MAssive Transfusion In Children (MATIC) Study - Update

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Disclosures

• Consultant
  • US Army Blood Research Program
  • Norwegian Navy Blood Research Program
  • TerumoBCT, Entegrion, Vascular Solutions
  • Octapharma, New Health Innovations

• Research Support
  • Haemonetics, Diapharma

• Financial support:
  • NIH/NHLBI, 1U01HL116383-01
  • DoD/USAMRMC/NHLBI, 3 U01 HL0772268-09S1
  • DoD/USAMRAA, W81XWH-10-1-0023
  • DoD/USAMRAA, W23RYX0216N601-N602
  • NIH/NHLBI, 5R01HL095470-02
  • DoD/USAMRAA, W81XWH-14-1-0373
Objectives

• Epidemiology, practice patterns, and outcomes for severe bleeding
  • Adults

• MATIC Study Overview

• Current Data

• Grant Proposal Status
Hemorrhage – Morbidity and Mortality

• Many Etiologies
  • Trauma
  • Operative bleeding
  • Obstetric
  • Gastrointestinal
  • Sepsis/DIC

• Data mainly from Adult Trauma population
Epidemiology

- Trauma most **common** cause of death (1-44 yrs)
- 180,000/year in US
- 20% of deaths are medically **preventable**
  - 66% are due to hemorrhage
- Up to 24,000 medically preventable deaths from hemorrhage per year in US
- Death from hemorrhage **occurs early**
  - Within first 6-12 hours (adults)

Resuscitation and transfusion principles for traumatic hemorrhagic shock

Philip C. Spinella a,*, John B. Holcomb b,†

Damage control resuscitation principles.

Rapid recognition of high risk for trauma-induced coagulopathy (massive transfusion prediction)
Permissive hypotension
Rapid definitive/surgical control of bleeding
Prevention/treatment of hypothermia, acidosis, and hypocalcemia
Avoidance of hemodilution by minimizing use of crystalloids
Early transfusion of red blood cells: plasma: platelets in a 1:1:1 unit ratio
Use of thawed plasma and fresh whole blood when available
Appropriate use of coagulation factor products (rFVIIa) and fibrinogen-containing products (fibrinogen concentrates, cryoprecipitate)
*Use of fresh RBCs (storage age of <14 days)
*When available thromboelastography to direct blood product and the hemostatic adjunct (anti-fibrinolytics and coagulation factor) administration
DCR Hypothesis

• Early recognition and treatment of shock and coagulopathy will reduce death/organ failure from severe hemorrhage
Warm Fresh Whole Blood Is Independently Associated With Improved Survival for Patients With Combat-Related Traumatic Injuries


Philip C. Spinella, MD, Jeremy G. Perkins, MD, Kurt W. Grathwohl, MD, Alec C. Beekley, MD, and John B. Holcomb, MD

**Fig. 1.** Kaplan-Meier curve of 30-day survival according to study group.
Table 6  Multivariate Logistic Regression With Treatment Groups for 30-d Survival

<table>
<thead>
<tr>
<th>Variables</th>
<th>OR (95.0% C.I.)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>WFWB group</td>
<td>12.4 (1.8–80)</td>
<td>0.01</td>
</tr>
<tr>
<td>Plasma:RBC ratio</td>
<td>11.7 (2.6–52)</td>
<td>0.0001</td>
</tr>
<tr>
<td>ISS</td>
<td>0.94 (0.91–0.97)</td>
<td>0.001</td>
</tr>
<tr>
<td>GCS eyes (normal)</td>
<td>4.1 (1.5–10.8)</td>
<td>0.004</td>
</tr>
<tr>
<td>Base deficit</td>
<td>0.88 (0.82–0.95)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

AUC (95% CI) for the logistic regression was 0.9 (0.85–0.95).

