2020 | https://doi.org/10.1111/trf.15740 | Citations: 4

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STRAC
Southwest Texas Regional Advisory Council

Prehospital Transfusion of Low-Titer O + Whole Blood for Severe Maternal Hemorrhage: A Case Report

Ryan Newberry, C.J. Winckler, Ryan Luellwitz, Leslie Greebon, Elly Xenakis, William Bullock, Michael Stringfellow & Julian Mapp

Case Study

- pulse of 85, blood pressure of 68/45 mmHg, respiratory rate of 14 and shock index of 1.3
- rapidly extricated to the ambulance, where intravenous access was obtained with a 16 gauge
- transfusion of 500 mL of warmed LTO + WB was initiated during transport to community hospital
- Hospital arrival: pulse of 97 bpm, blood pressure of 100/56 mmHg, respiratory rate of 18, SaO2 = 99% and shock index of 1.0

Prehospital Low Titer O+ Whole Blood Administration for
Gastrointestinal Hemorrhage:
Effect on Shock Index and Vital Signs

- *Jessica Wentling DO FAAEM FACEP,*
- *David Wampler, PhD, LP, FAEMS*
- *Yevgeniy Maksimenko MD NRP,*
- *Bryan Everitt MD NRP,*
- *Ramon Casanova EMT-P,*
- *William Bullock EMT-P,*
- *Michael Stringfellow EMT-P,*
- *Mark Dieterle MBA NRP LP,*
- *Christopher J. Winckler MD LP*

Blood through October 2023

Pediatric

- 56 patients under 17 years

Initial Nature of Call	Count of Initial Nature of Call
Shooting	46
MVC	4
Cutting/Laceration	2
Stabbing	1
Fall	1
Hemorrhage/Laceration	1
MVC Pinned	1
Grand Total	56

Geriatric

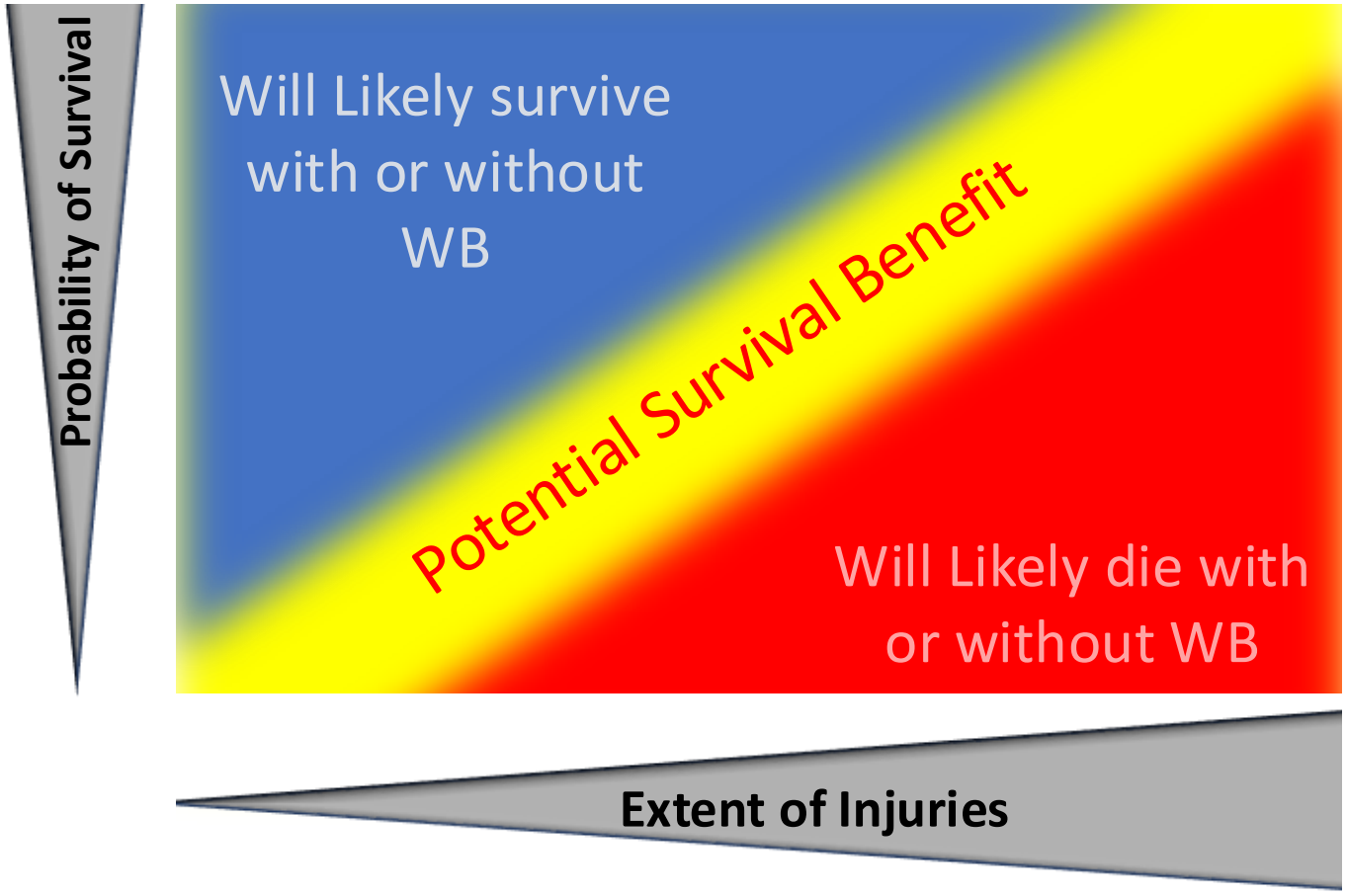
- 88 patients greater than 75 years

Initial Nature of Call	Count of Initial Nature of Call
Cutting/Hemorrhage/Laceration	44
Sick Person	15
Fall	5
Weak&Dizzy	4
Cardiac Arrest	3
Animal Bite	3
Unconscious/Fainting	6
MVC	3
Shooting	3
Abdominal Pain/Problems	2
MV Ped	1
Grand Total	88

