Massive Transfusion Guidelines: An Evidence Based Approach

Frank Resch, MSc HQ, MLT (CSMLSI), MLS (ASCP®M)
Conflict of Interest

• Nothing to disclose.
Objectives

• Provide a definition of massive hemorrhage and massive transfusion.

• Understand the complications of a massive transfusion.

• Overview massive transfusion (MT) guidelines in trauma medicine for best practice.

• Identify barriers and facilitators in massive transfusion guideline implementation.
Outline

• Background
• Define massive hemorrhage and massive transfusion
• Discuss current evidence based practice (EBP) guidelines for massive transfusion.
  • Review the segregated foundation of EBP MT guidelines.
  • Barriers and facilitators to massive transfusion implementation.
Background

- Exsanguination hemorrhage
  - Common cause of death in first hour for trauma patients
  - Causes 50% of deaths in the first 24 hours.
- Why?
  - Trauma patients present with a coagulopathy due to trauma
  - Trauma causes a hemodynamic unstable event
  - Coagulopathy is classified as Trauma Induced Coagulopathy (TIC)
- Causes
  - Crystalloid and colloid admiration dilutes pro coagulant factors
  - Hypothermia will reduce coagulation factor activity
  - Tissue hypoxia leading to acidosis
  - TIC + Hypothermia + Acidosis = “lethal triad”
- Manage TIC, control hemorrhage, limit crystalloid = Damage Control Resuscitation (Trudeau, 2017)
Definition

- Massive Hemorrhage (MH)
  - Adult and adult sized children (>50 kg)
    - the loss of one blood volume in a 24h
    - the loss of 50% blood volume in 3h
  - Pediatric
    - Acute blood loss >15% of total volume (Lau, 2017)
- Massive Transfusion (MT)
  - Adult
    - 10 or more units transfused in 24h
    - >4 units transfused in 1h
    - Replacement of >50% blood volume in 4h (Trudeau, 2017)
  - Pediatric
    - 37ml/kg/h blood transfused (Rosenfeld, 2019)
Massive Transfusion Guidelines from Evidence Based Practice

- European Guidelines developed by the Task Force for Advanced Bleeding Care in Trauma (2019)

- American College of Surgeons (ACS), Trauma Quality Improvement Program® (TQIP®) compiled MTP for trauma patients from evidence based practice (ACS, 2014)

- Data from studies for non-trauma MT guidelines are inconclusive and heterogeneous (Hsu et al., 2016)

- MT guidelines for trauma does not cover neonatal and pediatrics.

- TQIP® has the largest database for MTP activation and outcome.
MT Guidelines Overview

- MT Guidelines should include direction for the following:
  - Trigger for initiating a MTP
  - Resuscitation in the emergency department with availability of resources described
  - Resuscitation/continuation of resuscitation in operating theater (OT), angiography and intensive care unit (ICU)
  - Transfusion medicine service logistics of blood products
  - Transfusion targets
  - Adjuncts for a MT
  - MTP termination
  - Timely MTP debrief
MT Trigger Guidelines

- MT trigger should demonstrate specificity and sensitivity for activation

- Shock Index (SI): Systolic Blood Pressure (SBP), HR (Heart Rate)\(^{20-21}\).
- Emergency Transfusion Score (ETS): SBP, Focused Abdominal Sonography for Trauma (FAST), type of trauma, age and injury mechanism\(^{22-23}\).
- Trauma Associated Severe Hemorrhage (TASH): SBP, HR, Hemoglobin (Hb), Base excess (BE), FAST and trauma type\(^{24-25}\).
- Schreiber: Hemoglobin (Hb), International Normalized Ratio (INR), trauma type and sex\(^{26}\).
- McLaughlin: SBP, HR, pH and Hematocrit (Hct)\(^{27}\).
- Assessment of Blood Consumption (ABC): SBP, HR, FAST, trauma type\(^{28-29}\).
- Larson: SBP, HR, Hb and BE\(^{30}\).
- Van Dromme: SBP, HR, Hb, INR and Lactate\(^{31}\).
- Prince of Wales Hospital (PW/Haener): SBP, HR, FAST, trauma type, Hb, BE and Glasgow Coma Scale (GCS)\(^{2-32}\).
- Cincinnati Individual Transfusion Trigger (CITT): SBP, T, Hb, BE, INR and FAST\(^{33}\).
- Massive Transfusion Score (MTS) and Revised Massive Transfusion Score (RMTS): SBP, HR, T, Hb, BE, INR, FAST and trauma type\(^{34-35}\).
- Traumatic Bleeding Severity Score (TBSS): SBP, Lactate, FAST, type and age\(^{36-37}\).
MT ED Resuscitation Guidelines

• Emergency trauma bay needs to be ready once MTP is activated

• Document the start time in patient’s medical record.

