

# Massive Transfusion Protocol (MTP) – ADULT

University of Michigan 7/5/16 Rev 7

> 50 KG

## Appropriate Initial Interventions:

- Intravenous access – 2 large bore IVs and Central Venous Cath
- Labs: T&S, CBC, Plts, INR, PT, PTT, Fibrinogen, Electrolytes, BUN/Creatinine, ionized calcium, **ROTEM**
- Continual monitoring: VS, U/O, Acid-base status
- Aggressive re-warming
- Prevent / Reverse acidosis
- Correct hypocalcemia: CaGluconate or CaCl
- Target goal ionized calcium 1.2 – 1.3
- If use CaCl 1 gm, give slowly IV
- Repeat lab testing to evaluate coagulopathy
- Stop crystalloid - avoid dilutional coagulopathy

## Other considerations:

- **Anticipate hypocalcemia and infuse 1g calcium gluconate per 1-2 units PRBC's transfused**
- Cell salvage: Anes Tech via front desk 93-64270 (Main & CVCOR)
- Heparin reversal: Protamine 1mg IV/100 U heparin
- Warfarin reversal: Vitamin K 10 mg IV; Consider Prothromin Comp 4 Factor PCC Kcentra INR 2-4 25units/kg, INR>4-6, 35 units/kg, INR>6, 50 units/kg; repeat doing not recommended
- Chronic Renal Failure + VW Factor; DDAVP 0.3 µg/kg IV x 1 dose
- Consider antifibrinolytics:
  - Tranexamic acid 1 gm bolus plus infusion 1 gm over 8 hrs
  - Amicar 5 gm IV bolus then 1 gm/hr IV infusion

## Additional help

- Anesthesia: Page 8003; Trauma Chief (via web or operator)
- Rapid Response Team pager 90911 or call stat page 141

## General Guidelines for Lab-based Blood Component Replacement in Adults:

Product	Consider for	Dose
RBCs	N/A	MD discretion
FFP	INR > 1.5	4 units FFP
Platelets	< 100,000	One 5-pack Plts
Cryoprecipitate	Fibrinogen < 100	Two 5-packs Cryo

## Identify and Manage Bleeding (Surgery, Angiographic Embolization, Endoscopy)

Adult: 4U RBCs in <4 hours and ongoing bleeding

## Clinical Team Activates MTP & Designates Clinical Contact

**Clinical Contact phones Blood Bank (BB) at 936-6888 and:**

- Provides name of clinical contact person to Blood Bank (BB)
- Provides MR#, sex, name, location of patient
- Records name of BB contact, calls if location/contact information changes
- Sends person with **patient name and MRN** to pick up the cooler
- Ensures that MTP protocol electronic order is entered in CareLink

## BB Prepares MTP Pack

**MTP Pack: 5U RBCs; 5U FFP; One 5-pack Platelets or one apheresis platelet**  
This will result is an approximate 1:1:1 ratio

Hemostasis & resolution of coagulopathy?

NO

Clinical Contact calls BB at 6-6888 for another MTP pack  
\*\* MD can adjust pack based on labs PRN

YES

### Stop MTP

- Notify BB & return any unused blood ASAP
- Resume standard orders
- D/C MTP Electronic order

### Repeat Labs

- CBC, Platelets
- INR/PT, PTT
- Fibrinogen
- ABG (Ionized Calcium, Potassium, Lactate, Hematocrit)

WITH Orange Card

If persistent coagulopathy consider:

rFVIIa: 90 µ/kg dose

4 Factor PCC: Kcentra INR 2-4 25units/kg, INR>4-6, 35 units/kg, INR>6, 50 units/kg; repeat doing not recommended

# Massive Transfusion Protocol (MTP) – Pediatric < 50 KG

University of Michigan 7/5/16 Rev 7

## Appropriate Initial Interventions:

Intravenous access – by weight (kg):

- 1-5 kg: 22-24 gauge
- 6-10 kg: 20-24 gauge
- 11-25 kg: 18-22 gauge
- 25-50 kg: 16-20 gauge

Admission weight (kg)

Admission labs:

- T&S, CBC, INR/ PT, PTT, Fibrinogen, Electrolytes, BUN/Cr, ionized calcium, ABG, lactate
- Continual monitoring of vital signs
- Aggressive re-warming
- Prevent / Reverse acidosis
- Minimize crystalloid – avoid dilutional coagulopathy

