



# Massive Transfusion Protocol (MTP)

## Site Applicability

SPH Only

## Practice Level

Registered Nurses (RNs), Licensed Practical Nurses (LPN's), Nurse Practitioners (NPs), Physicians, Perfusionists, Anesthesia Assistants (AAs), Medical Laboratory Technologists (MLTs), Porters/Aides and Unit Clerks may all be involved in a MTP (see Roles and Responsibilities chart).

- Licensed Practical Nurses (LPNs) or Registered Psychiatric Nurses (RPNs) may be the second person required for the process of patient/product identification but CANNOT act as the transfusionist.

## Requirements

1. Consent is required for the transfusion of any blood/blood product.
  - If the patient or substitute decision maker is able, Consent for Transfusion of Blood and/or Blood Products (Form ID-2750) must be completed.
  - If patient/substitute decision maker are unable to provide consent the Certification of Need for Emergency Transfusion of Blood and /or Blood Products: Waiver (Form ID-2749) must be completed.
2. Collecting a Group and Screen prior to the administration of any blood should be made a priority during a Massive Transfusion (MT) event.
3. All blood/blood products must still be checked and administered as outlined in [B-00-12-10065](#) Blood/Blood Product Administration procedure
4. Identifying source of blood loss and incorporating damage-control resuscitation measures should be forefront in management.

## Need to Know

1. **Massive Transfusion (MT) Definition** – The rapid transfusion of large volumes of blood.  
Example:
  - 6 or more units of RBC in one bleeding episode with ongoing losses
  - 3 or more units of RBC in one hour with ongoing losses
2. **Massive Transfusion Protocol (MTP)** – is defined as a coordinated plan developed by a multidisciplinary team to restore blood volume rapidly and effectively in a massively bleeding patient. Initiation of an MTP is declared by a Provider and blood/blood product is ordered by the Physician based on clinical assessment. Blood/blood product is **NOT** provided automatically in pre-determined ratios.



- **NOTE:** As soon as a MTP is called to Transfusion Medicine Laboratory (TML), technical staff will begin to allocate RBCs, platelets, and thaw plasma, however an order for specific blood/blood product types and amounts will still be required
3. **Initiation criteria:** based on clinical judgement, recommend using one of the following tools:
    - **Shock index:** heart rate divided by systolic blood pressure; Initiate MTP if score is 1 or greater.
    - **ABC score:** 1 point for each: penetrating injury, blood pressure less than 90 mmHg, heart rate greater than 120 beats per min and positive results of FAST (Focused Assessment with Sonography for Trauma); Initiate MTP if score is 2 or greater.
  4. **Monitor:** Vital signs (including temperature) at least every 30 minutes.
  5. **Monitor:** CBC, PT, PTT, fibrinogen, ionized calcium, lactate, electrolytes and ABGs (rapid metabolic panel with venous pH ok in emergency department) every 60 minutes.
  6. **Aims:**
    - Temperature greater than 36°C
    - pH greater than 7.2
    - Hemoglobin greater than 70 g/L
    - Lactate less than 4 mmol/L
    - Ionized Calcium greater than 1.1 mmol/L
    - Platelets greater than 50
    - INR less than 1.8
    - Fibrinogen greater than 1.5 g/L

7. **Order:**

Product	Initial order	Goal
RBC (1 unit = 280 mL)	Based on clinical presentation  Consider 1:1 (or 2:1) PRBC'S to Frozen Plasma <b>and</b> Platelets as needed  4 RBC: 4 Plasma <b>and</b> Platelets as needed  RBC/Plasma order in units  Platelets order in dose	Target more than 70 g/L
Plasma (1 unit = 200 mL)		INR less than 1.8
Platelets (1 dose = 4 pooled units)		Platelets more than 50
<b>If Fibrinogen less than 1.5 g/L (obstetrical patients less than 2 g/L) then consider ordering:</b> Fibrinogen <b>or</b> Cryoprecipitate <ul style="list-style-type: none"> <li>Fibrinogen 1 dose = 4 g</li> <li>Cryoprecipitate 1 dose = 10 pooled units)</li> </ul>	Fibrinogen 4 grams <b>OR</b> Cryoprecipitate 1 dose	Fibrinogen more than 1.5 g/L
<b>NOTES:</b> <ul style="list-style-type: none"> <li>If in the ED due to cognitive overload the provider cannot determine what products are needed TM will default to preparing products in a 1:1 ratio (PRBC'S: FP'S) and platelets as needed</li> <li>If in the OR consider Rotational Thromboelastometry (ROTEM) guided product selection and local processes</li> <li>See <a href="#">Appendix A</a>: MTP Quick Reference</li> </ul>		

