

**Maine EMS Trauma Advisory Committee
Consensus Statement and Clinical Advice for Trauma Management**

**USE OF FLUIDS AND BLOOD PRODUCTS IN THE
TREATMENT OF TRAUMATIC INJURY**

PART I: Key Concepts

- A. Trauma patients requiring fluids and/or blood products for stabilization warrant prompt trauma center consultation and/or transfer.
- B. Uncontrolled hemorrhage is not improved by fluid resuscitation.
- C. Administration of fluids or blood products must be a deliberate response to objective alteration in perfusion.
- D. Blood pressure and perfusion have no fixed or reliable relationship.
- E. Neither crystalloids nor blood products are safe at high volume.

PLEASE REMEMBER:

Transfers or consultations related to **major injuries** – *regardless of age, comorbidities, or intended destination* – should be directed to the attending **trauma surgeon** at your regional **trauma center**. The trauma surgeon will recommend or facilitate subsequent actions or consultations as needed.

PART II: Annotations and Rationale

- A. *Trauma patients requiring fluids and/or blood products for stabilization warrant prompt trauma center consultation and/or transfer.*

Proper use of the trauma system begins with identifying patients whose injuries require care at a regional trauma center (RTC). Hypotension is an independent predictor of need for urgent intervention in trauma¹, and as such a valid criterion for automatic and systematic collaboration with the RTC. Even for a hospital with available surgical resources, the RTC can often provide additional advice and assistance to minimize delays to definitive care.

- B. *Uncontrolled hemorrhage is not improved by fluid resuscitation.*

“Fluid resuscitation” as a life-saving intervention is secondary to identifying and controlling ongoing blood loss.

Even after major injuries have been identified and addressed, restoring adequate perfusion is a more complicated exercise than once thought. Increasing evidence suggests that traditional efforts to treat trauma patients with empirical doses of crystalloids and blood may invite a variety of consequences, actually contributing to increased morbidity and mortality.²

With these concepts in mind, the inclusion of the RTC in the planning of early patient care is strongly encouraged.

- C. *Administration of fluids or blood products must be a deliberate response to objective alteration in perfusion.*

As suggested above, it is important to bear in mind that crystalloids and blood products have both indications and consequences that must be considered in all uses. For the purposes of trauma management, the indications are starkly finite: namely, objective and ongoing hypoperfusion (cerebral or systemic) in patients whose underlying injuries have been maximally addressed, given immediate circumstances (e.g., wound care, surgery, or transport to the RTC).

- D. *Blood pressure and perfusion have no fixed or reliable relationship.*

Blood pressure is one of many markers of perfusion, but no single number adequately characterizes perfusion in the context of an individual patient's needs. This is especially true in children, where B/P can endure in the normal range for minutes or hours despite profound declines in neurologic status or renal perfusion (implications for triage); but it also is important to remember -- for entirely different reasons -- in adult resuscitation.

In the unstable trauma patient, accumulating evidence suggests that normalizing blood pressure with fluids may be overshooting the target.³ The concept of “permissive hypotension” remains controversial and insufficiently

tested, but is based on a simple and irrefutable truth: the higher the blood pressure, the faster the bleeding, and the less likely that a useful clot will form.

F. *Neither crystalloids nor blood products are safe at high volume.*

The consequences of high-volume fluid resuscitation may be seen and suffered long past the acute phase. Complications are myriad and often life-threatening in and of themselves, most notably including each leg of the Deadly Triad: hypothermia, acidosis, and coagulopathy.⁴ These and other complications suggest that personnel at all levels be careful and thoughtful with administration of fluids to trauma patients.

Part III: References

¹ Lehmann RK, et al. Trauma team activation: simplified criteria safely reduces overtriage. *Am J Surg.* 2007 May;193(5):630-4; discussion 634-5.

² Pepe PE et al. Preoperative resuscitation of the trauma patient. *Curr Opin Anaesthesiol.* 2008 Apr;21(2):216-21.

³ Stern SA. Low-volume fluid resuscitation for presumed hemorrhagic shock: helpful or harmful? *Curr Opin Crit Care.* 2001 Dec;7(6):422-30.

⁴ Eddy VA et al. Hypothermia, coagulopathy, and acidosis. *Surg Clin North Am.* 2000 Jun;80(3):845-54.