TuftsMedicine
Lowell General Hospital

Hospital Policy and Procedure Manual, Vol. I, Provision of Care, Treatment and Services

Title: *Massive Transfusion Policy (Adult and Pediatrics)*
Author/Reviewer: *Blood Bank Supervisor*
IMPORTANT NOTICE: The official version of this policy is contained in Ellucid and may have been revised since the document was printed.

I. PURPOSE:

- To provide consistent expectations for assessment, communication and intervention for patients who require large blood volume replacement.
- To define a mechanism of treatment for patients who meet the criteria
- To define thresholds for immediate *Massive Transfusion* protocol
- To define continuous monitoring indicators of patient status/response
- To minimize unnecessary component transfusions
- To identify necessary personnel resources to activate *Massive Transfusion protocol*

II. SCOPE: Qualified Medical Staff, Registered Nurse (RN), Laboratory

III. POLICY:

1. Indications for the initiation of the Massive Transfusion protocol include but are not limited to:
    a. **Administration of one estimated blood volume** (approximately 10 units of blood in 24 hours in an adult; 40 ml/kg for pediatric patients) and continuing need for transfusion.
    b. Massive blood loss with profound hemorrhagic/hypovolemic shock.
    c. In cases of trauma, surgical or obstetrical emergency consider:
        1) Prolonged PT (INR greater than 1.5), decreased fibrinogen levels (less than 100 mg/dl) or platelet count (less than 100,000/ml), accompanied by hemorrhage.
        2) A clinical presentation that suggests profound or continued microvascular bleeding in the absence of abnormal lab values.

2. Blood and blood product administration will be based on the clinical condition and the results of laboratory tests. This will require tests to be done frequently with rapid turn-around to support timely assessment and treatment.
   The following laboratory tests should be monitored every *30 minutes*:

   PT/ INR
   PTT
   Fibrinogen
   Hemoglobin, Hematocrit, Platelet count

3. If there is gross evidence of microvascular bleeding/DIC that is not reflected in the most recent coagulation studies, the physician may consult with a pathologist and order cryoprecipitate as needed.
4. Blood and blood components in a predetermined ratio will be dispensed as the product becomes available. *Once the protocol is activated* ***consider*** *using 1 unit of plasma for each unit of RBC; 1 dose of apheresis platelets for every 6 to 8 units of RBC, 10 units of cryoprecipitate for every 10 units of RBC.* **Note:** Only one unit of apheresis platelets is kept in-house. Once the initial dose of apheresis platelets is dispensed, it can take 2-4 hrs. to receive additional units of apheresis platelets depending on availability.

MTP Cooler 1

- 2 liquid plasma (give 1st)
- 4 Red Cells (adult) - 2 Red Cells (pedi)
- 6 pack platelets (room temp container)

MTP Cooler 2

- 2 liquid plasma
- OB patients receive 1 bag of Prepooled Cryoprecipitate (room temp Container)

MTP Cooler 3

- 4 liquid plasma
- 4 red cells
- 6 pack platelets (if available) (RT container)

5. Ordered blood products will be available for transfusion within the appropriate time frames depending upon the product ordered:
    a. Type “O” uncrossmatched RBC: 7-15 minutes after receiving the order in the computer.
    b. Type specific IS-Crossmatch compatible RBC: 15-20 minutes after receiving both the Type and Screen and the confirmation sample.
    c. Type, Screen and Crossmatch: 40-50 minutes after receiving the specimen as long as a historical type is in the computer or a confirm sample is received.
    d. Additional units to be crossmatched: 15 additional minutes if the antibody screen was negative.

e. Plasma and cryoprecipitate approximately 20-30 minutes.
f. Platelets 7-15 minutes if available.

Note: If the one unit of Apheresis platelets kept in-house is available, it can be dispensed within 10 minutes. If the in-house unit of Apheresis platelets is not available, it will possibly take two hours for additional Apheresis platelets to arrive. Timeframe to arrive can be greater than 2 hours during rush hour traffic, inclement weather, or other factors beyond our control.

6. ***Clinicians must communicate to the Blood Bank the actual blood product usage so that "need" can be met and wastage prevented.***
7. **Switching Blood Types**: Massive transfusion of Rh-Negative patients may require the transfusion of Rh-Positive blood if the supply of Rh-Negative blood is low. Rh Negative males and women past childbearing age (greater than 50 years old), who do not have anti-D in their serum are *automatically* candidates for receiving Rh Positive blood in an emergency. Pathologist approval to switch to Rh-positive will be requested for all Rh-negative patients after receiving 4 Rh negative red cells.
8. Clinicians should consider the use of perioperative blood salvage (cell saver), recombinant Factor VIIa, TXA, blood warmers and rapid infusers.

