

# Deployment of Whole Blood Multnomah County EMS The Process

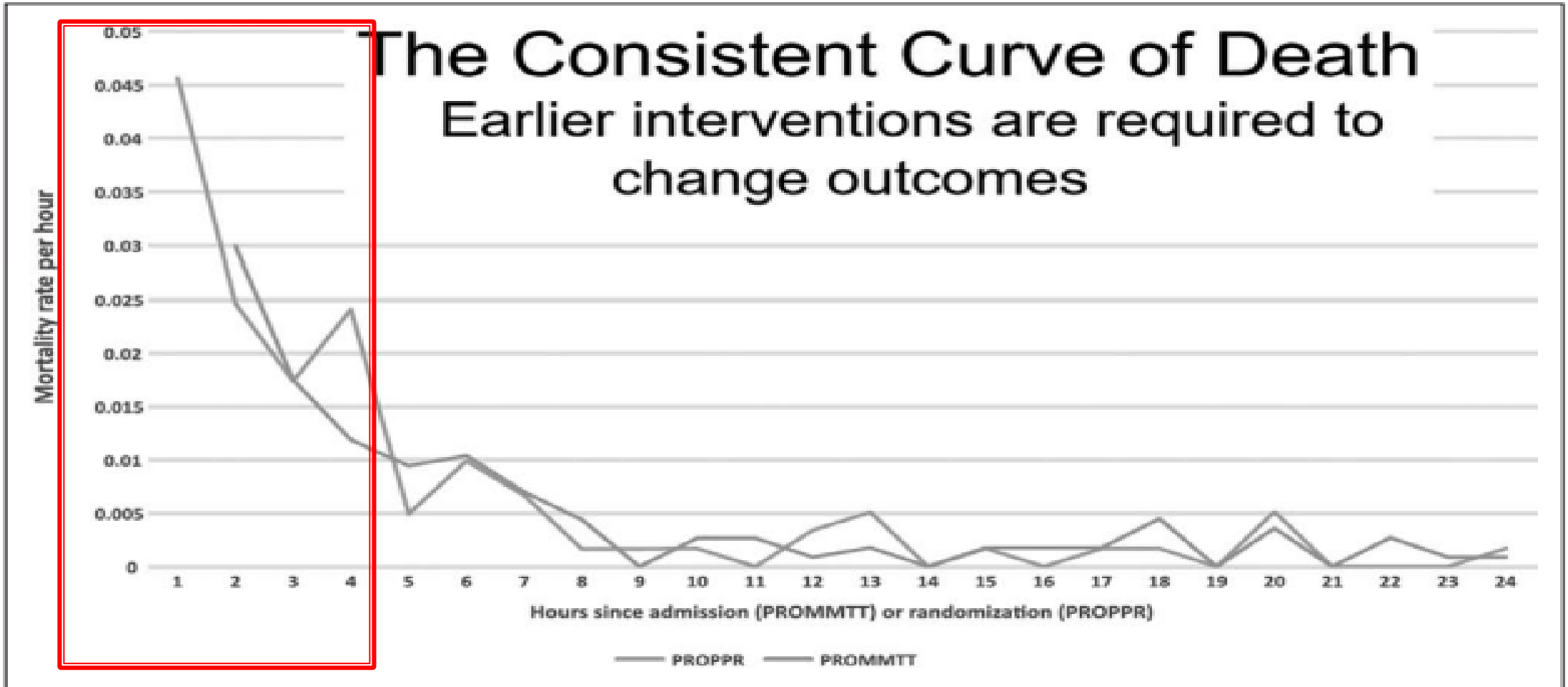
# EMS Whole Blood Deployment Process of Implementation

- The science
- Trauma center collaboration and endorsement
- Blood Bank
- Analysis of candidate patients
- Medical protocol (indications and procedure of transfusion)
- Key stakeholders (Pediatrics / OB-GYN / Fire / EMS)
- Deployment strategies
- Operations
  - Equipment and supplies
  - Operations
    - Storage
    - Rotation of blood
    - Paperwork
- Cost
- Training

# Mortality in Trauma: Timing of Critical Interventions

## Transport Time and Preoperating Room Hemostatic Interventions Are Important: Improving Outcomes After Severe Truncal Injury