Age	Sex	Dispatch code
2	Female	Trauma - Shooting (GSW) (Primary)
2	Female	Trauma - Shooting (GSW) (Primary)
3	Male	Trauma - Shooting (GSW) (Primary)
4	Male	Trauam - Shooting (GSW) (Primary)
4	Male	Trauma - Shooting (GSW) (Primary)
6	Female	Trauma - Shooting (GSW) (Primary)
7	Female	Trauma - Head Injury (Primary)
8	Male	Trauma - Shooting (GSW) (Primary)
8	Male	Atraumatic Bleeding (Primary)
9	Female	Unresponsive (Primary)
10	Female	Trauma - Shooting (GSW) (Primary)
12	Male	Trauma - Shooting (GSW) (Primary) GSW to head
13	Female	Trauma - Shooting (GSW) (Primary)
13	Male	Trauma - Shooting (GSW) (Primary)
13	Male	Trauma - Shooting (GSW) (Primary)
14	Female	Trauma - Shooting (GSW) (Primary)
14	Female	Shooting (GSW) (Primary)
14	Male	Trauma - Shooting (GSW) (Primary)

Prehospital LTOWB+ and Religious Exemption—It's Complicated

- Adult over 18 can refuse blood transfusions
- Case Law has been mixed for those under 18
  - Generally will transfuse to protect minor against parents wishes
- Follow your Local Trauma Center Guidelines on Objections to Blood Transfusions


Probability of Survival
Will Likely survive with or without WB
Potential Survival Benefit
Will Likely die with or without WB
Extent of Injuries

ALL Trauma Patients

Low Titer O+ Whole Blood – Trauma

History
- What was the mechanism of injury – blunt (MVC, fall, blow to body) vs. penetrating (stabbing, GSW, foreign body)?
- Did a medical condition contribute to the mechanism of injury? Other medical conditions?
- Medications – Coumadin? Plavix? Aspirin? Pradaxa? Xarelto? Eliquis? (any blood thinners or anticoagulants)
- Beta Blockers and Calcium Channel Blockers may not allow HR to increase appropriately

Key Concepts
- Low Titer O + Whole Blood is now being used to treat severely injured trauma patients who have or are at risk for severe hemorrhage

MARCHES Protocol
- Massive bleeding control
- Airway – NPA/OPA/ Cricth
- Respiratory – decompress chest if tension pneumothorax, occlusive dressing for open pneumothoraces
- Circulation- IV/IO Tqx, pelvic binder, wound packing
- Hypothermia care
- Eye injuries – cover with rigid shield and no pressure on the eye
- Spinal motion restriction if indicated

Criteria
HEMORRHAGIC SHOCK in medical or trauma Adult and Pediatric (≥ 6 yo) patients

Relative Contraindications
- Patient < 6 years old
  - Consult Medical Direction if patient is in hemorrhagic shock and < 6 yo
  - Medical Director may elect to give blood in patients < 6 yo

Contraindications
- Religious objection to receiving whole blood—consult On Call Medical Director

EMT
- Follow Trauma General Patient Care Guideline
- Follow appropriate Trauma Guideline

Paramedic

For Patients in HEMORRHAGIC SHOCK:
Administer Whole Blood with signs of acute hemorrhagic shock as evidenced by:

- Systolic Blood Pressure < 70 mmHg **OR**
- Systolic Blood Pressure < 90 mmHg with Heart Rate ≥ 110 beats per min **OR**
- ETCO2 < 25 **OR**
- Witnessed traumatic arrest < 5 min prior to provider arrival and continuous CPR throughout downtime **OR**
- Age ≥ 65 yo and SBP ≤ 100 **AND** HR ≥ 100 beats per minute

In general only 500mL (1 unit) of Low Titer O+ Whole Blood (LTO+WB) will be available per patient. If more than 500 mL of Whole Blood is available onscene the following general guidelines apply:

- 6-10 yo are eligible for 500 mL of Whole Blood
  - Consult Medical Direction for further orders, if needed
- 11-13 yo are eligible for 1000 mL of Whole Blood
  - Consult Medical Direction for further orders, if needed
- ≥13 yo are eligible for >1000 mL of Whole Blood
  - Consult Medical Direction for further orders, if needed

Of Note: At this time the LTO+WB does not have volume markings on the bag.

Whole Blood for Medical Patients

Low Titer O + Whole Blood – Medical

History
- Shock is defined as inadequate perfusion of blood and oxygen to the brain, heart and other vital organs
- Medications – Coumadin? Plavix? Aspirin? Pradaxa? Xarelto? Eliquis? (any blood thinners or anticoagulants)
- Beta Blockers and Calcium Channel Blockers may not allow HR to increase appropriately

Key Concepts
- Low Titer O + Whole Blood is now being used to treat critically ill medical patients who have or are at risk for severe hemorrhage

Examples of Patients in Hemorrhagic Shock
- Gastrointestinal (GI) bleed
- Postpartum hemorrhage
- Cirrhotic liver or liver failure
- Vascular – such as an uncontrolled bleeding shunt, fistula or varicose vein
- Urological – especially with recent surgery or procedure
- Potentially a recent surgical patient
- Uncontrolled epistaxis

Criteria
HEMORRHAGIC SHOCK in medical or trauma Adult and Pediatric (≥ 6 yo) patients

Relative Contraindications
- Patient < 6 years old
  - Consult Medical Direction if patient is in hemorrhagic shock and < 6 yo
  - Medical Director may elect to give blood in patients < 6 yo.

Contraindications
- Religious objection to receiving whole blood—consult On Call Medical Director

EMT
- Follow General Medical Care Guideline
- Follow appropriate Shock Guideline

Paramedic

For Patients in HEMORRHAGIC SHOCK:
Administer Whole Blood with signs of acute hemorrhagic shock as evidenced by:

- Systolic Blood Pressure < 70 mmHg **OR**
- Systolic Blood Pressure < 90 mmHg with Heart Rate ≥ 110 beats per min **OR**
- ETCO2 < 25 **OR**
- Witnessed cardiac arrest < 5 min prior to provider arrival and continuous CPR throughout downtime **OR**
- Age ≥ 65 yo and SBP ≤ 100 **AND** HR ≥ 100 beats per minute

In general only 500mL (1 unit) of Low Titer O+ Whole Blood (LTO+WB) will be available per patient. If more than 500 mL of Whole Blood is available onscene the following general guidelines apply:

- 6-10 yo are eligible for a total of 500 mL of Whole Blood
  - Consult Medical Direction for further orders, if needed
- 11-13 yo are eligible for a total of 1000 mL of Whole Blood
  - Consult Medical Direction for further orders, if needed
- ≥13 yo are eligible for >1000 mL of Whole Blood
  - Consult Medical Direction for further orders, if needed

Of Note: At this time the unit of LTO+WB does not have volume markings on the bag.