## Other considerations:

- Anticipate hypocalcemia with CaGluconate or CaCl
- 25units/kg, INR>4-6, 35 units/kg, INR>6, 50 units/kg; repeat doing not recommended
- Antifibrinolytic therapy:  
Amicar 100 mg/kg bolus then 33.3 mg/kg/hour
- Cell salvage: Anes Tech via Mott OR Front Desk 76-32430
- Additional help:**
  - Anesthesia: pager 1534
  - Pediatric Surgical Fellow – pager via web or operator
  - Rapid Response Team pager 90147 or call stat paging 141

## General Guidelines for Lab-based Blood Component Replacement in Children with Massive Bleeding:

Product	Consider For	Dose
RBCs (360 ml/unit)	N/A	30 ml/kg
FFP (250 ml/unit)	INR > 1.5	20 ml/kg
Platelets (50 ml/bag)	< 100,000	20 ml/kg
Cryoprecipitate (15 ml/unit)	Fibrinogen < 100	0.2 units/kg

## Identify and Manage Bleeding

(Surgery, Angiographic Embolization, Endoscopy)

≥ 30 mls/kg and ongoing uncontrolled bleeding

## Clinical Team Activates MTP & Designates Clinical Contact

Clinical Contact phones Blood Bank (BB) at 936-6888 and:

- Provides name of clinical contact person to BB
- Provides MR#, sex, name, location and weight of patient
- Records name of BB contact, calls if location/contact information changes
- Sends person with patient name and MRN to pick up the cooler
- Ensures that MTP protocol electronic order is entered in CareLink

## BB Prepares MTP Pack

MTP Pack: 5U RBCs; 5U FFP; 5 Random Platelets or one apheresis platelet  
This will result is an approximate 1:1:1 ratio

Hemostasis & resolution of coagulopathy?

NO

Clinical Contact calls BB at 6-6888 for another Peds MTP pack  
\*\* MD can adjust pack based on labs PRN

YES

### Stop MTP

- Notify BB & return any unused blood ASAP
- Resume standard orders
- D/C MTP Electronic order

### Repeat Labs

- CBC, Platelets
- INR/PT, PTT
- Fibrinogen
- ABG (Ionized Calcium, Potassium, Lactate, Hematocrit)

With Orange Card

If persistent coagulopathy consider:  
rFVIIa 90 µ/kg dose

# UNIVERSITY OF MICHIGAN

## Hospitals and Health Centers



# MASSIVE TRANSFUSION PROTOCOL

**AUTHORS:** TRANSFUSION COMMITTEE

**DATE SUBMITTED:** DECEMBER 17, 2012

**REVISED:** 5/27/15, 4/1/13, 9/30/13, 3/17/14, 11/20/14, 8/24/15,  
7/5/16

# Contents

---

<b>Contents</b> .....	1
<b>1. Policy Statement, Scope and Purpose</b> .....	2
<b>2. Definitions</b> .....	2
<b>3. Policy Standards/Procedures/Actions</b> .....	2
<b>4. Laboratory Test Orders</b> .....	3
<b>5. Exhibits</b> .....	3
<b>6. References</b> .....	4
<b>7. Committee Members</b> .....	6

## 1. Policy Statement, Scope and Purpose

It is the policy of the University of Michigan Hospitals that a Massive Transfusion Protocol (MTP) be used to standardize procurement of blood and blood components and clarify communications between the blood bank and the patient caregivers.

## 2. Definitions

### Massive Transfusion

<b>Adult</b>	4U RBCs in < 4 hours and ongoing uncontrolled bleeding
<b>Child</b>	30 mls/kg and ongoing uncontrolled bleeding

## 3. Policy Standards/Procedures/Actions

- The MTP may be initiated in any patient care area.
- The MTP may be initiated by the patient's clinical team.
- The clinical team assigns a clinical contact for the blood bank.
- The clinical team assigns a person to pick up the cooler and blood components.
- The blood bank assigns a contact person.
- The flowcharts "Massive Transfusion Protocol (MTP) – Adult University of Michigan" and "Massive Transfusion Protocol (MTP) – Pediatric University of Michigan" will be used to guide decision making.

