

Clinical Pearls from the Preventable Mortality Review Committee



Antiplatelet Reversal in Severe TBI or Significant Hemorrhage

- A sizable percentage of elderly trauma patients take antiplatelet agents before injury.
- Platelets are an option for reversing the effect of antiplatelet agents, but they are a limited resource and not available in many situations.
- Desmopressin (DDAVP) is another option for reversing the effects of antiplatelet agents that is typically more readily available; it is not associated with increased thrombotic events. The recommended dose is 0.3 mcg/kg iv.
- Results on using either platelets or DDAVP to reverse the effects of antiplatelet agents are mixed, but they should be strongly considered in patients with severe TBI or non-compressible torso hemorrhage.

Tranexamic Acid (TXA)

- TXA is an antifibrinolytic agent that reduces clot breakdown.
- TXA decreases mortality in patients with severe non-compressible torso hemorrhage¹ or moderate to severe TBI (GCS 3-12).²
- Early administration results in the best outcomes and the least complications.³
- TXA should be given in the pre-hospital setting if there is concern that the patient will require a moderate volume of blood products or has a moderate or severe TBI.
- The recommended dose for TXA is 2 grams slow IV or IO push is recommended to achieve peak concentrations rapidly; there is no need for a prolonged infusion.⁴
- Recommended pediatric dosage: 15mg/kg bolus up to 2g total

¹ Crash-2 Collaborators. Effects of tranexamic acid on death, vascular occlusive events, and blood transfusion in trauma patients with significant haemorrhage (CRASH-2): a randomised, placebo-controlled trial. *Lancet*, 376 (2010), pp. 23-32. DOI: 10.1016/S0140-6736(10)60835-5.

² Rowell SE, et al. Effect of out-of-hospital tranexamic acid vs placebo on 6-month functional neurologic outcomes in patients with moderate or severe traumatic brain injury. *Jama*. 2020 Sep 8;324(10):961-74. DOI: 10.1001/jama.2020.8958.

³ Crash-2 Collaborators. The importance of early treatment with tranexamic acid in bleeding trauma patients: an exploratory analysis of the CRASH-2 randomised controlled trial. *The Lancet*. 2011 Mar 26;377(9771):1096-101. DOI: 10.1016/S0140-6736(11)60278-X.

⁴ Drew B, et al. The Use of Tranexamic Acid in Tactical Combat Casualty Care: TCCC Proposed Change 20-02. *Journal of special operations medicine*. 2020 Jan 1;20(3):36-43. DOI: 10.55460/ZVV3-5CBW.

Permissive Hypotension

- A low BP is better than a “normal” BP for bleeding patients
- Use whole blood or balanced blood product resuscitation (plasma & platelets before RBCs)
- Avoid crystalloid

Until the control of significant bleeding is achieved, raising the blood pressure results in increased bleeding by “popping the clot” and increased bleeding, blood product utilization, and mortality.¹

Whole blood (WB) or balanced blood products approximating WB (1:1:1) should be infused to achieve a SBP of around 80mmHg. [If a severe TBI is suspected, a SBP of 100mmHg is recommended].

Each plasma unit should be given before its corresponding unit of RBCs in the 1:1 ratio because plasma is more important in stopping bleeding than RBCs.²

Platelets should be given through a separate IV, and they are likely more important than plasma or RBC in stopping bleeding and thus treating patients with massive hemorrhage.

Blood products should be given to pediatric patients in 15-20ml/kg aliquots.

A radial pulse and normal mental status can be used to approximate achieving these goals and perfusing end organs.³

Crystalloid should be avoided because it increases mortality by worsening almost everything balanced blood products achieve by popping clots while diluting coagulation factors and oxygen-carrying capacity.⁴

If a patient’s BP is too low to perfuse end organs (SBP <70) and no blood products are available, 250ml boluses of crystalloid should be administered to achieve a SBP >70 [SBP >100 should be the goal if there is a concern for severe TBI and not a concern for uncontrolled hemorrhage].⁵

¹ Tran A, et al. Permissive hypotension versus conventional resuscitation strategies in adult trauma patients with hemorrhagic shock: A systematic review and meta-analysis of randomized controlled trials. *Journal of Trauma and Acute Care Surgery*. 2018 May 1;84(5):802-8. DOI: 10.1097/TA.0000000000001816.