ALL Pediatric Patients

PED Low Titer O+ Whole Blood

History
- What was the mechanism of injury – blunt (MVC, fall, blow to body) vs. penetrating (stabbing, GSW, foreign body)?
- Did a medical condition contribute to the mechanism of injury? Other medical conditions?
- Medications – Coumadin? Plavix? Aspirin? Pradaxa? Xarelto? Eliquis? (any blood thinners or anticoagulants)

Key Concepts
- Low Titer O + Whole Blood is now being used to treat severely injured trauma patients who have or are at risk for severe hemorrhage

MARCHES Protocol
- Massive bleeding control
- Airway – NPA/OPA/ Cricb
- Respiratory – decompress chest if tension pneumothorax, occlusive dressing for open pneumothoraces
- Circulation- IV/IO Tqx, pelvic binder, wound packing
- Hypothermia care
- Eye injuries – cover with rigid shield and no pressure on the eye
- Spinal motion restriction if indicated

Medical Patients in Hemorrhagic Shock
- Less likely for children but consider the same medical causes for hemorrhagic shock as in adults

Criteria
HEMORRHAGIC SHOCK in medical or trauma Adult and Pediatric (≥ 6 yo) patients

Relative Contraindications
- Patient < 6 years old
  - Consult Medical Direction if patient is in hemorrhagic shock and < 6 yo
  - Medical Director may elect to give blood in this patient population
  - Religious objection to receiving whole blood—consult On Call Medical Director

EMT
- Follow Trauma General Patient Care Guideline
- Follow appropriate Trauma Guideline

Paramedic

For Patients in HEMORRHAGIC SHOCK:
Administer Whole Blood with signs of acute hemorrhagic shock as evidenced by:

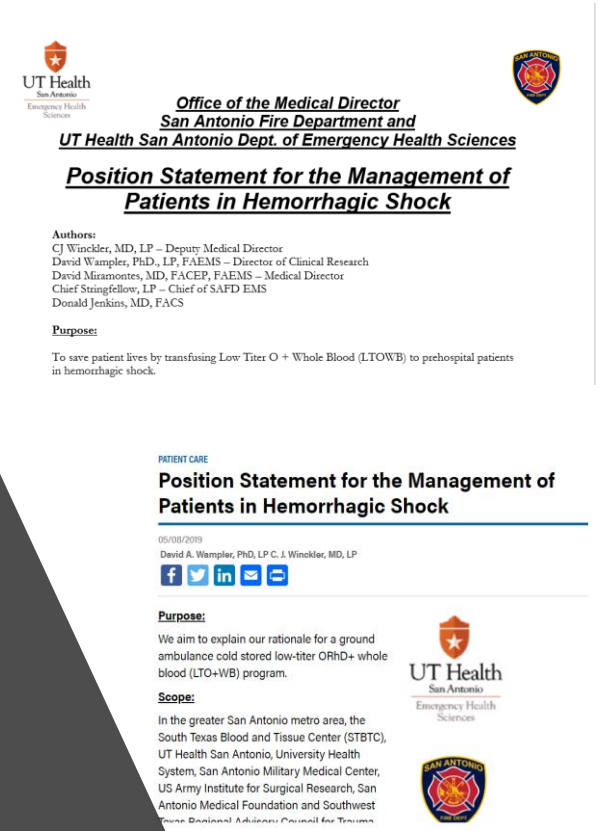
- Systolic blood pressure < 70 mmHg OR
- Systolic Blood Pressure < 90 mmHg with Heart Rate ≥ 110 beats per min OR
- ETCO2 < 25 OR
- Witnessed arrest from hemorrhagic shock < 5 min prior to provider arrival and continuous CPR throughout downtime

In general only 500mL (1 unit) of Low Titer O+ Whole Blood (LTO+WB) will be available per patient. If more than 500 mL of Whole Blood is available onscene the following general guidelines apply:

- 5-10 yo are eligible for 500 mL of Whole Blood
  - Consult Medical Direction for further orders, if needed
- 11-13 yo are eligible for 1000 mL of Whole Blood
  - Consult Medical Direction for further orders, if needed
- ≥13 yo are eligible for >1000 mL of Whole Blood
  - Consult Medical Direction for further orders, if needed

Of Note: At this time the LTO+WB does not have unit markings on the bag

Scope of Practice-Position Statement



Office of the Medical Director
San Antonio Fire Department and
UT Health San Antonio Dept. of Emergency Health Sciences

Position Statement for the Management of Patients in Hemorrhagic Shock

Authors:
CJ Winckler, MD, LP – Deputy Medical Director
David Wampler, PhD., LP, FAEMS – Director of Clinical Research
David Miramontes, MD, FACEP, FAEMS – Medical Director
Chief Stringfellow, LP – Chief of SAFD EMS
Donald Jenkins, MD, FACS

Purpose:

To save patient lives by transfusing Low Titer O + Whole Blood (LTOWB) to prehospital patients in hemorrhagic shock.

PATIENT CARE

Position Statement for the Management of Patients in Hemorrhagic Shock

05/08/2019

David A. Wampler, PhD, LP C. J. Winckler, MD, LP

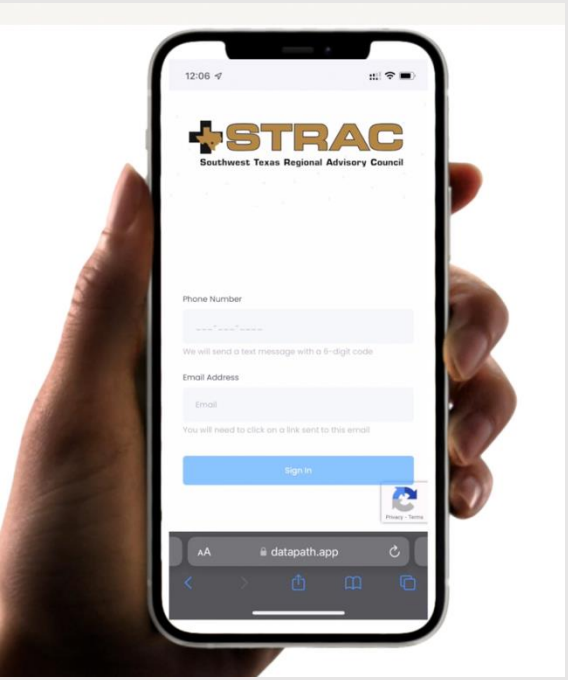
Purpose:

