

# Tranexamic Acid and Trauma

KARL SPORER, ALAMEDA COUNTY EMS AGENCY



## ORIGINAL RESEARCH

# Tranexamic Acid in Civilian Trauma Care in the California Prehospital Antifibrinolytic Therapy Study

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# California Prehospital Fibrinolytic Trial

- ▶ Tranexamic Acid
  - ▶ Inhibits Fibrinolysis
  - ▶ CRASH 2 Trial demonstrated 1.5 to 2.4% mortality benefit in severe trauma patients
  - ▶ 20,000 patients were randomized
  - ▶ Secondary studies demonstrated that earlier use improved survival

# California Prehospital Fibrinolytic Trial

- ▶ Multi center, prospective cohort with a retrospective cohort
- ▶ Three California Counties implemented TXA in 362 severe trauma patients
  - ▶ San Bernardino
  - ▶ Riverside
  - ▶ Alameda
- ▶ 362 Propensity Score Matching Cases

# California Prehospital Fibrinolytic Trial

- ▶ Primary Outcomes
  - ▶ Mortality at 24 hours, 48 hours, 28 days
  - ▶ Total Blood Products
  - ▶ Hospital and ICU length of stay

# California Prehospital Fibrinolytic Trial

- ▶ Mortality at 28 Days
  - ▶ TXA 3.6%
  - ▶ Control 8.3%
- ▶ Severely injured (ISS >15), 28 day mortality
  - ▶ TXA 6%
  - ▶ Control 14.5%
- ▶ Significant Reduction in Blood Transfusion requirements

# California Prehospital Fibrinolytic Trial

- ▶ Real World Implementation in three counties
- ▶ Hospital infusion is commonly not performed
- ▶ Average to poor EMS compliance
- ▶ Morality and Blood Transfusion improvements despite these issues

# TXA in TBI

(2 gm IV bolus appears be beneficial in ICH)

Craig Manifold, DO

Sharing information presented at the 2018 Military Health  
System Research Symposium

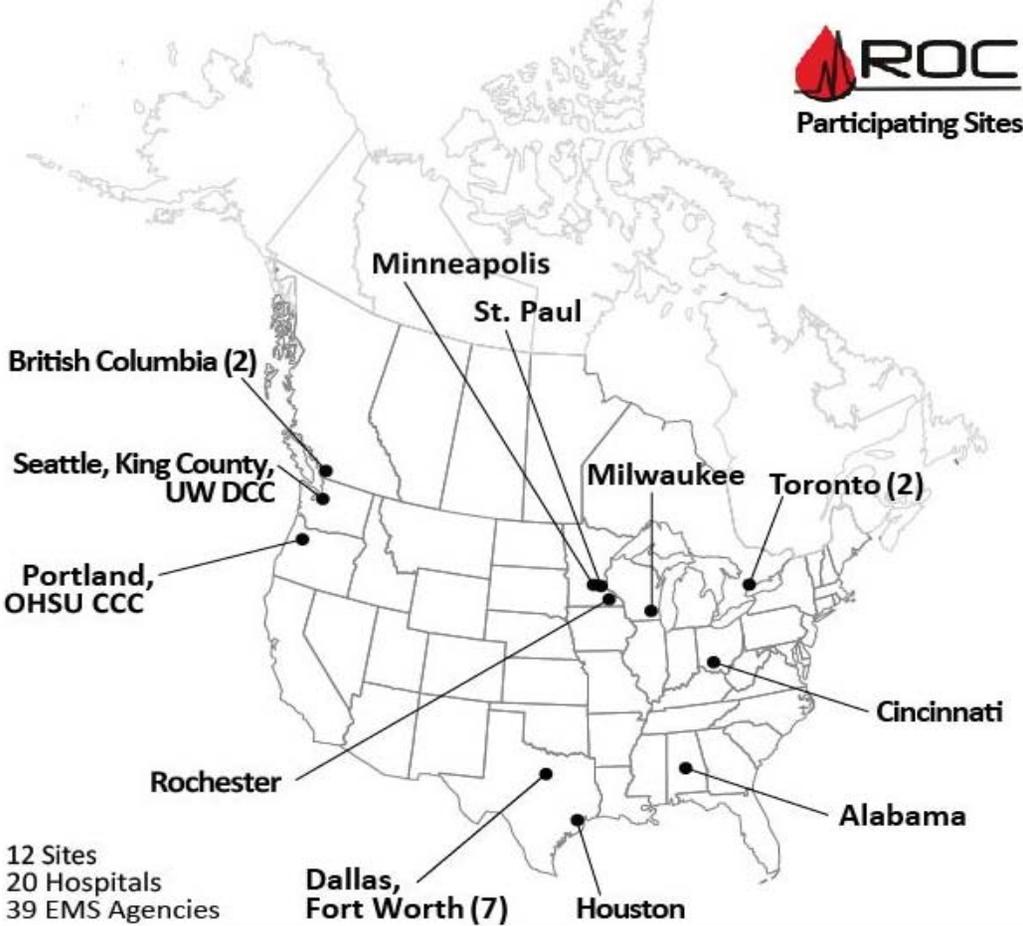
# A Two Gram Bolus of Tranexamic Acid Improves Survival After Traumatic Brain Injury in Patients with Intracranial Hemorrhage