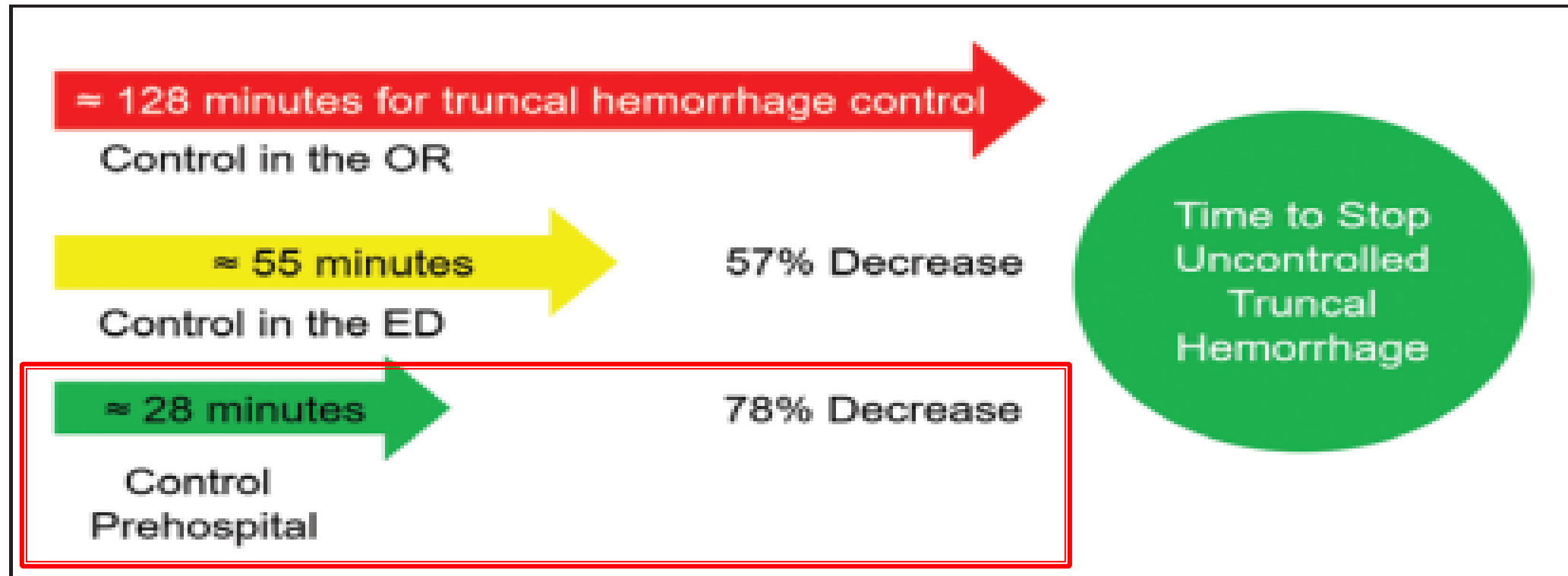
John B. Holcomb, MD, FACS



**Figure 2.** After admission, PRospective Observational Multicenter Major Trauma Transfusion (PROMMTT) and Pragmatic Randomized Optimal Platelet and Plasma Ratio (PROPPR) patients die early and at a very reproducible rate,  $n = 1,925$ . Modified from Fox et al (22).

Curve of Death

# Timing and Location of Interventions vs Survival



**Figure 4.** Timeline of truncal hemorrhage control. ED = emergency department, OR = operating room.

Published in final edited form as:

*Lancet*. 2018 July 28; 392(10144): 283–291. doi:10.1016/S0140-6736(18)31553-8.

**COMBAT**

Plasma-first resuscitation to treat haemorrhagic shock during emergency ground transportation in an urban area: a randomised trial

**TIMING**



Original Investigation

FREE

February 3, 2015

Transfusion of Plasma, Platelets, and Red Blood Cells in a 1:1:1 vs a 1:1:2 Ratio and Mortality in Patients With Severe Trauma  
The PROPPR Randomized Clinical Trial

John B. Holcomb, MD<sup>1</sup>; Barbara C. Tilley, PhD<sup>2</sup>; Sarah Baraniuk, PhD<sup>2</sup>; et al

