RECOGNIZING
PEDIATRIC HEMORRHAGE

Recognizing children (<50kg) likely to require **> 20ml/kg of RBC in 1st hour of resuscitation**

CLINICAL PEARLS

- STOP THE BLEEDING

- **VBG** early

- **TEG** goal-directed therapy

- **BEWARE of the Transient Responder**
(If >2 crystolloid boluses, switch to blood products)

- Give TXA within 3 hours of injury

Blood Bank
Verbal order
<u>with patient weight</u> may
initiate MTP.

<u>Must also</u>
complete *written*
Apex order

MASSIVE TRANSFUSION IS CONSIDERED FOR:

ABC-D Criteria

Penetrating Injuries	Positive FAST	Tachycardia & Hypotension	Lactate > 3.5	Base deficit ≥ -8.8

Two or more positive findings, initiate MTP

Full Policy (Power DMS or Shared K Drive): Trauma 8.0 Massive Transfusion Protocol
Tip Sheet found in Shared K Drive and copies in ED Trauma Bays

UCSF Benioff Children's Hospital Oakland

8.0 Massive Transfusion Protocol Summary

Criteria for Massive Transfusion Protocol (MTP) initiation

Pediatric patients (<50Kg): requiring > 20 ml/Kg of PRBC in the 1st hour of resuscitation or the high likelihood of requiring transfusion of > 0.1 units/Kg of PRBC in the 1st 12 hours of resuscitation.

- Consider the following for assessment of blood consumption in pediatric population for early initiation of MTP (ABC-D criteria):
    - penetrating injury,
    - +FAST,
    - age adjusted shock index (SIPA) for tachycardia & hypotension
    - elevated serum lactate (>3.5),
    - base deficit exceeding -8.8.
- Two or more positive findings initiate MTP

Adult patients or larger children (>50Kg): requiring 4 units of PRBC in the 1st hour of resuscitation or the high likelihood of requiring transfusion of >10 units of PRBC in the 1st 12 hours of resuscitation.

Blood Bank – verbal order may initiate, must also complete written order

1. Receives request for Massive Transfusion Protocol.
2. Prepares MTP products as follows:

Massive Transfusion Protocol Packages: Child <15kg

Package	RBC	Plasma	Platelets	Cryo
1st	1	1	1	
2nd	1	1		
3rd	1	1		2
4th	1	1		
5th	1	1		2

Massive Transfusion Protocol Packages: Child, 16-30 kg

Package	RBC	Plasma	Platelets	Cryo
1st	2	2	1	
2nd	2	2		
3rd	2	2		5
4th	2	2	1	
5th	2	2		5

Massive Transfusion Protocol Packages: 31-50 kg

Package	RBC	Plasma	Platelets	Cryo
1st	3	3	1	
2nd	3	3		
3rd	3	3	1	5
4th	3	3		
5th	3	3		5

Massive Transfusion Protocol Packages: Adult or Child >50 kg

Package	RBC	Plasma	Platelets	Cryo
1st	4	4	1	
2nd	4	4		
3rd	4	4	1	10
4th	4	4		
5th	4	4	1	10

Clinical Assessment and Interventions Associated with Massive Transfusion

1. There are four main conditions to be concerned about related to massive blood administration:

    a. Transfusion associated coagulopathy: Coagulopathy often occurs with the administration of massive blood products which may be partially due to dilution of the clotting factors which can be corrected with accompanying units of FFP and platelets.

        i. If a trauma induced coagulopathy is persistent, the use of Tranexamic Acid may be considered. Call pharmacy to prepare and bring needed product.

            1. Tranexamic Acid (TXA)- bolus dose 15mg/kg over 10 minutes followed by infusion of 2mg/kg/hr x8 hours or until bleeding stops

                a. TXA should be initiated within 3 hours of injury or based on goal directed therapy of TEG with LY30 >3.

            2. For coagulopathy associated with severe TBI refer to *Moderate to Severe Traumatic Brain Injury Guidelines*/ Trauma Protocol 8.10a for guidance on use of 4-factor prothrombin complex concentrate.

    b. Hypocalcemia: Since citrate is used to prevent banked blood from clotting, hypocalcemia may result during massive transfusion and may require repletion. Calcium should only be given if there is biochemical, clinical or electrocardiographic evidence of hypocalcaemia.

    c. Hypothermia: Depending on the rate and volume of the transfusions, a state of hypothermia may result from the administration of refrigerated blood products. Monitor core temperature closely and ensure that blood products are delivered using an IV warming device. External heating devices may also be necessary to maintain normothermia.

    d. Hypo/ hyperkalemia: Both hypokalemia and hyperkalemia are associated with massive transfusion in children; therefore, plasma potassium levels should be carefully monitored and treated accordingly in addition to other metabolic disturbances.

2. Once colloid infusions begin, consider minimizing crystalloid boluses (Neff et al., 2015).

VII. Summary

For massive uncontrolled traumatic hemorrhage, maintenance of full hemodynamic ability is usually unrealistic. **The priority is for definitive surgical arrest of hemorrhage from major vessels.** Combinations of stored whole blood, packed cells, colloids & crystalloids are given to maintain blood volume or pressure at adequate levels and hemoglobin at around 7g/dl or hematocrit at 0.25. Conserve limited supplies of fresh blood, plasma or platelets until the bleeding is controlled.