Table 7  Multivariate Logistic Regression Results With Blood Product Amount for 30-d Survival

<table>
<thead>
<tr>
<th>Variables</th>
<th>OR (95.0% C.I.)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>WFWB (U)</td>
<td>2.15 (1.21–3.8)</td>
<td>0.016</td>
</tr>
<tr>
<td>RBC (U)</td>
<td>0.91 (0.85–0.97)</td>
<td>0.003</td>
</tr>
<tr>
<td>Plasma (U)</td>
<td>1.09 (1.02–1.18)</td>
<td>0.019</td>
</tr>
<tr>
<td>Base deficit</td>
<td>0.91 (0.84–0.97)</td>
<td>0.002</td>
</tr>
<tr>
<td>GCS eyes (normal)</td>
<td>3.8 (1.4–10.2)</td>
<td>0.009</td>
</tr>
<tr>
<td>ISS</td>
<td>0.94 (0.91–0.98)</td>
<td>0.001</td>
</tr>
</tbody>
</table>

AUC (95% CI) for the logistic regression was 0.9 (0.86–0.95).
The Ratio of Blood Products Transfused Affects Mortality in Patients Receiving Massive Transfusions at a Combat Support Hospital

Matthew A. Borgman, MD, Philip C. Spinella, MD, Jeremy G. Perkins, MD, Kurt W. Grathwohl, MD, Thomas Repine, MD, Alec C. Beekley, MD, James Sebesta, MD, Donald Jenkins, MD, Charles E. Wade, PhD, and John B. Holcomb, MD

< 1:4  | 1:4-1:2  | > 1:2

[Diagram showing mortality percentages for different plasma:RBC ratio groups]

Fig. 1. Percentage mortality associated with low, medium, and high plasma to RBC ratios transfused at admission. Ratios are median ratios per group and include units of fresh whole blood counted both as plasma and RBCs.
The Ratio of Blood Products Transfused Affects Mortality in Patients Receiving Massive Transfusions at a Combat Support Hospital

Matthew A. Borgman, MD, Philip C. Spinella, MD, Jeremy G. Perkins, MD, Kurt W. Grathwohl, MD, Thomas Repine, MD, Alec C. Beekley, MD, James Sebesta, MD, Donald Jenkins, MD, Charles E. Wade, PhD, and John B. Holcomb, MD

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*Hemorrhage %*  |  92.5  |  78  |  37  
*Sepsis %*    |  5    |  6   |  19  
*MOF %*       |  0    |  11  |  13  
*Airway/Breathing %* |  0  |  6   |  8   
*CNS %*       |  2.5  |  0   |  23  
Time to death (hrs)*  |  2 (1-4)  |  4 (2-16)  |  38 (4-155)  

*J Trauma. 2007;63:805–813.*
Increased Plasma and Platelet to Red Blood Cell Ratios Improves Outcome in 466 Massively Transfused Civilian Trauma Patients

John B. Holcomb, MD,* Charles E. Wade, PhD,* Joel E. Michalek, PhD,† Gary B. Chisholm, PhD,† Lee Ann Zarzabal, MS,† Martin A. Schreiber, MD,‡ Ernest A. Gonzalez, MD,§ Gregory J. Pomper, MD,¶ Jeremy G. Perkins, MD,¶ Phillip C. Spinella, MD,** Kari L. Williams, RN,* and Myung S. Park, MD*

**FIGURE 3. Kaplan-Meier survival plot for the first 30 days after admission for the 4 groups (high plasma (FFP\textsubscript{H}) or platelet (Plt\textsubscript{H}) to RBC ratio ≥1:2, low plasma (FFP\textsubscript{L}) or platelet (Plt\textsubscript{L}) to RBC ratio <1:2).**
The effect of plasma transfusion on morbidity and mortality: a systematic review and meta-analysis

TRANSFUSION Volume 50, June 2010

Mohammad Hassan Murad, James R. Stubbs, Manish J. Gandhi, Amy T. Wang, Anu Paul, Patricia J. Erwin, Victor M. Montori, and John D. Roback