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COL, MC, USAR  
Professor of Surgery  
Oregon Health & Science University



- 3-arm randomized trial (1:1:1)
- Multi-center, multi-national
- Double-blinded
- Key coded kits placed on rigs and replaced at trauma center when used





12 Sites  
20 Hospitals  
39 EMS Agencies

To determine the effects of two dosing strategies of TXA on outcome following moderate to severe TBI



- No difference in favorable neurologic outcome at 6 months (primary)
- No difference in 28 day survival
- No difference in morbidity

Comparing patients who received 2 dosing strategies of TXA to those who did not receive TXA



### **Inclusion Criteria**

- Blunt or penetrating TBI
- GCS = 3 - 12
- Prehospital SBP  $\geq$  90 mmHg
- Age  $\geq$ 15 y/o, or  $\geq$ 50 kg, if age unknown
- IV placed
- Planned transport to participating hospital

### **Exclusion Criteria**

- GCS = 3 with no reactive pupil
- > 2 hours from time of injury or time unknown
- Any prehospital CPR
- Seizures, MI, stroke, dialysis
- Known or suspected prisoners
- Known/suspected pregnancy
- Drowning or hanging
- Burns >20% TBSA
- TXA or pro-coagulant drug
- Opt out





# Randomization Groups

- 2 gram PH bolus, 8 hour IH placebo infusion
  - BO
- 1 gram PH bolus, 8 hour IH 1 gram infusion
  - BM
- Placebo PH bolus, 8 hour IH placebo infusion
  - PB



- Enrollment from May 2015 – Mar 2017
- 967 patients randomized and received drug
  - 346\* BO
  - 312 BM
  - 309 PB

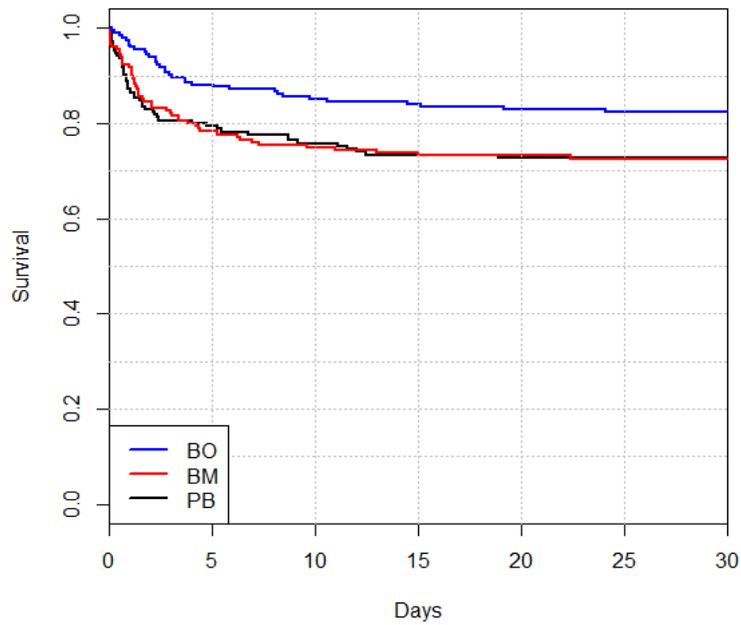
\* 1 excluded from analysis because enrolled while in police custody



