Massive Hemorrhage Protocol (Pediatric) – Informational Document

Purpose

This document provides information regarding the protocol involved to ensure the safe and expeditious provision of blood products during an identified situation of massive bleeding.[1234]

Policy

- Massive hemorrhage protocol activation is appropriate only within the context of a massively bleeding patient within a SHA Saskatoon urban hospital site.
  - **Massive blood loss in pediatric patients** is defined as:
    - The loss or anticipated loss of ≥40% (35-40 mL/kg) total blood volume in 3 to 24 hours.
  - The MRP (lead physician) shall clinically assess the patient to determine when massive blood loss criteria are met and decide when to activate the MHP.
  - The MRP activating the MHP shall designate a 'Team Contact' to notify TML of MHP activation.
  - If uncrossmatched red blood cells are being requested, the requesting physician MRP shall document in the patient's chart that the clinical situation justifies the transfusion and obtain informed consent from the recipient or caregiver when possible.

- To activate the MHP, one individual should be designated as the 'Team Contact' and shall notify the TML of MHP activation. The following details shall be provided by the team contact to TML:
  - 'Team Contact" name.
  - Patient identification (name, HSN, sex).
  - Approximate patient age (or date of birth, if known).
  - **Patient weight** (known or estimated).
  - Care team location.
  - Contact phone number.
  - Name of the MRP.

- The TML technologist shall notify Hematology/Coagulation and provide them with the patient's identification (name and identification number).

- A lavender EDTA tube shall be sent to TML for testing as soon as possible to enable issue of group specific blood components.

- The MHP boxes will include the following components, but can be customized upon request:

Patients ≤ 10 kg	Patients 11 – 49 kg	Patients ≥ 50 kg
MHP BOX 1: 1 RBC, 1 FP	**MHP BOX 1:** 3 RBC, 3 FP	**MHP BOX 1:** 4 RBC, 4 FP
MHP BOX 2: 1 RBC, 1 FP, 1 PLT	**MHP BOX 2:** 3 RBC, 3 FP, 1 PLT	**MHP BOX 2:** 4 RBC, 4 FP, 1 PLT

- TML will alternate between MHP BOX 1 and MHP BOX 2 until clinical situation is resolved.

- Blood component and plasma protein product considerations within the context of a MHP:

MHP Red Cell and Plasma Requirements

Note: *The Transfusion Medicine Physician may recommend alternative blood components depending on inventory limitations and degree of blood component utilization.*

Patient's Testing Status	Red Cell Requirements				Plasma Requirements	
	Crossmatched	Crossmatched Group O, Rh Compatible	Group Specific Uncrossmatched	Group O Rh Neg Uncrossmatched	Group Specific or Group Compatible	Group AB
Unknown patient identification – no blood group this admission Male or Female < 17				Yes*		Yes
Identified patient – no blood group this admission Male or Female < 17 years				Yes*		Yes
Identified patient, group and screen done this admission Male or Female < 4 months		Yes				Yes
Identified patient, group and screen done on this admission, but crossmatch is outdated Male or Female > 4 months, < 17 **ABO Confirm Tested**			Yes		Yes	
Identified patient, group and screen done on this admission, but crossmatch is outdated Male or Female > 4 months, < 17 **ABO Confirm NOT Tested**				Yes	Yes	
Identified patient, group and screen done this admission – crossmatch in-date and a historical blood group Male or Female > 4 months, < 17	Yes				Yes	

*If inventory allows, all female patients should receive Kell negative RBC.

- Group incompatible platelets may be issued throughout the duration of the MHP depending on inventory availability.
  - When Rh negative patients receive Rh positive platelets, Rh immune globulin shall be recommended to all pediatric patients once the MHP has been discontinued AND after consultation with the Transfusion Medicine Physician on-call.

Patients ≤ 10 kg	Patients 11 – 49 kg	Patients ≥ 50 kg
60 µg WinRho shall be issued	120 µg WinRho shall be issued	120 µg WinRho shall be issued

- Fibrinogen replacement may be requested in the form of Fibrinogen Concentrate (RiaSTAP) or Cryoprecipitate.
  - **Note**: Pediatric Fibrinogen Concentrate (RiaSTAP) dosing is 60 mg/kg (**MAX** 2 grams for patients between 3 to 30 kg body weight and 4 grams for patients > 30 kg).
  - Cryoprecipitate does not need to be blood group matched during a MHP for patients > 4 months.

- Special instructions in the LIS will be reviewed by the Transfusion Medicine Physician for appropriateness in the context of an MHP. Special instructions for blood components may include the following:
  - Irradiated
  - Phenotype matched
  - Other product manipulation requests (e.g., washing, volume reduction) shall be waived for the duration of the MHP.