<table>
<thead>
<tr>
<th>Study</th>
<th>OR</th>
<th>Lower limit</th>
<th>Upper limit</th>
<th>Events / Total Plasma Control</th>
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</thead>
<tbody>
<tr>
<td>Borgman, 2007</td>
<td>0.29</td>
<td>0.16</td>
<td>0.51</td>
<td>31 / 162 38 / 84</td>
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<tr>
<td>Cotton, 2009</td>
<td>0.46</td>
<td>0.28</td>
<td>0.75</td>
<td>54 / 125 88 / 141</td>
</tr>
<tr>
<td>Holcomb, 2008</td>
<td>0.58</td>
<td>0.40</td>
<td>0.84</td>
<td>87 / 252 102 / 214</td>
</tr>
<tr>
<td>Kashuk, 2008</td>
<td>0.44</td>
<td>0.22</td>
<td>0.88</td>
<td>23 / 59 44 / 74</td>
</tr>
<tr>
<td>Maegele, 2008</td>
<td>0.59</td>
<td>0.42</td>
<td>0.81</td>
<td>76 / 229 222 / 484</td>
</tr>
<tr>
<td>Teixeira, 2009</td>
<td>0.18</td>
<td>0.12</td>
<td>0.28</td>
<td>58 / 226 103 / 157</td>
</tr>
<tr>
<td>Scalea, 2008</td>
<td>1.49</td>
<td>0.63</td>
<td>3.53</td>
<td>58 / 226 103 / 157</td>
</tr>
<tr>
<td>Snyder, 2009</td>
<td>0.84</td>
<td>0.47</td>
<td>1.50</td>
<td>58 / 226 103 / 157</td>
</tr>
<tr>
<td>Duchesne, 2008</td>
<td>0.05</td>
<td>0.02</td>
<td>0.13</td>
<td>19 / 71 56 / 64</td>
</tr>
<tr>
<td>Dente, 2009</td>
<td>0.12</td>
<td>0.02</td>
<td>0.67</td>
<td>7 / 50 4 / 7</td>
</tr>
<tr>
<td></td>
<td>0.38</td>
<td>0.24</td>
<td>0.60</td>
<td></td>
</tr>
</tbody>
</table>

Heterogeneity: p=0.01; I^2=85%
Quality of evidence: Very low ☹️☹️☺️
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; Barbara C. Tilley, PhD; Sarah Baraniuk, PhD; Erin E. Fox, PhD; Charles E. Wade, PhD; Jeanette M. Podbielski, RN; Deborah J. del Junco, PhD; Karen J. Brasil, MD, MPH; Eileen M. Bulger, MD; Rachael A. Callcut, MD, MSPH; Mitchell Jay Cohen, MD; Bryan A. Cotton, MD, MPH; Timothy C. Fabian, MD; Kenji Inaba, MD; Jeffrey D. Kerby, MD, PhD; Peter Muskat, MD; Terence O’Keeffe, MBChB, MSPH; Sandro Rizoli, MD, PhD; Bryce R. H. Robinson, MD; Thomas M. Scalea, MD; Martin A. Schreiber, MS; Deborah M. Stein, MD; Jordan A. Weinberg, MD; Jeannie L. Callum, MD; John R. Hess, MD, MPH; Nena Matijevic, PhD; Christopher N. Miller, MD; Jean-Francois Pittet, MD; David B. Hoyt, MD; Gail D. Pearson, MD, ScD; Brian Leroux, PhD; Gerald van Belle, PhD; for the PROPPR Study Group

Massive Transfusion Protocols

- Standardize implementation of DCR
  - Push vs. pull system

- Activation criteria

- Reinforce DCR principles
  - Hypotensive resuscitation, early surgical control, avoid excessive use of crystalloids

- Guidance for Hemostatic Resuscitation
  - High ratios of plasma and platelets to RBCs
  - Hemostatic Adjuncts

- Consistent laboratory evaluation
Should DCR principles be applied to children with MTP Activations?