² Guyette FX, et al. Prehospital blood product and crystalloid resuscitation in the severely injured patient: a secondary analysis of the prehospital air medical plasma trial. *Annals of surgery*. 2021 Feb 1;273(2):358-64. DOI: 10.1097/SLA.0000000000003324.

³ Eastridge BJ, et al. Field triage score (FTS) in battlefield casualties: validation of a novel triage technique in a combat environment. *The American journal of surgery*. 2010 Dec 1;200(6):724-7. DOI: 10.1016/j.amjsurg.2010.08.006.

⁴ Ley EJ, et al. Emergency department crystalloid resuscitation of 1.5 L or more is associated with increased mortality in elderly and nonelderly trauma patients. *Journal of Trauma and Acute Care Surgery*. 2011 Feb 1;70(2):398-400. DOI: 10.1097/TA.0b013e318208f99b.

⁵ Schreiber MA, Meier EN, Tisherman SA, Kerby JD, Newgard CD, Brasel K, Egan D, Witham W, Williams C, Daya M, Beeson J. A controlled resuscitation strategy is feasible and safe in hypotensive trauma patients: results of a prospective randomized pilot trial. *The journal of trauma and acute care surgery*. 2015 Apr;78(4):687. DOI: 10.1097/TA.0000000000000600.

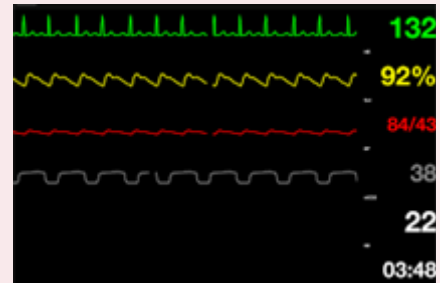
Do Not ignore Early Hypotension in a Trauma Patient

- The lowest vital signs in the pre-hospital setting should be used for trauma activation triage.¹
- One SBP <105 in the ED results in much higher mortality & need for immediate therapeutic intervention; this should result in upgrading the patient's trauma activation status.²
- Shock Index helps guard against missing this critical "alarm" for trauma patients. The Shock Index = HR/SBP and should be < 1.

Providers can be lulled into not recognizing the extent of trauma or hemorrhagic shock due to a patient's compensatory mechanisms raising their blood pressure after an initial low reading.

You should pay attention to any low systolic pressure, activate the trauma team, and consider that this patient has significant injuries until proven otherwise.

A heart rate per minute greater than the SBP in mmHg indicates that the patient may be in shock and trying to compensate with an increase in their pulse.³



Shock Index Examples		
Pulse	Systolic Blood Pressure	Shock Index
80	120	0.67
100	120	0.83
120	100	1.20
130	100	1.30
140	80	1.75

¹ Franklin GA, et al. Prehospital hypotension as a valid indicator of trauma team activation. Journal of Trauma and Acute Care Surgery. 2000 Jun 1;48(6):1034-9. DOI: 10.1097/00005373-200006000-00006

² Seamon MJ, et al. Just one drop: the significance of a single hypotensive blood pressure reading during trauma resuscitations. Journal of Trauma and Acute Care Surgery. 2010 Jun 1;68(6):1289-95. DOI: 10.1097/TA.0b013e3181db05dc.

³ Cannon CM, et al. Utility of the shock index in predicting mortality in traumatically injured patients. Journal of Trauma and Acute Care Surgery. 2009 Dec 1;67(6):1426-30. DOI: 10.1097/TA.0b013e3181bbf728.