- Requests for plasma protein products (not including Fibrinogen Concentrate) shall be reviewed with the Transfusion Medicine Physician on-call for appropriateness.

- Prior to blood component issue, a requisition containing patient identifiers (name, identification number, sex and weight), name of the requesting physician, time of request and blood destination **shall** be received by TML.
  - If patient identification is unknown at the time of MHP activation, the TML must be provided with patient identifiers (name, hospital number) assigned by patient registration, as per the requisition. Confirmed patient identification shall be merged with the assigned identification as soon as possible.

- Once the ABO blood group has been confirmed and/or IAT crossmatch results are available:
  - An attempt will be made by TML to retrieve all issued uncrossmatched RBC and replace with group specific uncrossmatched RBC.
  - An attempt will be made to retrieve RBC units issued which have been determined to be IAT crossmatch incompatible and replace with compatible units.

- All products issued under the MHP will be provided in unsealed coolers that are not validated for product storage and therefore must either be:
  - Transfused within 4 hours of issue **OR**
  - Returned to Transfusion Medicine within 60 minutes of issue for return to available inventory **OR**
  - Discarded by TML staff if returned unused greater than 60 minutes after issue.

- The MRP shall determine when the MHP may be discontinued.
  - Notification of MHP discontinuation shall be provided by the MRP or designate to the TML within 30 minutes of the decision to discontinue the MHP.
  - The TML shall notify Switchboard to communicate a PEDIATRIC CODE TRANSFUSION – ALL CLEAR message, to enable an overhead announcement and list page-out signaling MHP discontinuation.

- Discussion of any problems arising from the MHP should be initiated within one week of the event if possible. A summary of any MHP activation event will be reported to the Saskatoon Health Region MHP Committee. A blood product wastage report shall be provided to the MHP committee for review.

Definitions

For the purposes of this document, the following definitions apply:

Term, abbreviation, acronym, etc.	Definition
ASAP	As soon as possible
ELXM	Electronic crossmatch
HSN	Health Services Number - A unique personal health number assigned to an

	individual. This is usually the Saskatchewan or out-of-province health number, or may be Canadian Forces (CF), Federal Penitentiary (FPS) number, etc. The HSN is entered into the 'PHN field' of the LIS. See Appendix B for HSN formats.
Massive blood loss (in pediatric patients)	The loss of anticipated loss of ≥ 40% (35-40 mL/kg) total blood volume in 3 to 24 hours.
MRP	Most Responsible Physician or lead physician
MHP	Massive Hemorrhage Protocol
Neonate	A patient who is < 4 months of age
Pediatric	A patient who is > 4 months and < 17 years of age
RBC	Red blood cells
shall	Indicates the action is mandatory
should	Indicated the action is recommended
SHR	Saskatoon Health Region
TML	Transfusion Medicine Laboratory

Procedure

Step	Action
1	Identify the presence of 'massive bleeding'.
2	'Team Contact' shall notify the TML of MHP activation: • RUH: #2179. The following details shall be provided by the team contact to TML: • 'Team Contact" name. • Patient identification (name, HSN, sex). • Approximate patient age (or date of birth, if known). • **Patient weight** (known or estimated). • Care tram location. • Contact phone number. • Name of the MRP. At any time during the MHP, TML must be updated on patient location or team contact name to ensure accurate delivery of blood components.
3	Confirm with the TML technologist that a blood group and screen is available. If it has not yet been collected, the 'Team Contact' is responsible for ensuring the sample is drawn and received by TML.
4	If uncrossmatched red blood cells are being requested, MRP must document in the patient's chart the situation which justifies the transfusion. Obtain informed consent from the recipient or caregiver when possible. • Complete a Blood Product Request Form and send immediately to TML. • If patient identification is unknown at the time of the MHP activation, the patient will remain an unidentified patient (assigned name and identification number by registration) throughout the MHP event. Confirmed patient identification will be merged once the MHP is discontinued.
5	Early consideration should be given to the use of tranexamic acid for patients that are less than 3 hours from trauma. • **Dose:** Tranexamic acid 15-30 mg/kg IV (MAX 1 g) over 15 minutes in **all** patients within 3 hours of injury, followed by 5-10 mg/kg/h IV (MAX 1 g) infusion over 8 hours in trauma patients.

<table>
<tr><td>6</td><td>TML will notify the following individuals upon MHP activation:
• Transfusion Medicine Physician.
• Hematology/Coagulation.</td></tr>
<tr><td>7</td><td>TML will ensure that RBCs will be switched from Group O to group specific (if applicable) as soon as the patient ABO blood group is confirmed, and may be switched to Rh-positive according to the policy.</td></tr>
<tr><td>8</td><td>TML will prepare MHP BOX 1. TML will notify the ward when the box is ready. The ward is responsible for picking up the box.
• Plasma takes about 25 minutes to thaw; the RBC may be issued in advance of the plasma.

