

2014

Pediatric massive transfusion protocols

Ramsey Tate

Follow this and additional works at: https://digitalrepository.unm.edu/emergencymed_pubs

Recommended Citation

Tate, Ramsey. "Pediatric massive transfusion protocols." (2014). https://digitalrepository.unm.edu/emergencymed_pubs/3

This Presentation is brought to you for free and open access by the Emergency Medicine at UNM Digital Repository. It has been accepted for inclusion in Emergency Medicine Research and Scholarship by an authorized administrator of UNM Digital Repository. For more information, please contact disc@unm.edu.



Transfusing tiny soldiers

Ramsey C. Tate, MD
Fellow, Pediatric Emergency
Medicine



Applying combat-derived massive transfusion protocols to pediatric trauma patients

Agenda

Case

Damage control resuscitation

Massive transfusion protocols

Pediatric massive transfusion protocols

Agenda

Case

Damage control resuscitation (DCR)

Massive transfusion protocols (MTP)

Pediatric massive transfusion protocols (P-MTP)



Damage Control Resuscitation



Damage Control Resuscitation

Permissive hypotension

Aggressive correction of coagulopathy

Use of blood products and vasopressors to maintain hemodynamics and euvolemia

Damage Control Resuscitation

Permissive hypotension

Aggressive correction of coagulopathy

Use of blood products and vasopressors to maintain hemodynamics and euvolemia

Hemostatic resuscitation

Damage Control Resuscitation

Acidosis

Hypothermia



Death

Coagulopathy

Massive transfusion protocols



Fresh whole blood:

500 mL

Hct 33-43%

Plt 130-350,000

Fibrinogen 1500 mg

Clotting activity 86%

Full platelet activity

Warm



Fresh whole blood:

500 mL

Hct 33-43%

Plt 130-350,000

Fibrinogen 1500 mg

Clotting activity 86%

Full platelet activity

Warm

RBC + Platelets + FFP:

660 mL

Hct 29%

Plt 88,000

Fibrinogen 750 mg

Clotting activity 65%

Reduced platelet activity

Cold



Fresh whole blood:

500 mL

Hct 33-43%

Plt 130-350,000

Fibrinogen 1500 mg

Clotting activity 86%

Full platelet activity

Warm

RBC + Platelets + FFP:

660 mL

Hct 29%

Plt 88,000

Fibrinogen 750 mg

Clotting activity 65%

Reduced platelet activity

Cold



1:1:1

Key components of MTP

Resuscitation with predetermined ratios of blood components

Rapid infusion of warmed blood products

Coordination with transfusion specialists to ensure streamlined delivery of products

Monitoring of coagulation studies to determine the end-point of protocol

Key components of MTP

Resuscitation with predetermined ratios of blood components 1 RBC:1 FFP:1 Platelet

Rapid infusion of warmed blood products

Coordination with transfusion specialists to ensure streamlined delivery of products

Monitoring of coagulation studies to determine the end-point of protocol

Key components of MTP

Resuscitation with predetermined ratios of blood components

Rapid infusion of warmed blood products

Coordination with transfusion specialists to ensure streamlined delivery of products

Monitoring of coagulation studies to determine the end-point of protocol

Key components of MTP

Resuscitation with predetermined ratios of blood components

Rapid infusion of warmed blood products

Coordination with transfusion specialists to ensure **streamlined delivery of products**

Monitoring of coagulation studies to determine the end-point of protocol

Key components of MTP

Resuscitation with predetermined ratios of blood components

Rapid infusion of warmed blood products

Coordination with transfusion specialists to ensure streamlined delivery of products

Monitoring of coagulation studies to **determine the end-point of protocol**



Pediatric considerations

Math is hard

5 liters



0.5 liters



5 liters



Transfusion of one blood volume in 24 hours


Transfusion of one-half blood volume in 3 hours

0.5 liters



Harborview pediatric MTP

ONGOING HEMORRHAGE

	Stable	Tachycardia	Hemodynamic Instability 			
Estimated Blood Loss	0	20 mL/kg	40 mL/kg	80 mL/kg 1 blood volume	160 mL/kg 2 blood volumes	Each additional 80 mL/kg
Crystalloid		20-40 mL/kg				
Blood Products			PRBC 30 mL/kg	PRBC 30 mL/kg FFP 20 mL/kg	PRBC 30 mL/kg FFP 20 mL/kg PLTs 20 mL/kg Cryo 4 mL/kg	PRBC 30 mL/kg FFP 20 mL/kg PLTs 20 mL/kg Cryo 4 mL/kg Consider rFVIIa

- To order pediatric massive transfusion pack: call 744 –xxxx
- Cryoprecipitate after 2 blood volumes or fibrinogen <1-1.5 g/L
- Recombinant activated factor VII dosed 90 mcg/kg (*off label use*)
- For children > 30 kg, aim for 1:1:1 component therapy

based on Dehmer et. al. Seminars in Pediatric Surgery (2010) 19, 286-291
 adapted by Brian Johnston and Ramsey Tate

UNM pediatric MTP

Still in development

UNM may be a research site for P-MTP study

Weight (kg)	Total Blood Volume	Blood Pack "Shipment"	Crystalloid 20 mL/kg	Crystalloid 40 mL/kg	RBC 30 mL/kg	Plasma 30 mL/kg	Platelets 5 mL/kg	Cryo 2 mL/kg	10% Calcium Gluconate
1	100	A	20	40	30	30	5		0.1
1	100	B			30	30		2	
2	200	A	40	80	60	60	10		0.2
2	200	B			60	60		4	
3	270	A	60	120	90	90	15		0.3
3	270	B			90	90		6	
4	360	A	80	160	120	120	20		0.4
4	360	B			120	120		8	
5	450	A	100	200	150	150	25		0.5

Pediatric considerations

Math is hard

pRBCs	20 - 30 ml/kg
FFP	20 - 30 ml/kg
Platelets	5 - 20 ml/kg
Cryoprecipitate	2 -5 ml/kg
TXA	20 ml/kg

Pediatric considerations

Math is hard

Critical importance of warming (ENFLOW)

Pediatric considerations

Math is hard

Critical importance of warming (ENFLOW)

Different blood product preparation

Pediatric considerations

Math is hard

Critical importance of warming (ENFLOW)

Different blood product preparation

Difficult to interpret functional coagulation studies (ROTEM)

Pediatric considerations

Math is hard

Critical importance of warming (ENFLOW)

Different blood product preparation

Difficult to interpret functional coagulation studies (ROTEM)

Anticipate electrolyte abnormalities

Pediatric considerations

Math is hard

Critical importance of warming (ENFLOW)

Different blood product preparation

Difficult to interpret functional coagulation studies (ROTEM)

Anticipate electrolyte abnormalities

Scant research



Questions?