> Author Affiliations | Article Information

JAMA. 2015;313(5):471-482. doi:10.1001/jama.2015.12

**PROPPR**

**MATTERS**

The NEW ENGLAND  
JOURNAL of MEDICINE

ESTABLISHED IN 1812

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VOL. 379 NO. 4

**PAMPer**

Prehospital Plasma during Air Medical Transport in Trauma Patients at Risk for Hemorrhagic Shock

J.L. Sperry, F.X. Guyette, J.B. Brown, M.H. Yazer, D.J. Triulzi, B.J. Early-Young, P.W. Adams, B.J. Daley, R.S. Miller, B.G. Harbrecht, J.A. Claridge, H.A. Phelan, W.R. Witham, A.T. Putnam, T.M. Duane, L.H. Alarcon, C.W. Callaway, B.S. Zuckerbraun, M.D. Neal, M.R. Rosengart, R.M. Forsythe, T.R. Billiar, D.M. Yealy, A.B. Peitzman, and M.S. Zenati, for the PAMPer Study Group\*

Resuscitation with blood products in patients with trauma-related haemorrhagic shock receiving prehospital care (RePHILL): a multicentre, open-label, randomised, controlled, phase 3 trial



**RePHILL**

Nicholas Crombie, Heidi A Doughty, Jonathan R B Bishop, Amisha Desai, Emily F Dixon, James M Hancock, Mike J Herbert, Caroline Leech, Simon J Lewis, Mark R Nash, David N Naumann, Gemma Slinn, Hazel Smith, Iain M Smith, Rebekah K Wale, Alastair Wilson, Natalie Ives, Gavin D Perkins, on behalf of the RePHILL collaborative group\*



Summary

**Background** Time to treatment matters in traumatic haemorrhage but the optimal prehospital use of blood in major trauma remains uncertain. We investigated whether use of packed red blood cells (PRBC) and lyophilised plasma (LyoPlas) was superior to use of 0.9% sodium chloride for improving tissue perfusion and reducing mortality in trauma-related haemorrhagic shock.

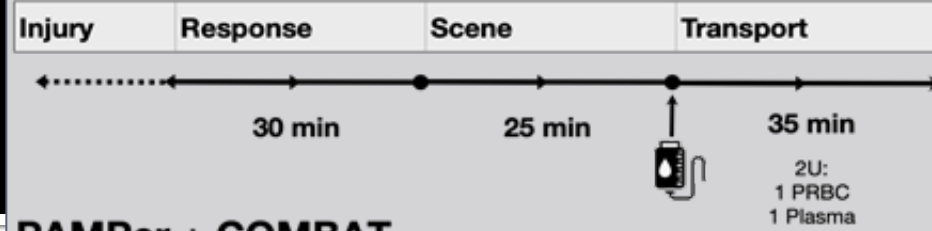
Lancet Haematol 2022  
Published Online  
March 7, 2022  
https://doi.org/10.1016/  
S2352-3026(22)00040-0

- 55 min. to start of blood admin
- 1u PRBCs 1u plasma 35 min.

## New Orleans

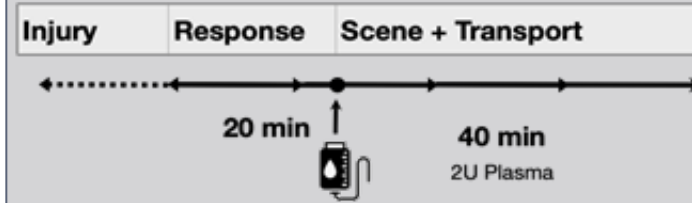
- 25 min. to start of blood admin
- 2u PRBCs 10 min. (600 mL)

### RePHILL



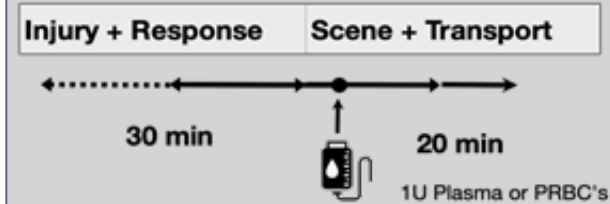
Pen	Blunt	NCTH	Severe TBI	Arrest	24H blood	Mortality
23%	78%	82%	48%	14%	11.3 U	42% *excludes arrest