<table><tr><th>Patients ≤ 10 kg</th><th>Patients 11 – 49 kg</th><th>Patients ≥ 50 kg</th></tr><tr><td>MHP BOX 1: 1 RBC, 1 FP</td><td>MHP BOX 1: 3 RBC, 3 FP</td><td>MHP BOX 1: 4 RBC, 4 FP</td></tr></table></td></tr>
<tr><td>9</td><td>TML will begin to prepare MHP BOX 2. This box will be ready for issue within 30 minutes of MHP BOX 1. TML will notify the ward when the box is ready. The ward is responsible for picking up the box.

<table><tr><th>Patients ≤ 10 kg</th><th>Patients 11 – 49 kg</th><th>Patients ≥ 50 kg</th></tr><tr><td>MHP BOX 2: 1 RBC, 1 FP, 1 PLT</td><td>MHP BOX 2: 3 RBC, 3 FP, 1 PLT</td><td>MHP BOX 2: 4 RBC, 4 FP, 1 PLT</td></tr></table></td></tr>
<tr><td>10</td><td>MHP BOX 1 and 2 will alternate until the clinical situation is resolved.</td></tr>
<tr><td>11</td><td>Order the following laboratory tests every 30 minutes:
• CBC, aPTT, INR, fibrinogen.
• Venous blood gas, ionized Ca.</td></tr>
<tr><td>12</td><td>Administer IV fluids through warming device and maintain patient temperature ≥ 36°C. If temperature < 35°C actively warm patient.
• Red blood cells or plasma should be infused through a blood warmer or rapid infuser (NOT platelets).</td></tr>
<tr><td>13</td><td>Assess hemorrhage rate and severity between doses of blood components. If possible, wait for results of laboratory tests before transfusing additional blood components.</td></tr>
<tr><td>14</td><td>The contents of MHP boxes may be customized upon request on the basis of the last available laboratory tests:

<table><tr><th>Product</th><th>Treatment Considerations</th></tr><tr><td>RBC</td><td>Maintain hemoglobin at ≥ 80 g/L</td></tr><tr><td>Plasma</td><td>INR ≥ 1.8 or aPTT > 40 and hemoglobin stabilizes, prioritize plasma transfusion over red cells</td></tr><tr><td>Platelets</td><td>Platelets ≤ 50 x 10^9/L consider an additional dose of platelets</td></tr><tr><td>Fibrinogen Concentrate or Cryoprecipitate</td><td>Fibrinogen ≤ 1.5 g/L consider fibrinogen concentrate 60 mg/kg (MAX 2 grams for patients between 3 to 30 kg body weight and 4 grams for patients > 30 kg) or Cryoprecipitate.</td></tr></table></td></tr>
<tr><td>15</td><td>Consider giving 50 mg/kg Ca Gluconate IV if ionized calcium < 1.15 mmol/L.</td></tr>
<tr><td>16</td><td>Contact the Transfusion Medicine Physician at any time to discuss the possibility of adjunctive blood component or plasma protein product therapy if hemorrhage persists despite optimal resuscitative efforts, patient has known bleeding disorder or is on anticoagulation.</td></tr>
<tr><td>17</td><td>When control of bleeding has been obtained, with achievement of hemodynamic stability and the transfusion rate has slowed, or when resuscitation efforts have been withdrawn, the MRP shall discontinue the MHP. Contact the TML to communicate that the MHP has been discontinued.</td></tr>
</table>

18	Return any unused blood products to TML as soon as possible. **Note**: Products that are returned after more than 60 minutes may be held in the laboratory for a short period of time before being discarded taking into consideration all products must be infused within 4 hours of original release from the laboratory.
19	The TML shall notify Switchboard of the PEDIATRIC CODE TRANSFUSION – ALL CLEAR.

Appendix

JA–304 Pediatric Massive Hemorrhage Protocol (MHP)

References

[1] Calgary Laboratory Services. FMC Massive Transfusion Protocol (MTP) – Adult. https://www.calgarylabservices.com. Accessed September 6, 2016.

[2] Hunt BJ, Allard S, Keeling D, et al. A Practical Guideline for the Haematological Management of Major Haemorrhage. In: British Journal of Haematology. 2015. 170, 788-803.

[3] Dzik WH, Blajchman MA, Fergusson D, et al. Clinical review: Canadian National Advisory Committee on Blood and Blood Products – Massive Transfusion Consensus Conference 2011: report of the panel. Critical Care 2011, 15:242.

[4] Pediatric MHP Provincial Tool Kit Ontario.