If yes, then how?

And Who?
Pediatric MTP Activation
Unknowns

• How frequent is it?
• Activation Criteria?
• Etiology of bleeding?
• What blood product ratios?
• Hemostatic adjuncts?
  • TXA, PCC’s, rFVIIa, Fibrinogen, Bandages
  • Doses?
• Outcomes?
Pediatric Survey of MTP Policies

- 50 sites responded from 84 “children’s” hospitals in the US, Jan-March of 2014
  - National Association of Children’s Hospitals Related Institutions (NACHRI) database

- 46/50 (92%) had an MTP Policy
  - 39% (18/46), children’s specialty hospitals
  - 35% (16/46), children’s general hospitals,
  - 26% (12/46), children’s units in a general hospitals
Pediatric Survey of MTP Policies

- 78.3% (36/46) specified a high (≥ 1:2) ratio of plasma:RBC

- 54.3% (25/46) specified a high (≥ 1:2) ratio of platelets:RBCs

Horst J, Spinella PC. Submitted for Publication
Pediatric MTP Policy Survey Results

- Hemostatic Agent Use
  - 23.9% (11/46), rFVIIa
  - 15.2 % (7/46) Antifibrinolytics
  - 13% (6/46) Fibrinogen concentrates,
  - 10.9% (5/46) Prothrombin complex concentrates
- 61% (28/46) of sites indicated cryoprecipitate
- 50% (23/46) of centers require laboratory measures after MTP activation

Horst J, Spinella PC. Submitted for Publication
Pediatric MTP Policy Survey Results

- 89% have Type O RBC units immediately available
  - Blood bank 63%
  - Emergency department 37%
  - Operating room 19.6%
  - Intensive care unit 10.9%

- 48% have thawed plasma units immediately available
  - Blood bank 45.7%
  - Emergency department 4.3%

Horst J, Spinella PC. Submitted for Publication
MATIC Study

- Prospective Observational Study
- All MTP activations in children
  - Epidemiology of MTP
  - Range of therapies used
  - Outcomes
- 300 children from 20 children’s hospitals
  - 1-2 year period
- Provide high quality preliminary data to assist with trial development for children with severe bleeding
MATIC Study

- Initiated “unfunded”
- While submitting for funding to support the project
- R21 scored in Feb 2015
- Currently have 10 sites collecting data
- Validating MOP now
- All 30 sites will start once MOP validated
Participating Networks

- Pediatric Emergency Care Applied Research Network (PECARN)
- Pediatric Acute Lung Injury and Sepsis Investigators (PALISI)/Blood Net
- Pediatric Trauma Society (PTS)
MATIC Study Hypotheses

• It is feasible to develop a robust multicenter surveillance registry of MTP activations

• MTP will be activated more commonly (>50%) for non-trauma indications in children
  • Outcomes will be dependent upon patient illness category

• Transfusion of a high ratio of FFP:RBCs is associated with reduced 24 hour mortality in children requiring massive transfusion regardless of clinical indication
Methodology

• Two-year prospective registry of children who required activation of a MTP

  • Will include children who present before their 18\textsuperscript{th} birthday from 1 Jan 2014 to 1 Jan 2016

  • Goal of at least 30 sites with approximately 300-500 patients to be recruited into the registry over a two-year period
Consent

- Waiver of consent to collect non-identifiable data
  - Necessary - Avoid sampling bias
  - Appropriate - This is a minimal risk study
Data Abstraction

• Data will be collected into a registry that will be a web-based interface into a RedCap database

• Research coordinators will electronically submit the data to the Data Coordination Center (DCC) at Washington University.

• All laboratory data we are collecting will be performed for clinical purposes only
Data Abstraction

• Time required for data extraction from the medical record is estimated to take on average **2-3 hours per patient**.

  • Based on an estimate of 10 patients per site, this will require 20-30 hours total over a one-year period.

