

MSH Emergency Department

Pediatric Massive Transfusion Protocol

Date Created: 06/30/2023

Date Reviewed:

Reviewed By: F. Yudkowitz MD, S. Arinsburg MD, P. Midulla MD,
S. Witkins MSN RN CNOR CNML



PURPOSE:

To define the process to expeditiously access large quantities of blood products for the treatment of patients with rapid and massive blood loss.

PRINCIPLE:

Massive transfusion can be defined as:

1. Transfusion of blood components equaling one or more blood volumes within a 24-hour period or
2. Half a blood volume in 3-12 hours

Blood volumes are calculated based on the following:

Age	Amount
Premature neonates	100 mL/kg
Mature neonates	90 mL/kg
Infants	80 mL/kg
Children	70-80 mL/kg

The goal of massive blood transfusion is to restore blood volume and components to maintain oxygen-carrying capacity, hemostasis, oncotic pressure, and chemical balance. Restoring blood components typically involves the administration of packed red blood cells (PRBC), fresh frozen plasma (FFP), platelets, and cryoprecipitate.

SCOPE:

Predicting the need for Massive Transfusion is situational and patient dependent. Activation of the Massive Transfusion Protocol (MTP) is based on the practitioner's professional decision that is based upon blood loss, anticipated transfusion requirements, physiology and/or anatomic injury complex.

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Criteria for activation of the MTP are:

1. Hemodynamic instability with large blood loss in < 4 hours
2. Large blood volume loss with ongoing blood loss
3. Major gastrointestinal or surgical bleeding
4. Severe thoracic, abdominal, pelvic, or multiple long bone trauma, and/or major head trauma

PROCEDURE:

1. Initiation of MTP
 - a. Only a physician or physician appointed designee
 - b. Designee must be a licensed medical practitioner (i.e., MD, RN, NP, PA)
 - c. A criterion for MTP activation must be anticipated or met
2. Blood Bank Notification (x46101)
 - a. The following information must be provided to the Blood Bank Staff:
 - i. Patient name, MRN, and location
 - ii. Weight if < 25 kg
 - iii. Initiating physician (who will sign the blood bank form), designee name, and contact number
 - b. The Blood Bank technologist will:
 - i. Confirm that the MTP has been activated
 - ii. Confirm patient's current type and screen and ABO confirmatory typing and if there is sufficient sample to appropriate crossmatching
 1. If these are absent, the "Initiating physician or designee" will be informed to send EDTA (pink top) samples. This may require one or two separate samples.
 2. If there is no active type and screen or cannot wait for crossmatched units, uncrossmatched blood will be released according to protocol.
 - iii. Immediately set up the first massive transfusion pack (weight based) consisting of PRBC + FFP + Platelets at a ratio of 1:1:1 as follows:

< 25 KG	PACK 1	PACK 2	PACK 3	PACK 4	PACK 5
PRBC	2 unit	2 unit	2 unit	2 unit	2 unit
FFP	2 unit	2 unit	2 unit	2 unit	2 unit
PLATELETS	1 apheresis	1 apheresis	1 apheresis	1 apheresis	1 apheresis
CRYOPRECIPITATE		1 unit (pooled)*			

*The cryo is thawed immediately after activation of MTP and issued when ready.

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≥ 25 KG	PACK 1	PACK 2	PACK 3	PACK 4	PACK 5
PRBC	5 unit	5 unit	5 unit	5 unit	5 unit
FFP	5 unit	5 unit	5 unit	5 unit	5 unit
PLATELETS	1 apheresis	1 apheresis	1 apheresis	1 apheresis	1 apheresis
CRYOPRECIPITATE	1 unit (pooled)*	1 unit (pooled)			

*The cryo is thawed immediately after activation of MTP and issued when ready.

- iv. Send the products via the pneumatic tube (if unavailable, a runner can pick up products at the blood bank)
- v. Set up Pack 2 immediately after Pack 1 is delivered by pneumatic tube
- vi. Send subsequent Packs when a phone request is received, which usually occurs when the previously issued products are nearly exhausted