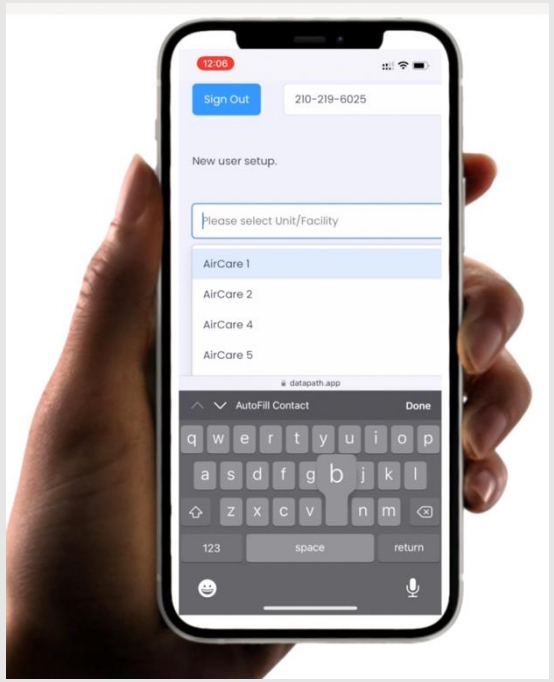
We aim to explain our rationale for a ground ambulance cold stored low-titer ORhD+ whole blood (LTO+WB) program.

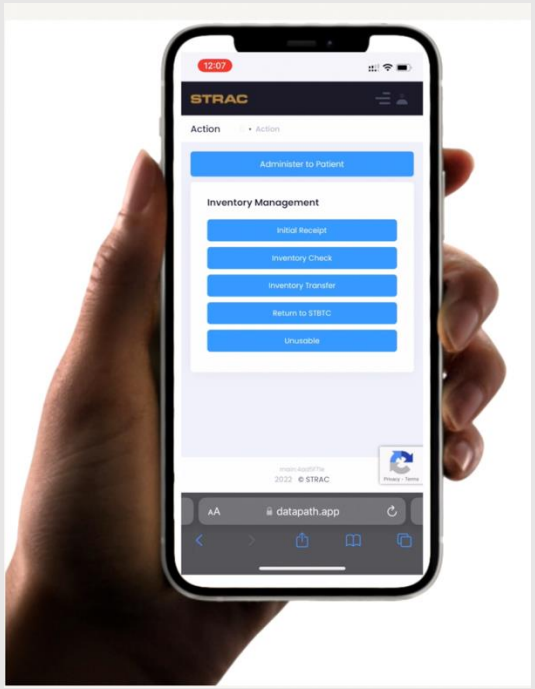
Scope:

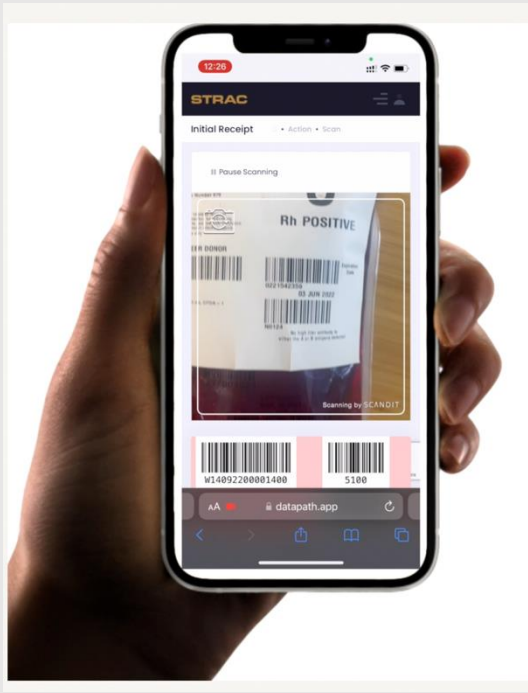
In the greater San Antonio metro area, the South Texas Blood and Tissue Center (STBTC), UT Health San Antonio, University Health System, San Antonio Military Medical Center, US Army Institute for Surgical Research, San Antonio Medical Foundation and Southwest