  • There will be an estimated 20 hours of administrative time, which includes start-up time for submission of institutional review board (IRB) materials, training and conference calls over the one-year study period.
Data Collected

• Demographics and PRISM-III score
• Pre-MTP laboratory data and hemodynamic measures
• Blood product or hemostatic adjuncts prior to MTP
• Hospital location of MTP activation
• Primary clinical service for patient with MTP activation
• Duration of massive transfusion
• Blood products and hemostatic adjuncts given, including the volume/kg and dose during the MTP, timing of initiation of each blood product
Data Collected

- Details of storage and processing methods of blood products used
- Crystalloid and colloids given during the MTP
- Post MTP laboratory data and hemodynamic measures
- ECMO status
- 28 day mortality, cause of mortality
- New or progressive multiple organ failure
  - 7 days from event
Data Collection/Validation

- All terms well defined
- Timing of labs is defined
- Most data already being collected by VPS or national trauma database (NTB)
- Limits on data entered
- Validating 100% of data from 2 different coordinators from the same chart.
  - 2 charts from each center
MATIC Preliminary Data
STUDY METHODS

Dates of Data Collection:
• 1/1/14 – 9/1/15

Sites Entering Data – Phase 1 Sites (9):
• Children’s of Alabama – Birmingham
• Children’s Hospital of Philadelphia
• Nationwide Children’s Hospital
• University of Minnesota
• Emory University
• Children’s Hospital of Pittsburgh
• Children’s Hospital of Wisconsin
• Akron Children’s Hospital
• St. Louis Children’s Hospital
Phase 2 Sites (20)

- Children’s Hospital of Los Angeles
- Children’s Hospital & Research Center at Oakland
- Children’s National Medical Center – Washington, DC
- Primary Children’s Medical Center
- Cardinal Glennon Children’s Medical Center
- VCU
- Golisano Children’s Hospital
- Hasbro Children’s Hospital – Providence
- Sanford USD Medical Center
- Texas Children’s Hospital
- University of Michigan
- Yale University
- Phoenix Children’s Hospital
- Cincinnati Children’s Hospital
- Boston Children’s Hospital
- John’s Hopkins
- Seattle Children’s
- UCSF
- Rainbow Babies & Children’s Hospital
- Riley Hospital
IRB/Regulatory

IRB approval has been received from:

Phase 1 Sites: (8/9)
- Children’s of Alabama – Birmingham
- Nationwide Children’s Hospital
- University of Minnesota
- Emory University
- Children’s Hospital of Pittsburgh
- Children’s Hospital of Wisconsin
- Akron Children’s Hospital
- St. Louis Children’s Hospital

Phase 2 Sites (5/17)
- Boston Children’s Hospital
- University of Michigan
- University of Utah
- VCU
- Yale University
DEMOGRAPHICS

Age (n=55)
• 5.8 years (1.4-14.5)

Gender (n=55)
• 69.1% male
DEMOGRAPHICS

Ethnicity (n=55)

- NOT Hispanic or Latino: 76.4%
- Hispanic or Latino: 9.1%
- Unknown/Not Reported in Chart: 14.5%
DEMOGRAPHICS

Race: (n=55)

• White: 58.2%

• Black or African American: 25.5%

• Other: 7.3%

• Unknown/Not Reported: 9.0%
Method of Product Transfusion Per Patient (n=55)

- Empiric Plasma-RBC ratio strategy: 60.0%
- Lab based blood product transfusion strategy: 23.6%
- Empiric ratio with lab modification: 16.4%
## LOCATION OF MTP ACTIVATION

<table>
<thead>
<tr>
<th>Location of Patient During MTP Activation</th>
<th>% of Patient Population (n=55)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ED</td>
<td>34.5%</td>
</tr>
<tr>
<td>OR</td>
<td>25.5%</td>
</tr>
<tr>
<td>PICU</td>
<td>21.8%</td>
</tr>
<tr>
<td>CICU</td>
<td>16.4%</td>
</tr>
<tr>
<td>NICU</td>
<td>1.8%</td>
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</table>
**INDICATION FOR MTP ACTIVATION**