8. **Optimize** intrinsic coagulation, consider:

- Tranexamic acid in trauma patients: for ordering consult [Parental Drug Therapy Manual](#)
- Avoiding hypothermia: use warm IV fluids and blood warmer

9. Consider **Reversal Agents** if indicated

10. Consider need for **Calcium Replacement** every 4 units of RBC or based on ionized calcium levels

## Protocol

### Steps

1. Physician declares MTP and determines what blood/blood products are required. Physician or delegate calls Transfusion Medicine Laboratory (TML) to verbally order blood/blood products:
  - One person/delegate should remain the TML contact person throughout the MT
  - When calling TML indicate: “massive transfusion”, identify reason (e.g., GI bleed), give patient information (name and MRN) and what blood/blood products are required
  - Alternatively, blood/blood products may be entered in Cerner using “TM Massive Transfusion Initial Treatment” Power Plan, but TML notification phone call still required. Blood/blood products **SHOULD NOT** be ordered in Cerner if already ordered verbally
2. TML will prioritize MT patient and notify Transfusion Medicine (TM) physician on call and core lab (to ensure all patient samples are prioritized and results expedited)
3. Area initiating MTP sends qualified staff to pick up products from TML
4. TML allocates and issues blood/blood product
  - If multiple blood/blood product types ordered TML will prepare blood/blood products based on ease of preparation unless otherwise requested, e.g., RBC then platelet then plasma then cryo/fibrinogen
  - Product preparation time in TML is dependent on blood/blood products ordered, quantity and staffing levels in TML:
    - i. RBC, Platelets: ready in approximately 3 to 5 minutes
    - ii. Plasma, Cryoprecipitate, Fibrinogen: ready in approximately 20 to 30 minutes
5. TML issues out product to qualified staff
  - Ideally staff to bring downtime blood/blood product pick up slip(s) with patient label on it (or if ordered in Cerner printed product pick up requisition); multiple blood/blood products can be requested using the same pick-up slip during a MT
  - Blood/blood product will be released during an MTP without pick up slip providing the person picking up blood/blood product knows exactly what blood/blood product is needed (type and amount) and has a Cerner patient label
  - If qualified staff arrive with no patient label: TML staff to call patient location and request information, if this cannot be done the only blood that can be released is untagged unmatched group O emergency RBCs
6. Blood given to patient
  - Platelets should be given on separate line (not through rapid infuser)
  - RBC and Plasma can be given via rapid infusion interchangeably without flushes between blood units
7. If patient remains critical: area to call TML for additional orders and follow step 2 to 6.
8. Once patient stabilized, area to call TML and notify them that MT is over; additional orders for blood/blood products to then be ordered in Cerner

9. Debrief with local team on how MT and patient care was managed
10. Debrief with full team on MT process:
  - TML will send out “Massive Transfusion Protocol Feedback – Clinical Team” ([Appendix B](#)) form to clinical area initiating the MTP (or ICU if initiated on the ward). Once completed, the clinical area to return form to TML
  - TML clinician to review MTP including process indicators and report back to all areas involved.

### Roles and Responsibilities

Role	Responsibilities
Provider (can also be NP)	Initiate MTP Identify Area Delegate Order required blood/blood products including type and volume Continually assess patient and MT requirements End MTP
Area Delegate (can be RN)	Communicate physician orders to TM Arrange blood/blood product pick up from TM Available to answer TM questions about blood/blood products
TML Technical Staff (MLTs)	Communicate with area delegate. Prioritize testing and product allocation for MT patient Allocate blood/blood product as ordered Issue blood/blood product as requested Notify on call transfusion physician of MTP
Porter/Aide (can be other qualified staff)	Pick up blood/blood product from TML and bring directly to MTP area
Area Staff (can include nurses, Perfusionists, AAs)	Check and administer blood/blood products Document MTP related events and product administration Communicate any changes in patient status to physician

## Documentation

- Document in free text note in Cerner all activates related to MTP including activation, deactivation and product administration if not charted according to B-00-12-10065 [Blood/Blood Product Administration](#) procedure

## Patient/Family Education

- Provide patient/family with verbal and written information regarding Massive Transfusion, including blood/blood products received and potential delayed adverse reactions. Provide pamphlet “[About Blood Transfusions](#)” (Available on the PHEM web site).