### PAMPer + COMBAT



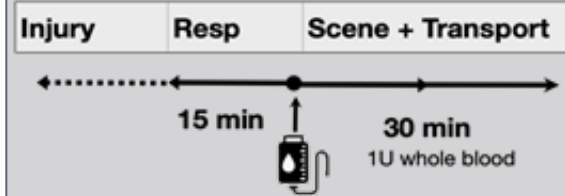
Pen	Blunt	NCTH	Severe TBI	Arrest	24H blood	Mortality
28%	73%	-	34%	13%	10u (?)	20.5%

### MEDEVAC



Pen	Blunt	NCTH	Severe TBI	Arrest	24H blood	Mortality
16%	84%	56%	20%	-	15U	11%

### San Antonio



Pen	Blunt	NCTH	Severe TBI	Arrest	24H blood	Mortality
63%	37%	-	-	7%	33% 10U 24h	29%

### NOEMS



Pen	Blunt	NCTH	Severe TBI	Arrest	24H blood	Mortality
95%	5%	95%	-	33%	6U	33% *includes arrest

**Is it Operationally feasible for civilian units to carry whole blood**



**San Antonio Texas**

**Regional Whole Blood Program**

**Three-year update on Prehospital and in hospital  
transfusion Practices**

# STRAC Regional Trauma and EMS System

SS2

TRANSFUSION

BRAVERMAN ET AL.