<table>
<thead>
<tr>
<th>Clinical Indication for activating the MTP</th>
<th>% of Patient Population (n=55)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trauma</td>
<td>38.2%</td>
</tr>
<tr>
<td>Intraoperative Bleeding</td>
<td>18.2%</td>
</tr>
<tr>
<td>Medical Bleeding</td>
<td>18.2%</td>
</tr>
<tr>
<td>Postoperative Bleeding</td>
<td>14.5%</td>
</tr>
<tr>
<td>Other</td>
<td>10.9%</td>
</tr>
<tr>
<td>Postprocedure Bleeding</td>
<td>0.0%</td>
</tr>
</tbody>
</table>
# Trauma MTP Activation Subgroups

<table>
<thead>
<tr>
<th>Trauma</th>
<th>% of Patient Population (n=21)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blunt</td>
<td>52.4%</td>
</tr>
<tr>
<td>Penetrating</td>
<td>47.6%</td>
</tr>
<tr>
<td>Burn</td>
<td>0.0%</td>
</tr>
</tbody>
</table>
Plasma: RBC Transfusion Ratios Utilized for Trauma Patients (n=21)
Plasma: RBC Transfusion Ratios Utilized for Patients with Operative Bleeding (n=19)

- 21.1% of patients transfused with ratio < 0.33
- 31.6% of patients transfused with ratio < 0.33
- 15.8% of patients transfused with ratio 0.33-0.66
- 21.1% of patients transfused with ratio 0.66-1.5
- 10.5% of patients transfused with ratio > 1.5
Plasma: RBC Transfusion Ratios Utilized for Patients with Medical Bleeding (n=15)

<table>
<thead>
<tr>
<th>% of Patients Transfused with Ratio</th>
<th>No Response</th>
<th>No Products</th>
<th>&lt; 0.33</th>
<th>0.33-0.66</th>
<th>0.66-1.5</th>
<th>&gt; 1.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Response</td>
<td>6.7%</td>
<td>13.3%</td>
<td>6.7%</td>
<td>26.7%</td>
<td>26.7%</td>
<td>20.0%</td>
</tr>
</tbody>
</table>

Legend:
- No Response
- No Products
- < 0.33
- 0.33-0.66
- 0.66-1.5
- > 1.5
Platelet : RBC Transfusion Ratios Utilized for Trauma Patients (n=21)
Platelet : RBC Transfusion Ratios Utilized for Patients with Operative Bleeding (n=19)

<table>
<thead>
<tr>
<th>Ratio</th>
<th>% of Patients Transfused with Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>No products</td>
<td>21.1%</td>
</tr>
<tr>
<td>&lt; 0.33</td>
<td>42.1%</td>
</tr>
<tr>
<td>0.33-0.66</td>
<td>15.8%</td>
</tr>
<tr>
<td>0.66-1.5</td>
<td>5.3%</td>
</tr>
<tr>
<td>&gt; 1.5</td>
<td>15.8%</td>
</tr>
</tbody>
</table>
Platelet : RBC Transfusion Ratios Utilized for Patients with Medical Bleeding (n=15)
HEMOSTATIC ADJUNCTS ADMINISTERED DURING MTP (N=55)

- Cryoprecipitate: 43.6%
- rVIIa: 23.6%
- TXA: 9.1%
- PCC: 7.3%
- AMICAR: 5.5%
- Fibrinogen: 0.0%
OUTCOMES PER PATIENT (n=52)

- NPMODS: 59.6%
- Death: 51.9%
- ARDS: 40.4%
- AKI: 36.5%
- Sepsis: 21.2%
- ACS: 3.8%
DEATH OUTCOMES BY MTP ACTIVATION INDICATION