3. During MTP

- a. Send laboratory tests – arterial blood gas, hematocrit, electrolytes, fibrinogen, platelets, PT, and PTT
- b. Maintain:
 - i. Hemoglobin 7-8 g/dL (neonates 9 – 10 g/dL)
 - ii. Fibrinogen 150-200 mg/dL
 - iii. PT/PTT < 1.5x normal
 - iv. Platelets 50,000 – 100, 000
- c. Anticipate and correct electrolyte abnormalities:
 - i. Hypocalcemia (Ca^{++} < 1.14 mmol/L)
 1. Calcium chloride - 10-20 mg/kg
 2. Calcium gluconate - 30-50 mg/kg
 - ii. Hyperkalemia (K^{+} > 5.5 mEq/L + ECG changes or K^{+} > 6 mEq/L)
 1. Calcium gluconate - 50-100 mg/kg
 2. Sodium bicarbonate - 1 mEq/L
 3. Insulin regular - 0.1 U/kg
 4. D50 - 1 mL/kg
 - iii. Acidosis (pH < 7.2)
 1. Consider sodium bicarbonate 1-2 mEq/kg/dose
 - iv. Hypomagnesemia (Mg < 1.5 mg/dL)
 1. Magnesium sulfate 50 mg/kg
- d. Maintain normothermia
- e. Consider tranexamic acid
 - i. 10 - 30 mg/kg (maximum 2g)
 - ii. 5 - 10 mg/kg/h infusion

4. Discontinuation of MTP

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- a. Initiation physician or designee will notify the Blood Bank by phone
 - b. Unused blood components should be returned immediately to the Blood Bank
5. Debriefing after MTP
- a. The Initiating physician or designee and Blood Bank physician will review whether:
 - i. There were any delays in receiving blood products
 - ii. Any issues arose with any blood component
 - iii. All appropriate forms and requests were completed
 - iv. There are any improvements that can be made in the process



Blood Bank and Transfusion Service
The Mount Sinai Hospital
One Gustave L. Levy Place
New York, NY 10029

Patient Name: _____

MRN: _____

Unit Location: _____ Tube Station # _____

Date / Time of phone call: _____

-- Please PRINT or attach patient label --

Emergency Blood Release – Please call 4-6101 to notify Blood Bank -- ask for “Emergency Release”, specify type of blood product, and give patient name and MRN

I certify that release of blood without complete crossmatch and/or ABO typing is clinically indicated by the emergency nature of the patient's condition. I understand that the Blood Bank will perform routine compatibility and crossmatch testing as soon as possible and will immediately report any incompatibility to me.

WARNING: STOP TRANSFUSION IMMEDIATELY IF NOTIFIED BY BLOOD BANK OF CROSSMATCH INCOMPATIBILITY ISSUE

MD Signature: _____ Dict. Code/License: _____

Reason for Emergency Transfusion: _____

Place Donor Identification Number Labels from Released on back of form

Reviewed by: _____
BB Medical Director/Designee

Date: _____

**Emergency Packed Red Cell (PRBC) Release-
Uncrossmatched (UnXM) Blood**

<input checked="" type="checkbox"/>	Order	Blood Availability	Blood Bank Provides
	2 UnXM PRBC	Immediate	2 units uncrossmatched PRBC
	4 UnXM PRBC	Immediate	4 units uncrossmatched PRBC

Neonatal / Pediatric Emergency Transfusion

Specify Blood Products / Derivative:

ECMO patient = 2 units RBC and 2 units FFP

**Massive Transfusion Protocol (MTP) – Call Blood Bank at 4-6101 to Activate MTP and request “MTP Pack”
Provide Patient Name, MRN, location, Responsible Attending, & Contact Information**

I certify that the clinical condition of this patient warrants use of the massive transfusion protocol, with immediate need for plasma and/or platelet.

WARNING: STOP TRANSFUSION IMMEDIATELY IF NOTIFIED BY BLOOD BANK OF CROSSMATCH INCOMPATIBILITY ISSUE

MD Signature: _____ Dictation Code: _____

Reason for Massive Transfusion: _____

Place Donor Identification Number Labels from Released on back of form

Reviewed by: _____
BB Medical Director/Designee

Date: _____

Adult Massive Transfusion Protocol Pack - Round 1 & 2

Blood Bank Provides:

5 packed red cell units, 5 thawed plasma units
1 apheresis platelet (= 6 units of platelets)
1 pooled cryoprecipitate (=5 units of cryo)

Massive Transfusion Protocol Pack – Round 3 will not include pooled cryoprecipitate

After MTP Round 3 please send CBC, PT/PTT and Fibrinogen level to central lab to follow for coagulopathy / modify component therapy as needed.

Pediatric Massive Transfusion Protocol – Round 1

Weight is less than 25 kg (55 lbs)

2 packed red cell units 2 thawed plasma units
1 apheresis platelet

Pediatric Massive Transfusion Protocol – Round 2

2 packed red cell units 2 thawed plasma units
1 apheresis platelet 1 pooled cryoprecipitate

Pediatric Massive Transfusion Protocol – Round 1 and Round 2

Weight is equal to or greater than 25 kg (55 lbs)

5 packed red cell units 5 thawed plasma units
1 apheresis platelet 1 pooled cryoprecipitate