REGIONAL TRAUMA & EMERGENCY HEALTHCARE SYSTEM

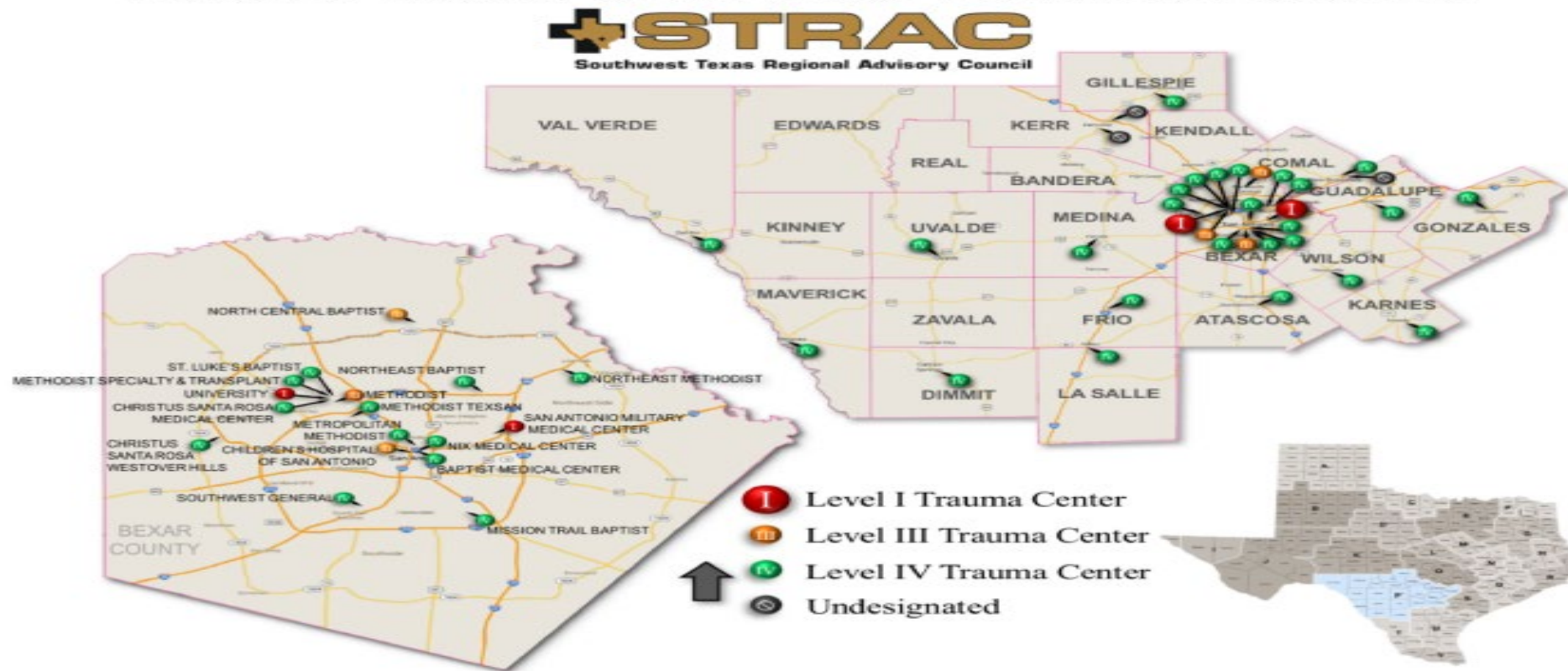


FIGURE 1 South Texas regional advisory council: Regional trauma system map. Adapted from <https://www.strac.org/trauma>

# New Orleans EMS Whole Blood Experience



IMAGETREND  
**CONNECT**  
2022

focused  
on the  
**FUTURE**



**Meg Marino, MD\***  
Director/Medical Director



\*Serve on Medical  
Advisory Board for  
ImageTrend



**Emily Nichols, MD\***  
Deputy Medical Director

# EMS Transfusion Criteria

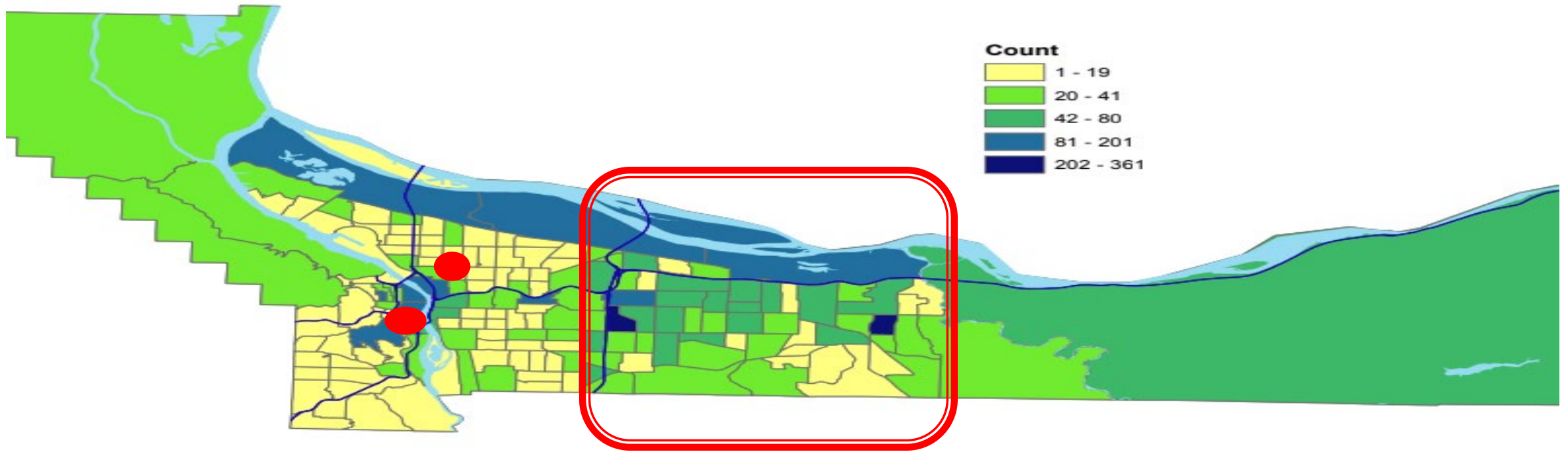
# STRAC Whole Blood Transfusion criteria

- Shock index greater than 1,
- SBP < 90 mm Hg,
- Witnessed traumatic arrest,
- Cardiac arrest less than 5 minutes for penetrating injuries and/or ETCO<sub>2</sub> < 25

# Analysis of Whole Blood Candidates

# Geospatial Incident Location of Trauma Patients SBP < 90

Trauma Patients: 2019-2022



# Trauma Patients with SBP < 90 or MAP < 65

Trauma patients with SBP<90 or MAP<65 at any time during the call.