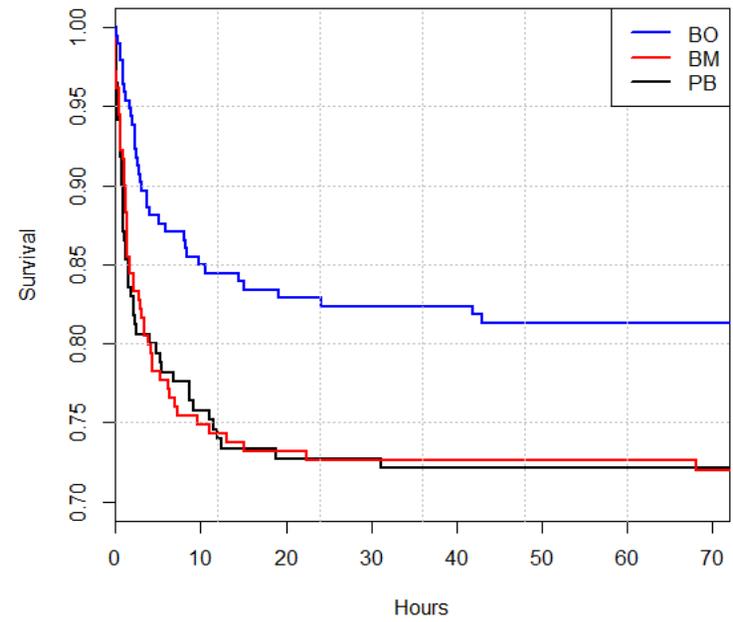
	28-Day Mortality, n (%)			OR for 28-Day Mortality (95% CI)		
	PB	BM	BO	Pairwise Comparisons		
				BM v. PB	BO v. PB	BO v. BM
<b>Mortality</b>						
All patients	53 (17)	53 (17)	41 (12)	1.01 (0.66, 1.55)	0.66 (0.42, 1.03)	0.65 (0.42, 1.02)
ICH on initial CT	51 (28)	51 (28)	36 (18)	1.03 (0.56, 1.88)	0.47 (0.25, 0.89)	0.46 (0.25, 0.86)



ICH patients through 30 days



ICH patients through 72 hours



	PB N = 309	BM N = 312	BO N = 345
<b><i>Key adverse events, n (%)</i></b>			
Seizure	7 (2)	5 (2)	17 (5)
Any thromboembolic event	30 (10)	13 (4)	32 (9)
MI	1 (0)	3 (1)	2 (1)
PE	5 (2)	3 (1)	6 (2)
Thrombotic stroke	10 (3)	3 (1)	13 (4)
DVT	9 (3)	3 (1)	9 (3)
Other	10 (3)	1 (0)	13 (4)



# Conclusions

- Prehospital TXA use is feasible
- Does not result in favorable GOSE at 6 months
- Does not affect TEG on admit
- 2 grams prehospital TXA results in improved 28 day survival in patients with ICH
- 1<sup>st</sup> therapeutic with evidence for benefit in acute TBI
- What about hemorrhagic shock?