## Related Documents

1. [B-00-12-10065](#) - Blood/Blood Product Administration
2. [B-00-07-10082](#) - Blood/Blood Products: Safe Transportation to/from Transfusion Medicine
3. [Transfusion Medicine: Blood Product Fact Sheet](#)
4. [Transfusion Medicine: Laboratory Manual](#)
5. [Nursing Competency: Blood/Blood Product Administration](#) Online Learning Hub

## References

1. Callum, J. L., Yeh, C. H., Petrosoniak, A., McVey, M. J., Cope, S., Thompson, T., Chin, V., Karkouti, K., Nathens, A. B., Murto, K., Beno, S., Pendergrast, J., McDonald, A., MacDonald, R., Adhikari, N. K. J., Alam, A., Arnold, D., Barratt, L., Beckett, A., Pavenski, K. (2019). *A regional massive hemorrhage protocol developed through a modified Delphi technique*. CMAJ Open, 7(3), E546–E561. <https://doi.org/10.9778/cmajo.20190042>
2. Trudeau, J., Dawe, P., Shih, A. (2021). *Massive Hemorrhage and Emergency Transfusion*. In *Clinical guide to transfusion* (Chapter 11). Retrieved from: <https://professionaleducation.blood.ca/en/transfusion/clinical-guide/massive-hemorrhage-and-emergency-transfusion>
3. Clinical Practice Guidelines for the management of Trauma- Based Massive Hemorrhage. Version 2.0(2023). Retrieved from : [http://www.phsa.ca/health-professionals-site/Documents/CPG\\_Massive%20Hemorrhage\\_Algorithm%20removed\\_2023-09-12.pdf](http://www.phsa.ca/health-professionals-site/Documents/CPG_Massive%20Hemorrhage_Algorithm%20removed_2023-09-12.pdf)

## Appendices

[Appendix A](#): MTP Quick Reference Guide

[Appendix B](#): Massive Transfusion Protocol Feedback – Clinical Team

**Appendix A: MTP Quick Reference Guide**

<b>Massive Transfusion Protocol (MTP)</b> <i>Reminders:</i> Establish unequivocal positive patient identification, IV access (2 large bore IVs); initiate crystalloid/blood products where appropriate (use fluid warmer if available)	
<b>CRITERIA</b>	<ul style="list-style-type: none"> <li>• More than 3 units of RBC's in one hour or more than 6 units of RBC's in one bleeding episode <b>with ongoing losses</b></li> <li>• Trauma with ABC score 2+ where each of the following is 1 point: penetrating mechanism, SBP 90 mmhg or less in ED, HR 120 bpm or more in ED, positive FAST</li> <li>• <b>If unsure, activate MTP</b></li> </ul>
<b>1. ACTIVATE MTP</b>	<ul style="list-style-type: none"> <li>• <b>Call TM lab</b> and notify "Massive Transfusion Protocol"</li> <li>• <b>Provide patient information:</b> Name, MRN, gender, age</li> <li>• <b>Designate clinical contact person:</b> Provide name and contact number to TM</li> <li>• <b>Request blood products:</b> Ask for what you need; all blood product orders are verbal; the person communicating orders to TM lab <b>does not</b> have to be the provider</li> </ul> <p><b>Suggest starting with:</b></p> <ul style="list-style-type: none"> <li>○ 4 units RBC</li> <li>○ 3 to 4 units plasma</li> <li>○ 1 adult dose platelets</li> <li>○ 4 g fibrinogen concentrate (standard dose)</li> </ul>
<b>2. BLOOD WORK</b>	<ul style="list-style-type: none"> <li>• Group and Screen (GRS), ideally collected <b>before</b> the first unit of RBCs is initiated</li> <li>• <b>Baseline:</b> CBC, INR, PTT, Lytes, Ca, Fibrinogen, Lactate</li> </ul>
<b>3. OBTAINING PRODUCT</b>	<ul style="list-style-type: none"> <li>• <b>Delegate an individual for product pick - up</b></li> <li>• Ensure product request form/down time pick-up slip sent down to TML</li> <li>• Blood product transfusion <b>must</b> begin within <b>30 minutes</b> from the time product issued from TML</li> <li>• If the transfusion is delayed, <b>RETURN</b> product to TML</li> </ul> <p><i><b>Note:</b> TM may issue out product without a pick-up slip however, a Cerner patient label and quantity of products must be provided at time of pick up</i></p>