2020		2021		2022	
<b>Total</b>	<b>118</b>	<b>Total</b>	<b>122</b>	<b>Total</b>	<b>114</b>
<b>TR3</b>	<b>31</b>	<b>TRAF2</b>	<b>10</b>	<b>TRAF2</b>	<b>19</b>
<b>AS1</b>	<b>18</b>	<b>TR3</b>	<b>9</b>	<b>27B0G</b>	<b>8</b>
<b>TA1</b>	<b>14</b>	<b>AS1</b>	<b>9</b>	<b>TRAF1</b>	<b>8</b>
<b>TA1P</b>	<b>13</b>	<b>TA1PED</b>	<b>7</b>	<b>TRAFP</b>	<b>6</b>
<b>TA1PED</b>	<b>10</b>	<b>17D4G</b>	<b>6</b>	<b>17D4G</b>	<b>5</b>
<b>TR1</b>	<b>7</b>	<b>27B0G</b>	<b>6</b>	<b>EMS2</b>	<b>5</b>
<b>AS3</b>	<b>5</b>	<b>TRAF1</b>	<b>6</b>	<b>17D3</b>	<b>4</b>
<b>TR4</b>	<b>5</b>	<b>TA1</b>	<b>5</b>	<b>TRAFR</b>	<b>4</b>
<b>TA1R</b>	<b>3</b>	<b>TR1</b>	<b>5</b>	<b>27D3S</b>	<b>3</b>
<b>UN1</b>	<b>3</b>	<b>CPR</b>	<b>3</b>	<b>33C3T</b>	<b>3</b>



# Operational Aspects : Equipment

# Blood Cooler

## Crēdo ProMed™



# Blood Bank Refrigerator



- **Nonreversible Temperature Indicators for Blood Products and Temperature-Sensitive Biologicals**
- Safe-T-Vue<sup>®</sup> 10 is a temperature-sensitive indicator that takes the guesswork out of whether or not blood products, plasma and RBCs have maintained temperature compliance during transport.

# Blood Warmer : QinFlow Warrior and Warrior Extreme



# LifeFlow Plus Blood Infusor

**LifeFlow PLUS is a hand-operated rapid infuser that allows clinicians to rapidly deliver blood, blood components, crystalloids or colloid fluids to critically ill patients requiring volume resuscitation.**



# Old Fashion Pressure Bag

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# Blood Bank Refrigerator



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# Operations

- Actual Process of Selection and Transfusion
- Patient selection
- IV access
- Prepare equipment
  - Blood Tubing
  - Blood warmer
  - Pressure bag
  - IV Fluid Saline
- Paperwork – Blood Bank Tracking
- Requires at least 2 providers during transport
- Trainer





## Site Visit to EMS Agency administrating Whole Blood in the Field

## Special Topics

- Women of childbearing age
- Pediatric

**The End**

# Multi-Variable, NON-Linear Progress in Whole Blood (w/Transient Regressions)

## The Oklahoma City Experience Gathering of Eagles 2023

**Jeffrey M. Goodloe, MD, NRP, FACEP, FAEMS, LSSBB**  
Chief Medical Officer, Medical Control Board  
EMS System for Metropolitan Oklahoma City & Tulsa  
Professor & EMS Section Chief, Department of Emergency Medicine  
University of Oklahoma School of Community Medicine  
Medical Director, Oklahoma Highway Patrol



 @drjeffgoodloe





Who are the two typical key stakeholders in a “whole blood in EMS” program?



What is the most common roadblock to effective “whole blood in EMS” programs? (\$\$\$\$\$)



Are there predictors we can use to avoid unneeded EMS transfusions of whole blood?