Whole Blood Inventory Phone App









STRAC
Southwest Texas Regional Advisory Council

San Antonio Fire Department
Whole Blood Status

Monday, January 6, 2025

STRAC
Southwest Texas Regional Advisory Council

842 Units Handled Total
Data reset November 1, 2022

559 Units Administered to Patients

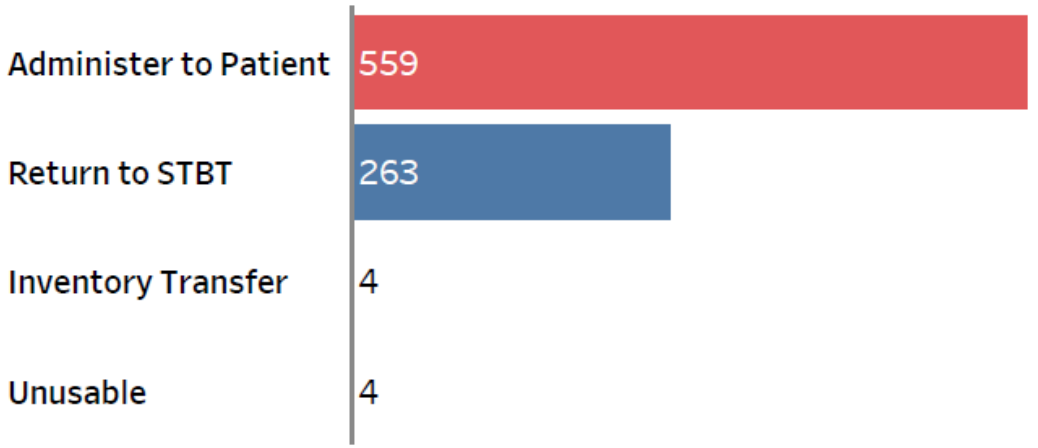
263 Units Returned to STBTC

4 Units Transferred to Another Unit

4 Units Unusable

9 Units On Hand

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

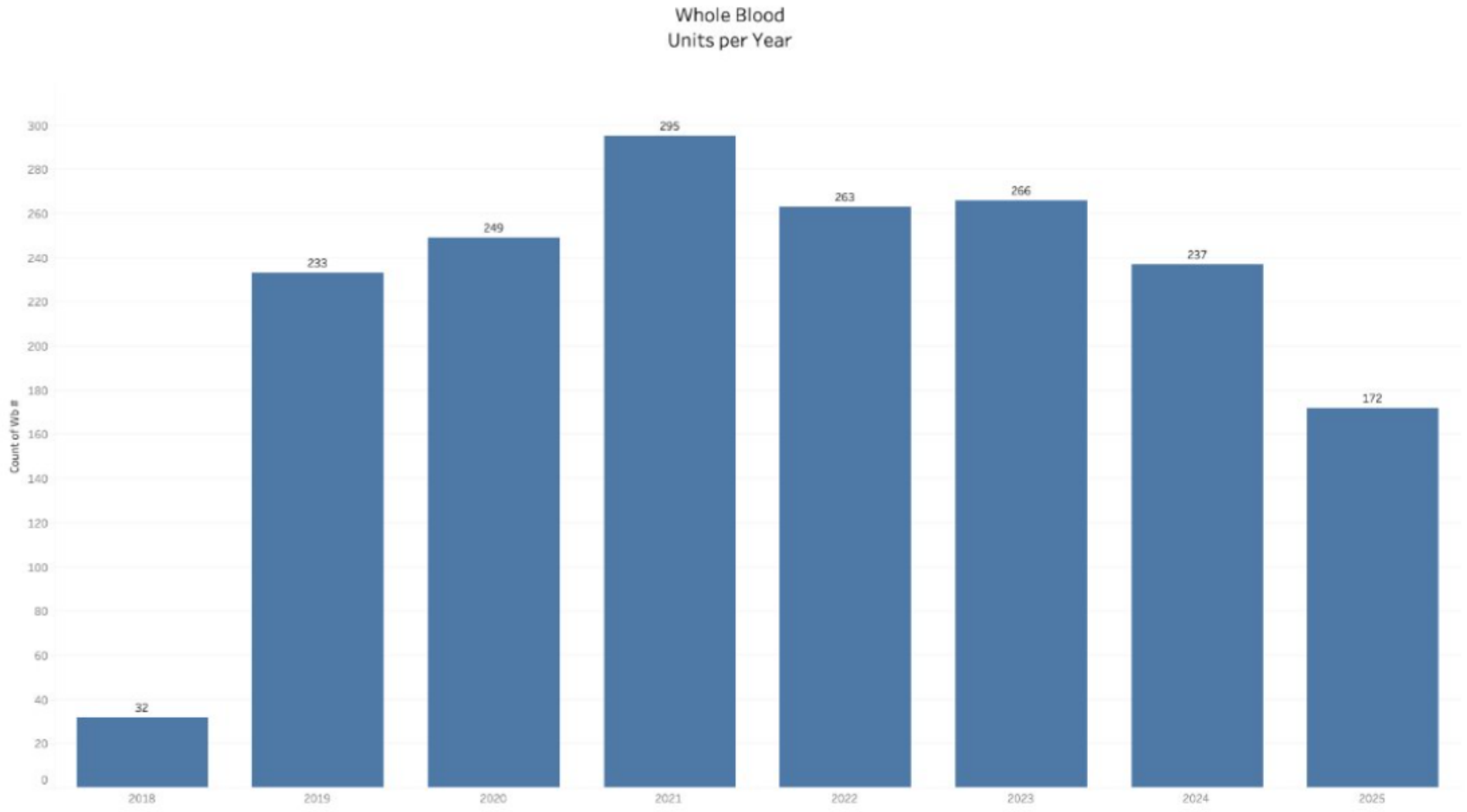


7.0 Days
Average Until Used

0 Days
Least Until Used

15 Days
Most Until Used

SAFD Prehospital LTOWB Transfused Per Year



A Safety Review of Metropolitan EMS Prehospital Whole Blood Transfusion

Emily Raetz, MD[1,2,4]; David Wampler, PhD, LP[2,6]; Leslie Greebon, MD[5], Donald Jenkins, MD[3], Brigmon, Erika, MD[3], Messenger, Jacquelyn, PhD[7], Prajapati, Vipulkumar, MD[5], Bullock, William, MPA, BS, EMT-P[8], Rayas, Emmanuel, BS[2], Barry, Lauren, BS[2], Ferguson, Brian, MD, MPH[1,2,4], Rachel Ely, MD, MPH[1,2,4], Christopher Winckler, MD[2]

[1]Brooke Army Medical Center, Department of Emergency Medicine, [2]University of Texas Health Science Center at San Antonio, Department of Emergency Health Sciences, [3]University of Texas Health Science Center at San Antonio, Department of General Surgery [4]San Antonio Uniformed Services Health Education Consortium, EMS & Disaster Medicine Fellowship, [5]University of Texas Health Science Center at San Antonio, Department of Pathology and Laboratory Medicine,[6]Southwest Texas Regional Advisory Council, [7]Brooke Army Medical Center, Pathology and Area Laboratory Services, [8]San Antonio Fire Department

Introduction

The Southwest Texas Regional Advisory Council (STRAC) started a prehospital low titer O-positive whole blood (LTOWB) program in 2018. The program includes:

- Provision of cold stored LTOWB to helicopter and ground ambulance services in the STRAC area.
- Requirement of blood storage in a blood cooler with a remotely monitored electronic temperature sensor.
- Use of a commercial re-warming device during transfusion.
- Cycling of prehospital blood to the regional blood bank for redistribution within the regional hospital system if not transfused withing 14 days.
- Regional tracking of storage and use with both electronic and paper methods.
- Prehospital transfusion criteria varies by service but follows the theory of transfusion for vitals signs indicative of shock with evidence of acute hemorrhage and is not limited by age.

It has been shown by many studies that the in-hospital transfusion of LTOWB improves outcomes in trauma patients and its use has become to be thought of as safe in a hospital setting. Studies on prehospital use and efficacy have been published throughout the literature, but few of these fully address the risks of transfusion reactions and other side effects and most involve relatively small sample sizes.

Objective

The focus of this study is to look at prehospital LTOWB transfusions in trauma patients and review for side effects or transfusion reactions to develop a safety profile.

Methods

This was a retrospective review of consecutive trauma patients who received prehospital LTOWB (Rh+) over a 54-month period.