<b>4. ONGOING MANAGEMENT</b>	<ul style="list-style-type: none"><li>• <b>Keep temperature above 36°C</b>; aggressive re-warming reduces bleeding</li><li>• <b>Continue requesting blood products</b> as required; all blood product orders are verbal; the person communicating orders to TM lab <b>does not</b> have to be the MD</li><li>• <b>Bloodwork every 45 to 60 minutes</b>: CBC, INR, Fibrinogen, ABG (iCa2+)</li></ul> <p><b>Target:</b></p> <ul style="list-style-type: none"><li>○ Hemoglobin greater than 70</li><li>○ Platelets greater than 50</li><li>○ pH greater than 7.2</li><li>○ INR less than 1.8</li><li>○ Lactate less than 4 mmol/L</li><li>○ Fibrinogen greater than 1.5 g/L (obstetrical patients greater than 2 g/L)</li><li>○ Ionized Calcium greater than 1.1 mmol/L</li></ul>
<b>5. CONSIDER ADJUNCT MEASURES</b>	<ul style="list-style-type: none"><li>• Consider tranexamic acid (TXA); <b>DO NOT</b> use for GI bleeds<ul style="list-style-type: none"><li>○ 1 g IV bolus + 1 g IV bolus if required, ideally within 3 hours of injury</li></ul></li><li>• Empiric calcium administration: <b>Suggest</b> 1 g for every 4 units RBC</li><li>• Consult Transfusion Medicine physician via switchboard for further adjunctive therapy</li></ul>
<b>6. TERMINATE MTP</b>	<ul style="list-style-type: none"><li>• <b>Call TM lab</b> and notify “cancel MTP”</li><li>• <b>Return</b> all unused blood products to TM lab as soon as possible</li><li>• <b>If emergency supply used</b>, affix patient label to yellow copies of Transfusion Record and return to TM lab</li></ul>

*\*Adapted from: VCH Massive Hemorrhage Protocol, revised October 2023*





## Appendix B: Massive Transfusion Protocol Feedback – Clinical Team



Providence  
Health Care

### MASSIVE TRANSFUSION EVENT POST EVENT EVALUATION

Place Patient Label Here  
or

NAME: \_\_\_\_\_

MRN: \_\_\_\_\_

To continually evaluate the massive transfusion process at PHC please have a member of the clinical team who was involved in the recent massive transfusion activation for the patient listed below complete this form and **return** it to transfusion medicine (**tube to station 04 or fax to 68627 or return in person**).

Date MTP implemented: \_\_\_\_\_

MTP location: ☐ ED ☐ OR ☐ ICU ☐ CSICU ☐ CICU ☐ Other: \_\_\_\_\_

1. Was the initial process of activating an MTP easy? YES/NO (please explain):

\_\_\_\_\_

2. How would you rate the communication with the TM staff? Circle one:

EXCELLENT	GOOD	AVERAGE	POOR	WORST
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3. Were the blood/blood product(s) ordered received in a timely manner from Transfusion Medicine? YES/NO (Please explain):

\_\_\_\_\_

4. How would you rate your overall experience during the MTP? Circle one:

Needs Improvement	Satisfactory	Well Done
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5. Any additional suggestions for improvement?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Completed By: \_\_\_\_\_ Date Completed: \_\_\_\_\_  
Name Designation

RETURN FORM TO TRANSFUSION MEDICINE (Tube station 04 or fax to 68627)

**Persons/Groups Consulted:**

Team Lead Transfusion Medicine Laboratory

Medical Team Lead, Transfusion Medicine

Nurse Educator, - ED SPH

Nurse Educators- ICU

Nurse Educator- OR

Clinical Process Consultant -OR

Nurse Educator- PACU

**Developed By:**

Regional Transfusion Medicine Clinician

**Revised by:**

Regional Transfusion Medicine Clinician

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