• Pre determination of the MTP Leader and communication liaison

• Universal blood groups for red blood cells (RBC) and plasma (FFP) available for immediate use.

• Use a predefined transfusion ratio FFP:RBC between 1:1 and 1:2 (Spahn et al., 2019)

• Pre determined package of blood products delivered every 15 minutes (ACS, 2014)

• Use rapid infusion and blood warming devices to treat hypovolemic shock and hypothermia.
MT Resuscitation Continued at Transferred Service Guidelines

- Patient may need to be transferred to angiography suite, operating theater (OT), or intensive care unit (ICU)

- Communicate to all services the movement of the patient to avoid delay in services

- Pass MTP leadership and communication roles to new team

- Lab or POC directed transfusion should be started when bleeding has slowed

- Receiving units should be prepared with equipment to continue rapid infusion of a MT.
Communication
- Identify communication role at both locations (Lab and Unit)
- Brief – tools like SBAR (O’Daniel, 2008) be used exclusively during a MTP

Resources
- Blood component inventory should have a critical minimum level documented
- RBC and FFP could be stored in a blood bank fridge in the ED
- Runner needs to be assigned on activation

Special considerations
- Blood group should be determined early to change to group specific
- Identify patient population that shall receive O neg blood products
- Urgent notification when antibodies are discovered
MT Transfusion Targets
Guidelines

• Decision process on ceasing resuscitation attempt

• No active bleeding OR patient remains in acute resuscitation phase

• Switch from ratio guided transfusion to laboratory/POC guided transfusion.

• Lab test guided transfusion will rely on Hb, plt count, PT, aPTT and fibrinogen levels to guide further transfusions.

• POC guided transfusions will rely on viscoelastic method (VEM) results
MT Adjuncts Guidelines

- Guidelines list four adjuncts.
  - Tranexamic Acid (TXA) – used enroute or early in MTP
  - rFVIIa – not recommended for management to control bleeding.
  - Prothrombin Complex Concentrate (PCC) – used for warfarin reversal
  - Fibrinogen Concentrate – recommended laboratory/POC guided administration
MT Termination Guidelines

- Communication role – notify the Transfusion service of MTP termination
- Runner Role – return all unused blood products and the designated storage containers to Transfusion Service.
- MTP Lead – determine patient is stable or discontinue resuscitation attempt.
- Document the MTP termination time in the patient’s medical record.
MT System Performance Guidelines

• Debrief tool should be developed and used.
• Debrief should be conducted as soon as possible after MTP deactivation
• MTP case review of patients that developed MT related complications
  • Coagulopathies, thrombotic complications, acute respiratory distress syndrome (ARDS), over transfusion of RBC, transfusion reactions, and death
• MTP efficiency metrics should be tracked
  • Time from MTP activation to first transfused RBC and/or FFP, adherence to goal driven transfusion ratio, informing the Transfusion Service of deactivation within 1 hour, and blood product wastage
Barriers and Facilitators Massive Transfusion Guidelines

• Barriers
  • Limited resources
  • Geographic Location
  • Preparation

• Facilitators
  • Team facilitation
  • System design
  • Proactive planning
Where to go from here?

• Guidelines require periodic review and updating

• Massive Transfusion Protocols can be developed from current guidelines

• Survey in Ontario (Callum et al., 2019) helped reach consensus on guidelines.

• Provincial standardized protocol based on the guidelines creates database to review MTP

• Current and future areas for opportunity in research into evidence based practice
  • TXA
  • Pediatric and neonate MT guidelines
  • Non-trauma MT guidelines
References


