

TxMD™

Massive Transfusion Protocol Development

Why a Massive Transfusion Protocol (MTP)

How to develop a protocol

What to include in the protocol



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Why Develop a Massive Transfusion Protocol (MTP)

Many different clinical situations at a hospital require a life-saving approach to care. Hemorrhaging patients are no different. Their care entails close monitoring, numerous resources, a multidisciplinary team approach and rapid, appropriate blood product transfusion. Early recognition of severe bleeding and smooth transition of care can be lifesaving. When time is of the essence, having a massive transfusion protocol provides a standardized and coordinated approach that enhances readiness and improves patient care.

What is the purpose of an MTP?

A hemorrhaging patient often causes a chaotic situation where transfusion needs quickly overwhelm the compensatory mechanisms of the patient, the workload of the healthcare providers and resources of the institution. The purpose of an MTP is to minimize the chaos by identifying roles and responsibilities of staff providing care and ensuring rapid availability and delivery of a pre-defined ratio of blood products. The ultimate goal of an MTP is improved patient survival.

Since hemorrhaging patients may present anywhere in the hospital, development of an MTP should be a multidisciplinary, interdepartmental, hospital-wide improvement project. The aim is to organize a team that works in collaboration with a common goal of improved patient care in mind.¹

Who should be on the multidisciplinary team?

An effective hospital-wide protocol is dependent on gathering a team from multiple specialty departments throughout the hospital. It is essential that representatives from the transfusion service and laboratory be active members of the team. As you form your team, consider where hemorrhaging patients might present or travel through the system and start with representatives from these departments and disciplines:

Department

- Emergency Department
- Operating Room
- Intensive Care Unit
- Radiology
- Labor & Delivery
- Transfusion Service

Staff Members

- Physicians
- Anesthesiologists
- Nurses
- Extended Care Providers
- Educators
- Lab Scientists
- Pharmacists
- Unit Coordinators
- Materials Management

Together this team will develop a protocol that defines criteria for activation, identifies roles and responsibilities of key staff involved in the care of the bleeding patient, streamlines and enhances departmental communication, and outlines the pre-defined ratio of blood products for quick, efficient delivery. A complete MTP includes a means to evaluate and audit the process after each deployment.¹

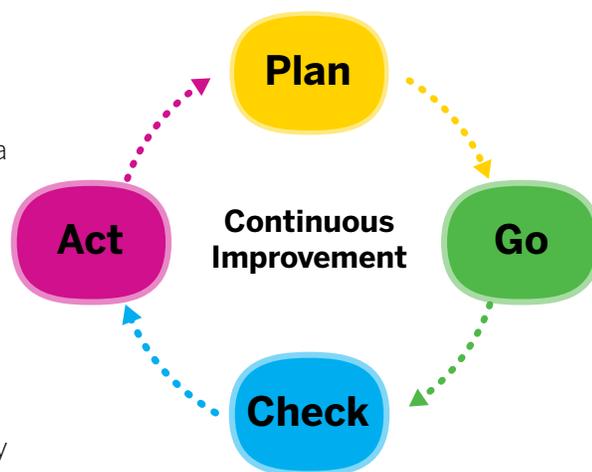
How to Develop a Protocol

Defining the Protocol

When developing an MTP the team must first define a massive transfusion and the trigger for activation. The definition can be broad or specific depending on the requirements of the institution. For example, the AABB *Technical Manual* states a massive transfusion is the administration of 8 to 10 RBC units to an adult patient in less than 24 hours. A more dynamic definition, especially for MTP activation may be rapid administration of 4 to 5 RBC units in 1 hour.^{1,2} Reviewing the trauma level designation and type of patients who may present at your hospital (e.g. trauma, ruptured aneurysm, postpartum hemorrhage) are to be considered when developing the definition for triggering an MTP.

Activation

Identifying who can activate the protocol is another important aspect to establish. Depending on the trauma level designation and institutional specific policies, there can be a variety of approaches for who can activate the MTP. Some institutions allow only selected physicians such as the trauma surgeon or OB/GYN physician. A limitation to this approach may be a delay in activation until the surgeon or obstetrician arrives. Another approach is to allow any provider including nurse practitioners, physician assistants, and residents to activate the protocol. This may result in faster protocol activation with prompt delivery of blood products to the bedside. The transfusion service staff can also encourage activation of the protocol to the provider based on the rapidity and/or amount of blood products already issued.