<table>
<thead>
<tr>
<th>MTP Activation Indication</th>
<th>% of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trauma (n=21)</td>
<td>42.9%</td>
</tr>
<tr>
<td>Operative Bleeding (n=19)</td>
<td>31.6%</td>
</tr>
<tr>
<td>Medical Bleeding (n=15)</td>
<td>80.0%</td>
</tr>
</tbody>
</table>
NPMODS OUTCOMES BY MTP ACTIVATION INDICATION

- Trauma (n=21): 47.6%
- Operative Bleeding (n=19): 42.1%
- Medical Bleeding (n=15): 80.0%
ARDS OUTCOMES BY MTP ACTIVATION INDICATION

% of Patients per MTP Activation Indication

Trauma (n=21)
Operative Bleeding (n=19)
Medical Bleeding (n=15)

- Trauma: 23.8%
- Operative Bleeding: 42.1%
- Medical Bleeding: 53.3%
AKI OUTCOMES BY MTP ACTIVATION INDICATION

- Trauma (n=21): 4.8%
- Operative Bleeding (n=19): 42.1%
- Medical Bleeding (n=15): 46.7%
ACS OUTCOMES BY MTP ACTIVATION INDICATION

% of Patients per MTP Activation Indication

- Trauma (n=21)
- Operative Bleeding (n=19)
- Medical Bleeding (n=15)

Medical Bleeding shows the highest outcome of 13.3%.

Trauma and Operative Bleeding have the lowest outcomes at 0.0%.
CAUSE OF DEATH (N=27)

- Hemorrhage: 44.4%
- CNS: 29.6%
- Sepsis: 11.1%
- Other: 7.4%
- Not Listed: 7.4%

% of Patient Population
Future Directions

• Goal Directed Hemostatic Resuscitation
• Whole blood instead of components
• Platelets at 4C
• Improved RBCs/oxygen carriers
• Improved topical hemostatics/injectable foams
R21 Feedback – NHLBI: PAR 13-025

CRITIQUE 1:
Significance: 2
Investigator(s): 2
Innovation: 4
Approach: 4
Environment: 1

CRITIQUE 2:
Significance: 1
Investigator(s): 1
Innovation: 2
Approach: 5
Environment: 1

CRITIQUE 3:
Significance: 2
Investigator(s): 2
Innovation: 4
Approach: 5
Environment: 2
Approach Concerns

- Heterogeneity of patients
  - Age range
  - Disease process
- Feasibility of recruiting sufficient numbers of evaluable patients
- Manual data extraction vs electronic capture
NHLBI feedback

- Feasibility
  - Addressed with prelim data.
  - Validation data helpful

- Heterogeneity
  - Increase comparisons in Aim 1
  - Focus evaluation of ratios in trauma patients only.
Conclusions

- MATIC study data collection going well
- MATIC methods being validated
- Preliminary data is interesting and promising for the development of interventional trials
- R21 to be resubmitted in November (hopefully)
THANKS TO PARTICIPATING SITES

• Children’s of Alabama – Birmingham
• Children’s Hospital of Philadelphia
• Nationwide Children’s Hospital
• University of Minnesota
• Emory University
• Children’s Hospital of Pittsburgh
• Children’s Hospital of Wisconsin
• Akron Children’s Hospital
• St. Louis Children’s Hospital
• John’s Hopkins
• Seattle Children’s
• UCSF
• Rainbow Babies & Children’s Hospital
• Riley Hospital

• Children’s Hospital of Los Angeles
• Children’s Hospital & Research Center at Oakland
• Children’s National Medical Center – Washington, DC
• Primary Children’s Medical Center
• Cardinal Glennon Children’s Medical Center
• VCU
• Golisano Children’s Hospital
• Hasbro Children’s Hospital – Providence
• Sanford USD Medical Center
• Texas Children’s Hospital
• University of Michigan
• Yale University
• Phoenix Children’s Hospital
• Cincinnati Children’s Hospital
• Boston Children’s Hospital
Thank you

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