Inclusion criteria:

- Transfusion of prehospital LOTWB
- Transported to one of two level I metropolitan trauma centers

Exclusion criteria:

- Prehospital transfusion for a non-traumatic reason
- Declared dead prior to or on arrival at the hospital
- Transfusion reaction occurred >10 days after prehospital transfusion
- Hospital blood bank records unavailable

Descriptive statistics were used for data analysis and the rate of transfusion reaction was compared to the US national average in-hospital transfusion reaction rate of 1% with a Chi-squared test of independence.

This study was deemed exempt by the institutional review boards of Brooke Army Medical Center and UT Health San Antonio.

Results

Out of 1126 prehospital transfusions 572 (51%) were included in this study. Exclusions were due to:

- Declaration of prehospital death (242, 21%)
- Non-traumatic reason for transfusion (259, 23%)
- Unavailable hospital records (53, 5%)

There were no exclusions related to reactions that occurred more than 10 days after a prehospital transfusion.

There were 3 reported transfusion reactions during the study period (Table 2). All were considered minor and there were no patient deaths related to transfusion reactions. One of the reported reactions was attributed to an in-hospital transfusion of packed red blood cells (pRBCs) by the hospital pathology department but is included here for completeness.

There were no reported instances of hemolytic reactions, transfusion-associated anaphylaxis, transfusion related acute lung injury (TRALI), or transfusion associated circulatory overload (TACO).

When compared to the US national average for transfusion reactions from all blood products the prehospital transfusion reaction counts were not significantly different ($\chi^2 = 0.325$, p-value 0.568).

Demographics	
Gender	
Male	455 (79%)
Female	101 (18%)
Unknown	16 (3%)
Age in Years	
Mean	36 (±1)
Range	2 - 93
Chief Complaint	
Gunshot	309 (54%)
Laceration	96 (17%)
MVC	55 (10%)
Stabbing	45 (8%)
Pedestrian Struck	36 (6%)
Fall	9 (2%)
Train Collision	4 (<1%)
Animal Bite	3 (<1%)
Unknown	15 (2%)
Transfusion Volume	
1 unit	564 (99%)
2 units	8 (1%)

Table 1. Demographics of patients.

Transfusion Reactions			
Type	Day of Hospitalization	Reaction Attributed to:	Notes
Febrile Non-Hemolytic	1	Whole Blood	None
Minor Allergic	1	Whole Blood	Hives and shortness of breath
Minor Allergic	4	pRBCs	Hives

Table 2. Description of transfusion reactions. pRBCs = packed red blood cells

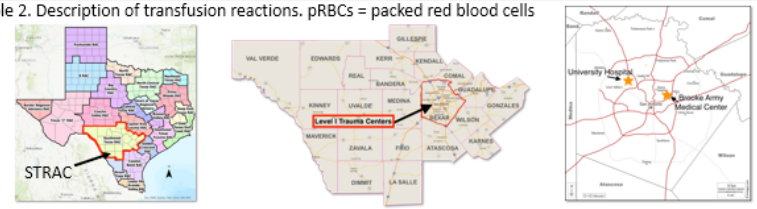


Figure 1. Map of STRAC in Texas, its counties, and the location of its two level I trauma centers.

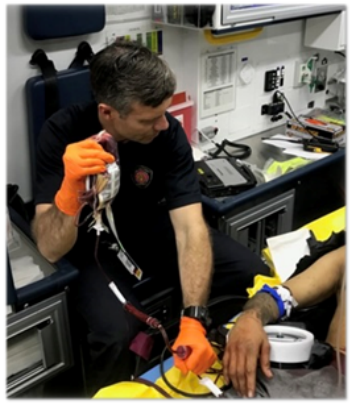


Figure 2. LTOWB Transfusion to a trauma patient using an in-line warmer

Limitations

There are several limitations to this study:

- In patients who received additional transfusions after arrival at the hospital it is difficult to determine which blood product caused the reaction.
- This study only looked at trauma patients, so applicability to patients with a non-traumatic need for transfusion cannot be determined.
- Some transfusion reactions, such as TRALI and TACO, may not be reported to the blood bank and therefore may be underreported in this study.

Conclusions

- LTOWB has a similar rate of transfusion reaction as transfusion with other blood products.
- Concerns about the safety of LTOWB should not preclude its use prehospital.
- Prehospital personnel should be trained in the recognition and management of hemolytic and non-hemolytic transfusion reactions.

Acknowledgements

We would like to acknowledge and thank all the medics in the STRAC region who contributed both to this research and to saving the lives of hundreds of patients through the transfusion of prehospital blood. We also acknowledge the contributions of STRAC and its members who made this regional prehospital blood transfusion system possible.

Southwest Texas Regional Advisory Council

Contributing Factors for Paramedic Transfusion of Prehospital Whole Blood

Brian Ferguson, LCDR,USN, DO[1,3]; William Bullock LP[2], Emmanuel Giovanni Rayas MS2[1], Mark Dieterle LP[1], David Wampler PhD, LP[1], and Christopher "CJ" Winckler MD[1]

UT Health Science Center at San Antonio, Department of Emergency Health Sciences, Texas[1];San Antonio Fire Department, Texas[2]; San Antonio Uniformed Services Health Education Consortium, Texas (SAUSHEC)[3]

Introduction

- Hemorrhage is the leading cause of preventable death from trauma.
- Advancements in hemorrhage control over the last few decades have improved but not significantly changed mortality rates in hemorrhagic shock.
- Hemorrhagic shock continues to be a focus of military and civilian training programs in the form of damage control resuscitation (DCR). The overarching concept of DCR is hemostatic compression with blood products or whole blood.
- The Committee on Tactical Combat Casualty Care (CoTCCC) recommends whole blood as the preferred resuscitation fluid in DCR.
- SAFD has up to 9 units of Low Titer O+ Whole Blood (LTOWB) available for use for DCR at any time.

Study Goal

The goal of the study was to determine triggers for transfusion of LTOWB along with the when, where, and by which units most blood were given.