Communication

Regardless of who activates the MTP, proper communication is the cornerstone for success. How and when information is relayed to the laboratory, transfusion service and other ancillary areas is critical for an effective MTP process and positive patient outcomes. Ideal MTP communication must be accurate, timely and thorough. The clinical team (see Roles section below) will use protocol-prescribed communication each and every time to convey that the MTP is to be activated and what patient information will be provided. For example, when contacting the laboratory to initiate an MTP, a member of the clinical team announces: *"Initiate MTP on Trauma Patient [Name]; medical record number is 123456. Location is ED. The ordering provider is Dr. Bleeder. The point person is Mary Nurse at extension 9999."* Having clear and concise communication from the start can provide a smoother delivery of care.

Roles

The role of each department in a massive transfusion event should be defined within the protocol. It may be helpful to align the MTP roles with other emergency response protocols within the institution to maintain consistency. These roles should be established at the start and maintained throughout the event. Furthermore it's important to consider the responsibilities of each department during a massive transfusion event. For example, the transfusion service may need extra staff to prepare and issue blood products. The laboratory might need to deploy a phlebotomist to draw and transport blood samples. Staff may also need to be assigned to process blood samples in an emergent manner, assist with transport of blood products, and perform point-of-care testing if available at the institution. At the bedside, roles should be identified that include a communicator who is the main contact person during

the event, a recorder who documents ongoing events, and a staff member who will be responsible for delivery of blood products to the bedside. Roles and areas of responsibilities that have been clearly defined and rehearsed foster an efficient and effective course of action for controlling the hemorrhage and improving patient care.

Blood Product Ratios

In a massively bleeding patient with coagulopathy there is often no time to wait for laboratory tests to determine which blood products to give. Many studies on the management of massively bleeding patients have originated in the military and civilian trauma centers. Findings suggest that using fixed ratios with higher plasma to RBC ratios improve survival.^{3,4} Approximating whole blood through a predefined ratio of blood products delivers faster hemorrhage control, fewer complications and more efficient use of blood products.¹ Until recently, there was no large randomized clinical trial to support these retrospective findings for trauma resuscitation practices and optimal blood product ratio. The Pragmatic Randomized Optimal Plasma and Platelet Ratios (PROPPR) trial studied the effectiveness and safety of plasma: platelets: RBC in 1:1:1 ratio compared to a 1:1:2 ratio in 680 trauma patients at 12 Level One trauma centers in the US and Canada. The authors concluded the different ratios did not result in significant differences in mortality at 1 or 30 days; however, more patients in the 1:1:1 group achieved hemostasis faster and fewer experienced death by exsanguinations at 24 hours.⁵ While this trial helps answer questions about appropriate ratios for severe massive bleeding, it is essential that blood product ratios be chosen based on blood availability and clinical practice/provider consensus within the institution. Having a pre-defined blood product ratio speeds delivery of the appropriate blood components for transfusion and is essential to providing immediate and sustainable care while the patient is actively bleeding.

Other Considerations

Other factors to consider in the overall practice for managing massively bleeding patients include:

- Laboratory testing
- Tools available for blood management
- Pharmacologic agents and usage

Laboratory testing is an important component of any MTP. A type and screen should be one of the first tests performed to facilitate switching from emergent-released blood to compatible blood products for the patient. Switching to compatible blood products as soon as possible helps conserve O Negative RBCs and AB plasma.

Common laboratory tests for monitoring trauma resuscitation and blood product management include: CBC with platelet count, PT/INR, aPTT, fibrinogen, arterial blood gases, potassium, and ionized calcium.⁶ Physician preference and institutional practice guide testing frequency – whether based on units transfused, specified time, or per “cooler”. Recommendations include baseline lab studies and then hourly monitoring to aid in goal-directed therapy once bleeding is controlled.⁶ Due to the variety of options, testing and frequency must be defined in the protocol.