### Number of Units to be Issued Per Cooler

Protocol	Red Cells	Plasma	Platelets	Cryo (if requested)
<b>Adult</b>	6	4	One 5-pack	One 5-pack
<b>Pediatric/Infant</b>	6	4	5 single platelets	As ordered

## 4. Laboratory Test Orders

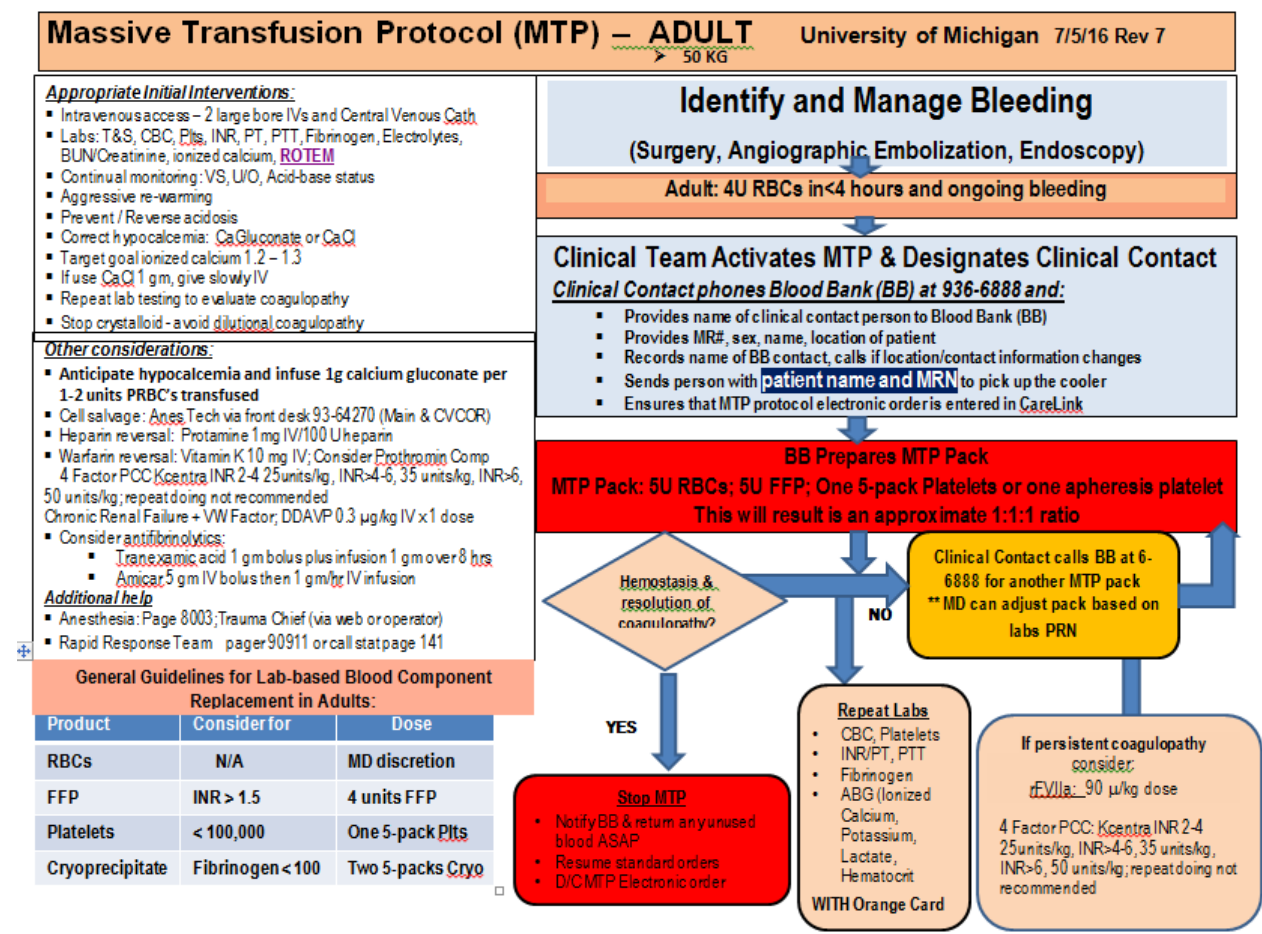
- The first massive transfusion pack will contain a set of orange cards with the phrases “MASSIVE TRANSFUSION PROTOCOL Phone Coagulation Results to \_\_\_\_\_”.
- The clinical team will fill in the phone number/pager.
- This card is to be placed in the bag with blood specimens sent to Specimen Processing to indicate that the specimens should be treated as STAT specimens and Coagulation results should be called to the clinical team.