09:35



Trauma

T-06



### Head Trauma

<b>History</b> <ul style="list-style-type: none"> <li>• Time of injury</li> <li>• Mechanism (blunt / penetrating)</li> <li>• Loss of consciousness</li> <li>• Bleeding</li> <li>• Medical history</li> <li>• Medications</li> <li>• Allergies</li> <li>• Evidence of multi-trauma</li> <li>• Helmet use or damage to helmet</li> </ul>	<b>Signs and Symptoms</b> <ul style="list-style-type: none"> <li>• Pain, swelling, bleeding</li> <li>• Abnormal mental status</li> <li>• Unresponsive</li> <li>• Respiratory distress / failure</li> <li>• Vomiting</li> <li>• Significant mechanism of injury</li> <li>• Pupillary abnormalities</li> <li>• CSF leaking from ears, nose, mouth</li> </ul>	<b>Differential</b> <ul style="list-style-type: none"> <li>• Skull fracture</li> <li>• Brain injury (contusion, concussion, hemorrhage, or laceration)</li> <li>• Epinephrine-induced hypertension</li> <li>• Acute intracranial hemorrhage</li> <li>• Subarachnoid hemorrhage</li> <li>• Spinal injury</li> <li>• Abuse</li> </ul>
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<b>Universal Patient Care Protocol (U-01)</b> <b>Spinal Motion Restriction (S-05)</b>	<b>Assess GCS</b>	<b>GCS 3-10</b>	<b>Trinitrophenol Acid (TAM) 2 Grams Over 10 Minutes (NIO) infusion</b>	<b>Legend</b> <ul style="list-style-type: none"> <li>S System</li> <li>U Unsupervised</li> <li>EMT - B</li> <li>EMT - I</li> <li>EMT - P</li> <li>Medical Control</li> </ul>
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<b>GCS = 12</b>	<b>Elevate Head of Bed/tilt 30°</b>	<b>Exclusions</b> <ul style="list-style-type: none"> <li>• GCS 3 &amp; Pupils Non-Responsive</li> <li>• 2 hours from Time of Injury</li> <li>• Bleeding, IIC, Stroke, Seizure</li> <li>• Vomiting or Nausea</li> <li>• Bony &gt; 20% BIA</li> <li>• Prior ICA</li> </ul>
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<b>Isolated Head Trauma?</b>	<b>SAO<sub>2</sub> + SpO<sub>2</sub> or ETCO<sub>2</sub> + ABG?</b>	<b>Hypertension (SBP &gt; 160)?</b>	<b>Seizure?</b>	<b>Blood Glucose &lt; 80?</b>	<b>Monitor and Reassess q 5 min</b>	<b>Contact Destination or OLMC</b>
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<b>Multiple Trauma Protocol (T-07)</b>	<b>Airway Protocol (S-01)</b>	<b>Multiple Trauma Protocol (T-07)</b>	<b>Seizure Protocol (S-07)</b>	<b>Altered Mentation Protocol (S-03)</b>
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**Notes**

- If evidence of open traumatic chest wall, CXR may reflect rapid decline in SpO<sub>2</sub> or SpEtCO<sub>2</sub> and in absence of respiratory hyperinflation the patient (P) - 20 breaths per minute if available titrate to SpEtCO<sub>2</sub> 30 - 35 mmHg.
- Pupils missing 100% dilation suggest to hemorrhage, stroke & trauma. Brain Injury should receive 100% dose of TAM-2 (TAM).
- Hypertension: consider initial therapy to normotensive and titrate to normotensive (Cushing's Response).
- Hypotension: consider initial therapy to normotensive and titrate to normotensive.
- Hypertension & hypotension: consider initial therapy to normotensive.
- The most important term to monitor and document is a change in the level of consciousness and GCS.
- Consider Protocol T-06 necessary to support early prehospital practice per the Prehospital Protocol.
- Concomitant are periods of contact or LOS associated with trauma which may have occurred by the time EMS arrives. Any documented use of intracranial pressure (ICP) or other data electronically should be included in a patient report.





 United States Army USMRAA W81XWH-13-2-0090

 National Heart, Lung and Blood Institute

 Institute of Circulatory and Respiratory Health  
of the Canadian Institute of Health Research

 Defence Research and Development Canada

 Heart and Stroke Foundation of Canada

 American Heart Association



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# Prehospital Blood Transfusion in a Metropolitan City