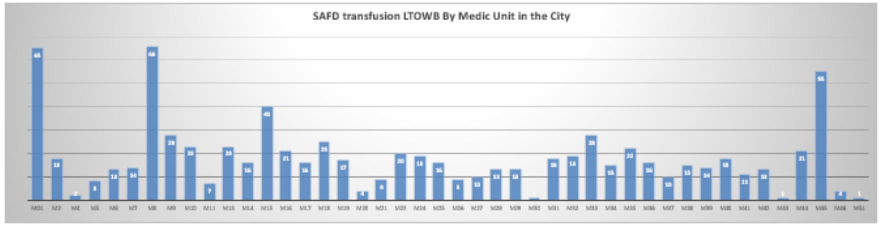
Figure 1: San Antonio Fire Department EMS medical officer supervisor vehicles (top) and medical special operations unit MICU ambulances (right) are both equipped with whole blood.
Photos: San Antonio Fire Department

Methods

- This was a retrospective review of consecutive prehospital whole blood use records over a 40-month period.
- Demographic data were described using mean and standard deviation.
- The Chi square for independence was used to compare the degree of sole trigger to transfusion status between groups; (Group1; SBP<70, Group 2; ETCO2<=25, Group 3 SI>=1.2).

Results

- During the 40-month Study period 827 patients were transfused at least one unit of LTOWB.
- Mean age 41.5, median 37, mode was 30, SD= 18.7, min age 3, max was 97.
- Males Represented 74%, Summer was highest season, September greatest month, Friday was the most frequent day and between hours of 2100-2200 were the most frequent hour.
- 75% of blood is used in trauma with the most common mechanism of injury (MOI) was shooting, followed closely by stabbing.
- Paramedics must have a suspicion of hemorrhagic shock to administer LTOWB with SBP<70, Shock Index (SI) >1.2, or ETCO2 < 25.
- Paramedics at SAFD frequently have several indications at the same time but the most common single trigger is ETCO2 < or equal to 25.

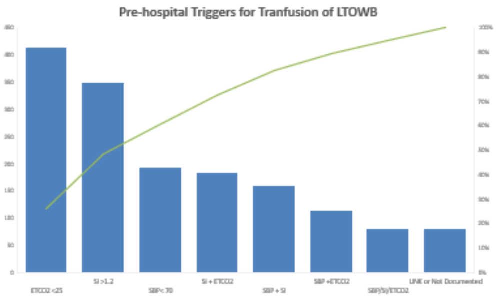


Limitations

- Limitations include the retrospective nature of the study.
- Documentation done by clinicians in the field.

Conclusion

- LTOWB has been used in San Antonio Fire Department for over four years.
- Since 2018 SAFD has transfused over 1000 units of LTOWB in the field.
- Paramedics most common single trigger for transfusion is ETCO2<=25; more than SBP<70, or SI >= 1.2.



"The views expressed in this article reflect the results of research conducted by the author and do not necessarily reflect the official policy or position of the Department of the Navy, Department of Defense, nor the United States Government."

WB San Antonio—Reduced Early Mortality

Transfusion. 2021 Jul:61 Suppl 1:S15-S21. doi: 10.1111/trf.16528.

Prehospital whole blood reduces early mortality in patients with hemorrhagic shock

Maxwell A Braverman [1], Alison Smith [1], Douglas Pokorny [1], Benjamin Axtman [1], Charles Patrick Shahan [1], Lauran Barry [1], Hannah Corral [1], Rachelle Babbitt Jonas [1], Michael Shiels [2], Randall Schaefer [3], Eric Epley [3], Christopher Winckler [4], Elizabeth Waltman [5], Brian J Eastridge [1], Susannah E Nicholson [1], Ronald M Stewart [1], Donald H Jenkins [1]

Results: A total of 538 patients met inclusion criteria. Patients undergoing PHT had worse shock physiology (median SI 1.25 vs. 0.95, $p < .001$) with greater reversal of shock upon arrival (-0.28 vs. -0.002, $p < .001$). In a propensity-matched group of 214 patients with prehospital shock, 58 patients underwent PHT and 156 did not. Demographics were similar between the groups. Mean improvement in SI between scene and ED was greatest for patients in the PHT group with a lower trauma bay mortality (0% vs. 7%, $p = .04$). No survival benefit for patients in prehospital cardiac arrest receiving LTOWB was found ($p > .05$).

Discussion: This study demonstrated that trauma patients who received prehospital LTOWB transfusion had a greater improvement in SI and a reduction in early mortality. Patient with prehospital cardiac arrest did not have an improvement in survival. These findings support LTOWB use in the prehospital setting. Further multi-institutional prospective studies are needed.

SWIFT Trial—WB Non-Inferior

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Prehospital Whole Blood in Traumatic Hemorrhage — A Randomized Controlled Trial

Authors: Jason E. Smith, M.D., Rebecca Cardigan, Ph.D., Emily Sanderson, M.Sc., Laura Silsby, B.Sc., Claire Rourke, M.Sc., Ed B.G. Barnard, Ph.D. , Peter Basham, B.Sc., +18 , for the SWiFT Trial Group* Author Info & Affiliations

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CME

RESEARCH SUMMARY

Prehospital Whole Blood in Traumatic Hemorrhage

RESULTS

A total of 942 patients underwent randomization. After the exclusion of participants with nontraumatic hemorrhage or traumatic cardiac arrest, 616 were included in the analysis (314 in the whole-blood group and 302 in the standard-care group). A primary-outcome event occurred in 48.7% of the participants in the whole-blood group and in 47.7% of those in the standard-care group (relative risk, 1.02; 95% confidence interval, 0.80 to 1.31; P=0.84). The incidence of death from any cause at all time points, massive transfusion, and other secondary outcomes appeared to be similar in the two groups. Prothrombin times were above the normal range in 40.7% of the participants in the whole-blood group and in 30.5% of those in the standard-care group. More serious adverse events occurred in the standard-care group than in the whole-blood group (37 and 31, respectively). The incidence of thrombotic events appeared to be similar in the two groups.

CONCLUSIONS

Among participants with life-threatening hemorrhage, prehospital transfusion of 2 units of whole blood was not superior to standard care in reducing the risk of death or massive transfusion within 24 hours. (Funded by NHS Blood and Transplant and others; ISRCTN Registry number, ISRCTN23657907.)