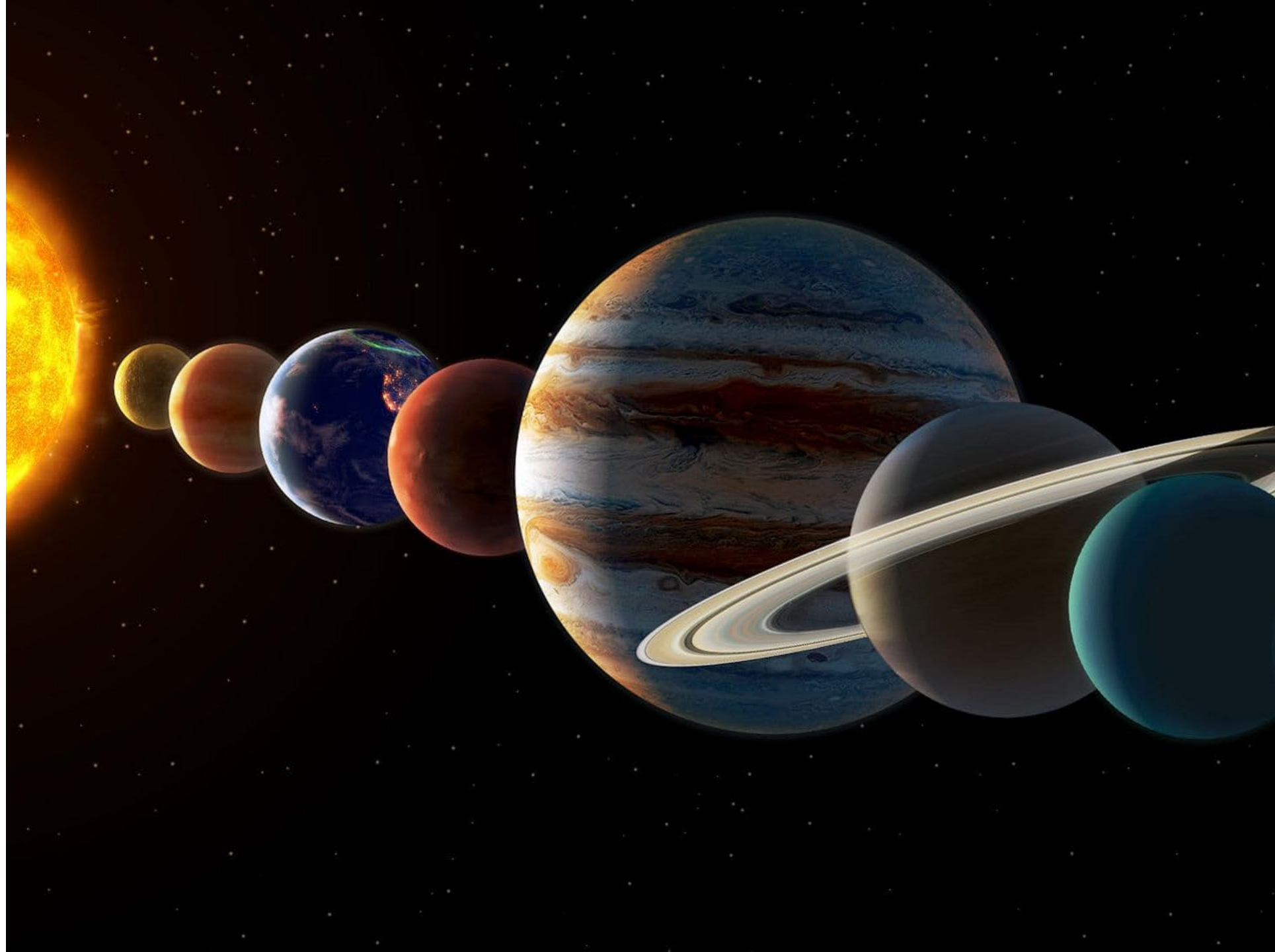


# Stakeholders

- EMS – frontline, support line & all other lines
- Governance – city? county? boards?
  - Attorneys
- Trauma surgeons (and hospitals!)
- Blood banks
  - Trauma Center
  - Regional (production capability/donor supply)









Nov 30, 2022





# Pitfalls to Avoid

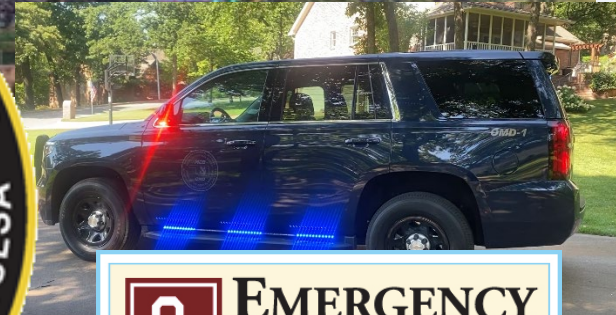
## Protecting a Scarce Resource

- Ground level falls
- “A lot of blood” ...without verifying vital signs
- Isolated head injury
- All Oklahoma City protocols on whole blood at [www.okctulomd.com](http://www.okctulomd.com)





**TULSA**



**OKLAHOMA CITY**



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