IV. ADDITIONAL INFORMATION:

1. ** ***Hypothermia contributes to coagulopathy. Use the blood warmers when administering large volumes of blood products and fluids.*** **
2. The clinical staff will monitor and document the following:
    a. Vital signs
    b. Lab results
    c. Times and volumes of colloids, crystalloids and drugs infused.
3. Transfuse with **uncrossmatched** blood if crossmatch will unnecessarily delay the transfusion. **O Rh-negative (if available)** for all **No Type on File females under age 50** and **Rh-positive** for all others.
4. **Patients with known Antibodies:** Massive transfusion guidelines can also apply to patients with **clinically significant allo-antibodies**. The Red cells selected **must be negative** for the corresponding **antigens *if possible;*** if that is not possible then antigen negative red cells must be provided once the bleeding is under control. Patient will be switched back to antigen negative blood and to full antiglobulin crossmatches if additional blood is ordered after the massive transfusion.
5. Additional preparation time is needed when blood products are aliquoted or pooled or when deviation from protocol occurs.
6. During an emergent blood transfusion, documentation will be recorded in the Trauma Narrator in the medical record. All nursing actions must still be followed in accordance with Lowell General Hospital's Administration of Blood Product, Post-Partum Hemorrhage and/or Massive Transfusion policies and procedures.

V. PROCEDURE:

1. A physician will initiate the ***Massive Transfusion Protocol*** if a patient demonstrates massive blood loss accompanied by hemorrhagic shock and/or metabolic acid/base deficit.
2. The charge nurse will activate the trauma pager. An MTP order will be placed in the medical record and followed up with a call to the Blood Bank. The Administrative Coordinator will also be notified of the trauma activation and initiation of the ***Massive Transfusion Protocol.*** The following information will be provided to the Blood Bank:

a. State "**Initiate Massive Transfusion Protocol**" for a patient:
b. Full Name of Patient
c. Medical Record Number
d. Gender & date of birth (if known)
   Note: If patient information is unknown, create a generic patient in the HIS to be used throughout the case
e. Specify location of patient
f. Verify Blood Bank sample has been ordered and drawn.
   Note: It is difficult to get an accurate blood type on a patient if the blood bank sample is obtained after the patient has received multiple blood products.

Order Massive Transfusion Protocol in HIS

3. The Blood Bank will:
   a. Document patient information and start time on "Massive Transfusion Checklist".
   b. Prepare RBC cooler with ice packs and dispense 4 units of "Type Specific" or type "O" RBC's for adults. **(Rh-negative [if available] for all NTOF females under the age of 50 and Rh positive for all others). Pediatric patients will receive 2 red cells.**

   Note: The initial RBC cooler should arrive within 15 minutes of Massive Transfusion Activation if orders are in the computer. Un-crossmatched blood will be dispensed if crossmatching will unnecessarily delay the transfusion. (Rh negative [if available] for all "**No Type on File" female patients under age 50** and Rh positive for all other patients). An Emergency release form **MUST** be signed any time all the necessary testing is not complete prior to dispensing blood product.

   c. Add 2 pre-thawed Group A plasma to the cooler with the 4 Red cells. Cooler will be labeled MTP Cooler 1. In emergency situations Group A plasma can be dispensed to any ABO type.

   Note: Only the Main Campus keeps 2 Pre-thawed Group A plasma. Saint Campus would need to immediately begin thawing 2 "Type specific", "A" or "AB" plasma.

   d. Dispense one platelet into a room temp container (if available)
   e. Bring the cooler and room temp container with the platelet to the location if necessary. LDR will send a courier. The documenting nurse is the point of contact for the Emergency Department. Give the cooler to him/her.
   f. Have the doctor sign the Emergency Release Form.

   Note: If the physician is unable to sign the form at that time, a witness/RN can sign in the interim, but physician signature must be obtained when available.

   If the physician signs the Emergency release form, a RN does not have to sign.

   g. On all Maternity patients or patients suspected of being in DIC start thawing 1 unit of **Pre-pooled Cryo** (each pool equivalent to 5 doses of Cryo).
   h. Begin thawing additional 2 units of plasma.
   i. Notify a pathologist that the MTP is in process.

j. Add the thawed plasma to a cooler with ice labelled MTP Cooler 2. Contains 2 plasma.

Note: Do not add plasma that has just been thawed to a cooler with refrigerated red cells.

k. If cryo was thawed, add it to a room temp container.
l. Bring the thawed plasma and cryo (if needed) to the location.
m. If needed, start thawing 4 more FFP.
n. Continue releasing blood products on a 1:1 red cell to plasma basis as thawed plasma comes available.
o. Evaluate blood product inventory and order from the American Red Cross as needed.
p. When platelets arrive, call nursing unit to notify them platelets have arrived and ask if they want them immediately transported to patient location.
q. ***Seek communication with Clinicians pertaining to the actual blood product usage so that "need" can be met and wastage prevented.***

4. The clinical staff will administer the blood products as indicated by patient status and lab results.
    i. All packed cells and plasma will be administered with an appropriate filter using a **blood-warming device**.
    ii. Pumps can be used when increased flow is needed.
    iii. Packed cells and plasma not immediately transfused will be kept in Blood Bank approved coolers at the patient's bedside until administered. Coolers are validated to hold six products for six hours.
    iv. Cryoprecipitate is available in pre-pooled packs of 5 units. Consider use when fibrinogen is less than 100 mg/dl.
    v. Platelets and cryoprecipitate must be kept at room temperature **Do Not Refrigerate**.
    vi. Transfuse with type specific, crossmatched blood whenever possible
    vii. Transfuse with **uncrossmatched** blood if crossmatch will unnecessarily delay the transfusion (**Rh negative [if available] for all No Type on File females under age 50** and **Rh positive** for all others).
    viii. Monitor lab data as it becomes available and reassess need to continue support at current level.
    ix. ***Communicate to the Blood Bank the actual blood product usage so that "need" can be met and wastage prevented.***
    x. Blood Bank coolers are not to leave the hospital. If products need to be sent with the patient, the Blood Bank can transfer the products to a validated shipping box.