## 5. Calcium Replacement

- Anticipate hypocalcemia and infuse calcium gluconate. The adult dose is approximately 1g calcium gluconate per 1-2 units PRBC's transfused

## 6. Exhibits

### The Massive Transfusion Protocol (MTP)- Adult University of Michigan



# The Massive Transfusion Protocol (MTP)- Pediatric University of Michigan

## Massive Transfusion Protocol (MTP) – Pediatric < 50 KG University of Michigan 7/5/16 Rev 7

### Appropriate Initial Interventions:

Intravenous access – by weight (kg):

- 1-5 kg: 22-24 gauge
- 6-10 kg: 20-24 gauge
- 11-25 kg: 18-22 gauge
- 25-50 kg: 16-20 gauge

Admission weight (kg)

Admission labs:

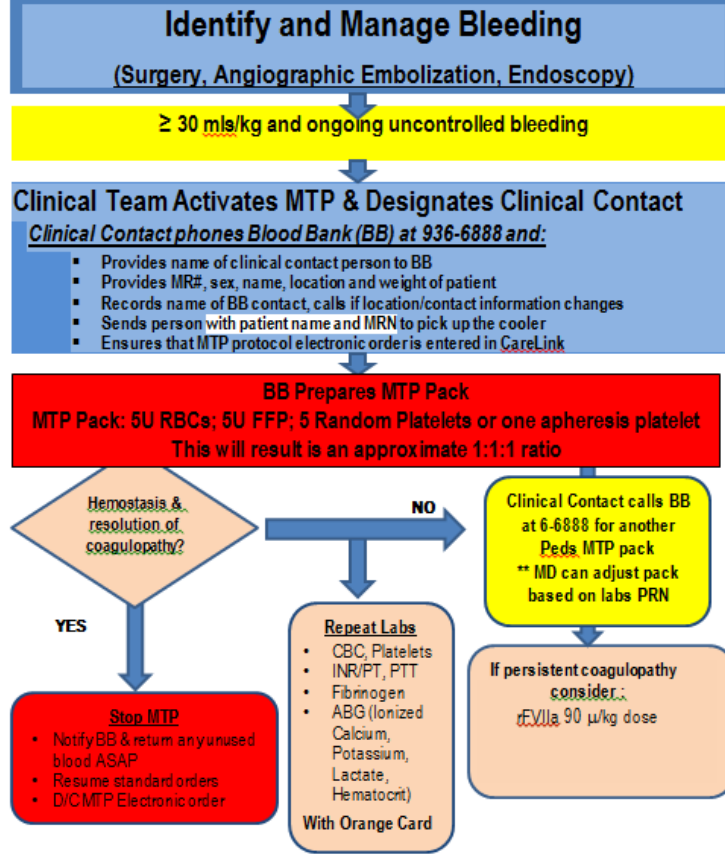
- T&S, CBC, INR/PT, PTT, Fibrinogen, Electrolytes, BUN/Cr, ionized calcium, ABG, lactate
- Continual monitoring of vital signs
- Aggressive re-warming
- Prevent / Reverse acidosis
- Minimize crystalloid – avoid dilutional coagulopathy

### Other considerations:

- Anticipate hypocalcemia with **CaGluconate** or **CaCl**
- 25units/kg, INR>4-6, 35 units/kg, INR>6, 50 units/kg; repeat doing not recommended
- Antifibrinolytic therapy:  
**Amicar** 100 mg/kg bolus then 33.3 mg/kg/hour
- Cell salvage: **Anes Tech** via Mott OR Front Desk 76-32430
- **Additional help:**
- Anesthesia: pager 1534
- Pediatric Surgical Fellow – pager via web or operator
- Rapid Response Team pager 90147 or call stat paging 141

General Guidelines for Lab-based Blood Component Replacement in Children with Massive Bleeding:

Product	Consider For	Dose
RBCs (360 ml/unit)	N/A	30 ml/kg
FFP (250 ml/unit)	INR > 1.5	20 ml/kg
Platelets (50 ml/bag)	< 100,000	20 ml/kg
Cryoprecipitate (15 ml/unit)	Fibrinogen < 100	0.2 units/kg