TOWAR Trial—WB Non-Inferior

The NEW ENGLAND JOURNAL of MEDICINE

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ORIGINAL ARTICLE

Prehospital Resuscitation with Type O Whole Blood for Trauma and Hemorrhage

Authors: Jason L. Sperry, M.D., M.P.H., Francis X. Guyette, M.D., M.P.H., Bryan A. Cotton, M.D., James F. Luther, M.A., Richard B. Utarnachitt, M.D., Matthew E. Kutcher, M.D. , Brian J. Daley, M.D., +24 , for the TOWAR Study Group* Author Info & Affiliations

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RESEARCH SUMMARY

Type O Whole Blood for Prehospital Resuscitation

RESULTS

Of 1020 eligible patients transported to hospitals by the air bases, 715 were assigned to receive whole blood and 305 to receive blood components; 695 and 298, respectively, were included in the primary analysis. Mortality at 30 days was 25.9% in the whole-blood group and 20.5% in the component group (adjusted odds ratio, 1.24; 95% confidence interval [CI], 0.87 to 1.76; P=0.24). No substantial between-group differences in adverse events were observed. In the observational substudy, 30-day mortality was 27.1% among 210 patients who received whole blood with a storage age of 15 to 21 days and 26.4% among 443 patients who received whole blood with a storage age of 1 to 14 days (adjusted odds ratio, 0.99; 95% CI, 0.74 to 1.32).

CONCLUSIONS

In injured patients with hemorrhagic shock, the use of whole blood for prehospital transfusion did not result in lower 30-day mortality than the use of blood components. (Funded by the Defense Health Agency Research Technology Portfolio Management, Combat Casualty Portfolio; TOWAR ClinicalTrials.gov number, NCT04684719.)

Administration of Blood

- Scope of Practice- Not Recognized in DOT
- FDA
  - Blood Circular Available
  - Consent is technically required
  - Physicians Signature
  - Double Typing of Blood
  - Storage vs Transport Temps
  - Approved Blood Products
  - No Such thing as FDA Accreditation

AABB Standards for Prehospital Use

- Recommended , not required !
- Identifies parties
  - Administration Services
  - Transfusion Service
- Incorporates Best Practices
- Double Typing of Blood
- Temp Management
- Reactions and Notifications
- Mirrors FDA Standards
- We are training the accreditors

National Coalition for Prehospital Blood

PREHOSPITAL
BLOOD TRANSFUSION
INITIATIVE COALITION

Vision

- Prehospital blood products are available to every bleeding patient for whom these products are medi
- Every provider is properly and appropriately reimbursed for prehospital blood products.

Mission

- Establish reimbursement coverage, from both government and commercial payors, for prehospital bl
- Ensure prehospital blood transfusion is included appropriately in the prehospital clinical scope of pra and jurisdictions across the United States.

Texas Coalition for Prehospital Blood

Governor's EMS/Trauma Advisory Council
Prehospital Whole Blood Task Force Agenda

Vision:
Provide Texans with emergency blood transfusions when and where they need it regardless of location.

Mission:
The mission of the Prehospital Whole Blood Task Force is to enhance emergency medical response capabilities, improve patient outcomes through the sustainable integration and utilization of whole blood transfusion in prehospital settings.

Purpose:
Our purpose is to improve survival rates and outcomes for patients across Texas by ensuring timely access to whole blood, promoting best practices in prehospital transfusion and fostering collaboration among emergency medical services, hospitals, blood banks, Regional Advisory Council's, and other stakeholders. We are dedicated to increasing blood donations, advancing education, research, and policies that support the effective and efficient use of whole blood as a life-saving intervention in prehospital care.

Goals/ Tasks:

- Establish Regional Rotation Systems to ensure lowest wastage and highest efficiency
- Develop an Approved Products List that is supported by participating blood centers
- Develop and Implement a Common Operational Picture of PH WB
- Develop additional MCI Push Packs that can be rapidly deployed
- Develop and Implement Walking Blood Bank (WBB) procedures, prioritizing our rural facilities and communities.

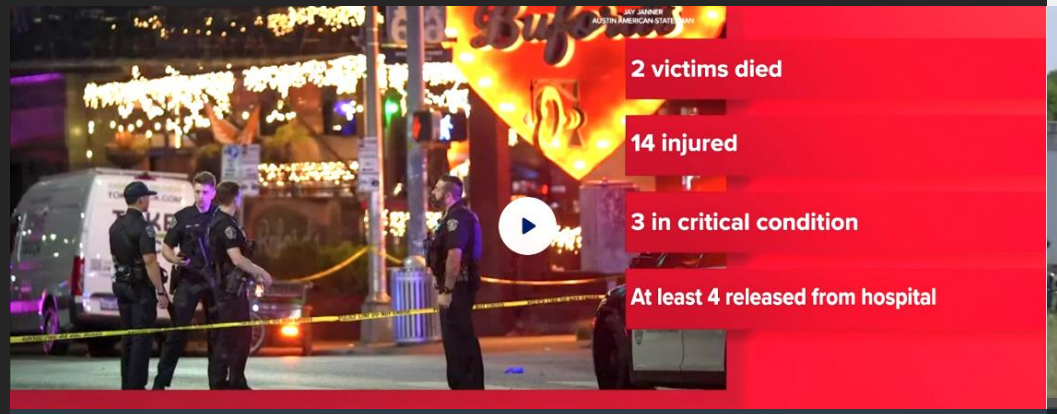
Spray Dried Plasma For MCI

Uvalde Mass Shooting

- 20 Units of Whole Blood Onscene within 30 minutes
  - 17 units with HEMS
  - 3 Units with EMS
- 20 Units of Blood Sent to Local Hospital
  - 10 Units of Whole Blood
  - 10 Units of PRBCs O – (O negative)
- 1 Unit of WB transfused in hospital
- 1 Unit of WB transfused enroute to trauma center

MCI Prehospital Transfusions—Best Practice—More Blood

- Currently Constrained by Blood Availability and Time to Scene/Patient



AUSTIN MASS SHOOTING

FBI investigating 'potential nexus to terrorism' in 6th Street shooting that left two dead, 14 injured | Shooter also killed

The Austin Police Department says 3 people are dead, including the suspect, and 14 were injured after a shooting just before 2 a.m. The

PUBLIC SAFETY

SAPD: 4 killed, others hurt after stolen car crashes into bus heading to Eagle Pass

More than a dozen people were hospitalized as of 4 p.m. Thursday, according to Chief McManus. Authorities are looking for four

Questions

- C. J. Winckler MD, LP
- winckler@uthscsa.edu

UT Health San Antonio
Emergency Health Sciences

Office of the Medical Director

TEXAS DEPARTMENT OF STATE HEALTH SERVICES
EMS MEDICAL DIRECTOR