5. Upon cessation of Massive Transfusion Protocol by a physician
    a. The primary RN will notify the Blood Bank and the Administrative Coordinator.
    b. Any coolers and room temp containers will be returned to the Blood Bank

c. The Blood Bank will no longer automatically supply blood or blood products

IV. **LIMITATIONS:** The optimum ratio of RBC: Plasma: Platelet: Cryo is unknown. Monitor patient lab results for best outcome.

V. **NURSING PROCEDURE ADULTS:**

a. The attending physician will determine the need for implementation of the Massive Transfusion Policy (MTP)
b. Order for MTP to be placed in medical record.
c. Charge RN or other Designee will follow up with phone call to Blood Bank to notify of order for MTP and patient location for delivery of products
d. Registered Nurse will administer blood products in order of cooler delivered to unit
    i. Blood products will be delivered via rapid infusion with blood filter tubing
    ii. Warming measures will be utilized
    iii. Administration of units will continue until MTP event is discontinued
    iv. Nursing will document Vital Signs every 5 minutes during MTP Event
    v. Nursing will continuously monitor patient for signs of possible transfusion reaction
    vi. Beware of hyperkalemia
    vii. Beware of hypocalcemia – Replete as ordered
    viii. Lab specimens will be sent as ordered
e. Discontinuation of the MTP event, as determined by the attending physician, will be communicated by the Charge RN or other Designee directly to the Blood Bank
f. Unused products will be returned to the Blood Bank
g. Administration of products will be documented in the medical record. Documentation will include the following information
    i. Unit #
    ii. Product Type
    iii. Time Up
    iv. Time Down
    v. Volume Infused
h. Special Considerations
    i. Platelets cannot be administered via rapid infuser/warmer – Instead they will be rapidly infused on primary blood tubing
    ii. Cryoprecipitate cannot be administered via rapid infuser/warmer – Instead infuse rapidly on primary blood tubing
    iii. Blood Bank Coolers cannot be permitted to leave the building - If a patient is to be transferred to an outside hospital, Blood Bank personnel can specially package blood products for transportation in compliance with FDA regulations

PEDIATRICS: (in addition to above)

a. **Inclusion Criteria: Patients weighing 35kg or less requiring greater than or equal to 40ml/kg of blood product administration**
b. Exclusion Criteria:
    i. Patients weighing more than 35kg
    ii. Neonates
c. Blood products should be administered in 10m/kg aliquots
d. Consider administration of tranexamic acid (TXA) 15mg/kg (max dose 1gm) within first 3-hours of hemorrhage, then 2mg/kg/hour infusion in addition to the MTP (Dftb, 2015; Evangelista et al., 2020; Russel et al. 2023).
e. Beware of hyperkalemia
f. Beware of hypocalcemia

i. Replete with Calcium Chloride 20mg/kg – OR – Calcium Gluconate 100mg/kg

g. Monitor temperature

h. Cryoprecipitate
   i. Indications:
      1. Fibrinogen less than 100 mg/dL OR
      2. Rapidly falling fibrinogen
   ii. Dose 1u/5kg
   iii. In contrast to RBC, FFP and Platelets, Cryoprecipitate will not be prepared by the Blood Bank automatically, without a specific order for cryoprecipitate. The attending physician or designee will contact the Blood Bank to order cryoprecipitate.

VI. ASSOCIATED LINKS:

Link A: Emergency Release form

VII. REFERENCES:

1. AABB Standards for Blood Banks and Transfusion Services, 32th Edition, April 2020
2. AABB Technical Manual, 19th Edition, 2017
3. Increase plasma and platelets to red blood cells ratios improve outcome in 466 massively transfused civilian traumas. Holcomb JB et al. Ann Surg.2008; 248(3):447-58
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5. Dftb, T. (2015). Massive transfusion protocol. *Don't Forget The Bubbles*. https://doi.org/10.31440/DFTB.7098
6. Evangelista, M. E., Gaffley, M., & Neff, L. P. (2020). Massive Transfusion Protocols for Pediatric Patients: Current Perspectives. *Journal of Blood Medicine*, *11*, 163–172. https://doi.org/10.2147/JBM.S205132
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VII. POLICY TRACKING RECORDS:

REVISED/REVIEWED: 7/12; 2/13; 6/15; 7/18; 1/20; 2/22; 11/23
Policy Adopted and Integrated at Saints Campus; 3/15; 11/16, 2/19, 12/23

VIII. ENDORSEMENT:

Trauma Program Manager, Laboratory Director, Policy Review Committee, Nurse Practice Council, VP Patient Care Services, CNE