Many innovative technologies have come to market in the last 10 to 20 years that can aid in the management of bleeding patients. However, not all tools may be available in all institutions. Some examples to consider are:

- Blood recovery and reinfusion (e.g. cell salvage) to recover patient's own blood lost during surgery and return it to the patient after processing and washing.
- Thromboelastography (TEG®) and or Rotational thromboelastometry (ROTEM®) to supplement standard coagulation assays and help guide goal-directed transfusion therapy.
- Point of care testing (e.g., i-STAT®) for performance of critical lab testing at/near the bedside.
- Rapid infusing devices & blood/fluid warmers.

Pharmacological agents may be valuable tools in your MTP arsenal. When considering inclusion of these agents in the protocol, consulting with the pharmacy representative on your MTP team is essential to provide an evidence-based, locally agreed upon, clinical pathway that outlines drugs, dose, route and timing. In addition, involvement of pharmacy also ensures the correct drug is on formulary for prompt availability when the need arises. Pharmaceutical agents to consider for inclusion (not an exclusive list):

- Antifibrinolytic agents such as tranexamic acid (TXA)⁶.
- Prothrombin Complex Concentrate (non-activated 4F-PCC or K-Centra®).
- Reversal protocols for patients on warfarin or target-specific anticoagulants who present with life threatening bleeding and need emergent/urgent surgery.

Deactivation

Deactivation of the protocol is based on the patient's response to the MTP and at the treating physician's discretion. Criteria for discontinuing the MTP should be based on the control of bleeding and normalization of the hemodynamic status.¹ The clinical team must communicate to other departments when the protocol is deactivated. Any unused products should be quickly returned to the transfusion service to prevent wastage.

Follow up evaluation

A review or audit of each event to identify what processes are effective and where improvements are needed should be performed. Some suggestions for evaluating the process include:

- who activated the protocol.
- time elapsed for blood products to be received at the bedside.
- time type and screen specimen received in transfusion service.
- number and type of blood products transfused.
- wastage of any unused products.

Audit frequency should depend on the number of activations at your institution.¹⁰

Conclusion

A multidisciplinary team approach to creating, maintaining, auditing and monitoring the massive transfusion protocol will provide standardization to the clinical staff involved in the process and can lead to improved patient outcomes.

References

1. American College of Surgeons Total Quality Improvement Project (TQIP) Massive Transfusion in Trauma Guidelines, 2013. (Accessed on-line June 21, 2015)
2. Pham HP, Shaz BH. Update on massive transfusion. *Br J Anaesthesia* 2013;111(S1):i71-i82 doi:10.1093/bja/aet376
3. Borgman MA, Spinella PC, Perkins JG, et al. The ratio of blood products transfused affects mortality in patients receiving massive transfusions at a combat support hospital. *J Trauma*. 2007;63(4): 805-13.
4. Holcomb JB, Wade CE, Michalek JE, et al. Increased plasma and platelet to red blood cell ratios improves outcomes in 466 massively transfused civilian trauma patients. *Ann Surg* 2008;248:447-58.
5. Holcomb JB, Tilley BC, Baraniuk S, et al. Transfusion of plasma, platelets, and red blood cells in a 1:1:1 vs a 1:1:2 ratio and mortality in patients with severe trauma: the PROPPR randomized clinical trial. *JAMA*. 2015;313(5): 471-482.
6. Shakur H, Roberts I, Bautista R, et al. Effects of tranexamic acid on death, vascular occlusive events, and blood transfusion in trauma patients with significant haemorrhage (CRASH-2): A randomised, placebocontrolled trial. *Lancet* 2010; 376:23–32.
7. Bailey AM, Baker SN, Weant KA. Tranexamic acid for trauma-related hemorrhage. *Adv Emerg Nurs J*. 2014; Apr-Jun;36(2):123-131.
8. Levi M, Levy JH, Anderson HF, Truloff D. Safety of recombinant activated factor VII in randomized clinical trials. *N Engl J Med* 2010;363:1791-800.
9. David J-S, Godier A, Dargaud Y, Inaba K. Case scenario: Management of trauma-induced coagulopathy in a severe blunt trauma patient. *Anesthesiology* 2013; 119(1): 191- 200.
10. Cotton BA, Dossett LA, Au BK, et al. Room for (performance) improvement: provider-related factors associated with poor outcomes in massive transfusion. *J Trauma* 2009; 67(5):1004-1012.