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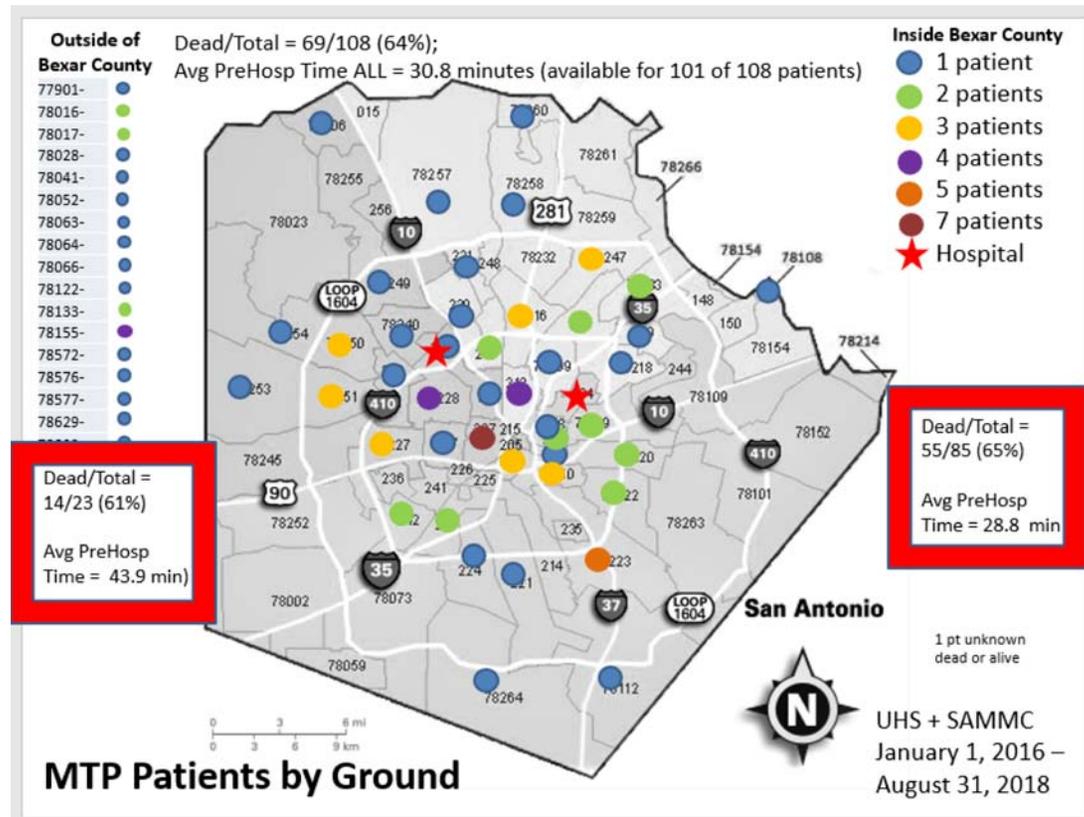


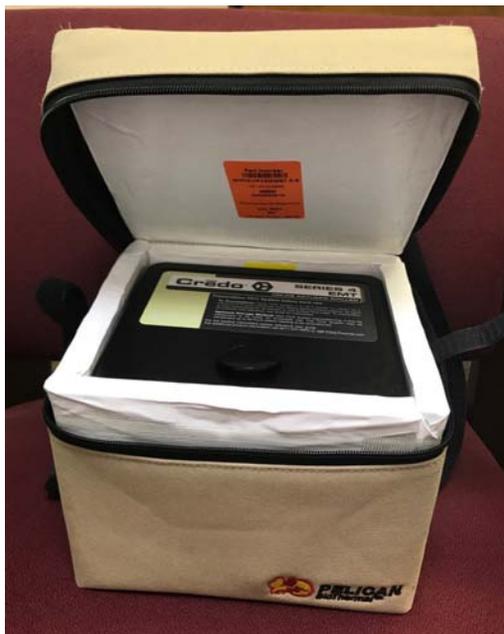
Collaboration



**TRANSFORMING TRAUMA CARE**

Plan





Equip and Train





Deploy

# Save Lives

## Woman survives traumatic crash thanks to new resource on SAFD EMS units

By Sarah Acosta - Reporter, Joe Herrera - Photojournalist

Posted: 8:40 PM, February 19, 2019  
Updated: 3:29 AM, February 20, 2019





Questions?

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