## 7. References

### Adult

1. Sihler KC, Napolitano LM. Massive transfusion: new insights. Chest. 2009 1. Dec;136(6):1654-67. Review.
2. Sihler KC, Napolitano LM. Complications of Massive transfusion. Chest. 2010 Jan;137(1):209-20. Review.
3. Borgman MA, Spinella PC, Perkins JG, Grathwohl KW, Repine T, Beekley AC, Sebesta J, Jenkins D, Wade CE, Holcomb JB. The ratio of blood products transfused affects mortality in patients receiving massive transfusions at a combat support hospital. J Trauma. 2007 Oct;63(4):805-13.
4. Damage Control Resuscitation JTTS Clinical Practice Guideline, August 10, 2011 update, at <http://www.usaisr.amedd.army.mil/cpgs.html>
5. Cotton BA, Reddy N, Hatch QM, LeFebvre E, Wade CE, Kozar RA, Gill BS, Albarado R, McNutt MK, Holcomb JB. Damage control resuscitation is associated with a reduction in



resuscitation volumes and improvement in survival in 390 damage control laparotomy patients. *Ann Surg.* 2011 Oct;254(4):598-605.

6. Holcomb JB, Wade CE, Michalek JE, Chisholm GB, Zarzabal LA, Schreiber MA, Gonzalez EA, Pomper GJ, Perkins JG, Spinella PC, Williams KL, Park MS. Increased plasma and platelet to red blood cell ratios improves outcome in 466 massively transfused civilian trauma patients. *Ann Surg.* 2008 Sep;248(3):447-58. Erratum in: *Ann Surg.* 2011 Feb;253(2):392.
7. Nunez TC, Young PP, Holcomb JB, Cotton BA. Creation, implementation, and maturation of a massive transfusion protocol for the exsanguinating trauma patient. *J Trauma.* 2010 Jun;68(6):1498-505.
8. Elmer J, Wilcox SR, Raja AS. Case Presentation: Massive Transfusion in Traumatic Shock. *J Emer Med.* 2013 44(4) pp 829-838.

### **Pediatric**

1. Michael M. Fuenfer, ed. Border Institute, Walter Reed Army Medicine Center, Washington, DC. Chapter 5, "Transfusion Medicine" from *Pediatric Surgery and Medicine for Hostile Environments*.
2. Dehmer JJ, Adamson WT. Massive transfusion and blood product use in the pediatric trauma patient. *Seminars in Pediatric Surgery* 2010;19:286-291.
3. Dressler AM, Finck CM, Carroll CL, et al. Use of massive transfusion protocol with hemostatic resuscitation for severe intraoperative bleeding in a child. *Journal of Pediatric Surgery* 2010;324:1530-1533.
4. Hendrickson J. Massive transfusion in the pediatric setting. Online document from Emory University School of Medicine 2011. [Seabb.org/.../doc.../95-massive-transfusion-in-the-pediatric-setting-2011](http://Seabb.org/.../doc.../95-massive-transfusion-in-the-pediatric-setting-2011).
5. Nester T and Kang M. Guidelines for pediatric transfusion at HMC. Online document for Harborview Medical Center, University of Washington 2003. [www.cbbs.org/enf/attachments/ped\\_txprotocol\\_nov08.pdf](http://www.cbbs.org/enf/attachments/ped_txprotocol_nov08.pdf)



## 7. Committee Members

---

Name	Department
Paul Picton, M.D.	Chairman/Anesthesia
Vinita Bahl, DMD	UMH CIDDS
Suzanne Butch, MA, MT(ASCP) SBB	Blood Bank
Darrell Campbell, MD	Surgery/OCA
Laura Cooling, MD	Pathology
Enrique Criado-Pallares, MD	Vascular Surgery
Robertson Davenport, MD	Pathology
Theresa Downs, MT(ASCP)SBB	Blood Bank
Tim Dubovoy, MD	Cardiac Anesthesia
Shon Dwyer, RN, MBA	Hospital Administration
Jonathan Haft, MD	Cardiac Surgery
Karen Harden, MS, RN, AOCNS	Hem/Onc Nursing
Tiffany Hunter, RN	Pediatric Nursing
Raymond Hutchinson	Peds Hem/Onc
Robert Hyzy, MD	Medical ICU
Martin Lawlor	Pathology
Charles Muck, RN	Education Nurse Coordinator
Lena Napolitano, MD	Intensive Care
Clark Nugent, MD	OB-Gyn
Jeffrey Rohde, MD	Internal Medicine
Samuel Silver, MD	Hem/Onc
Chisa Yamada, MD	Pathology

***Please direct any questions and concerns to the Transfusion Committee***