PROTOCOL – MASSIVE BLEEDING ***Early management of hypovolemia results in improved patient outcomes.***

PROTOCOL

- Appropriate fluid resuscitation with crystalloid fluid boluses must be initiated.
  - Assess the patient's response to the initial fluid bolus. If there is no response or the response is transient, repeat the fluid bolus. If there is still no or transient response initiate the massive bleeding protocol.

- The cause of the fluid or blood loss must be identified and corrected as soon as possible.

- All attempts should be made to get a type and crossmatch for transfusion as soon as possible.

  - ★ Patients with unknown ABO group will be issued group O red blood cells (RBCs).

  - ★ For patients who are Rh-negative or whose Rh-status is unknown, Rh-negative RBCs will be issued initially but may be switched to Rh-positive blood products at the discretion of the physician.

CONTRAINDICATIONS AND CAUTIONS

1. The patient's religious beliefs may prohibit the administration of blood or blood products. Jehovah's Witnesses prohibit treatment with whole blood, autologous and allogenic red blood cells, fresh frozen plasma, platelets and hemoglobin solutions.

PROCEDURE

1. Ensure adequate venous access with two large bore peripheral IVs (e.g., 14 to 18-gauge) and/or a central venous access device (CVAD) or intraosseous access.

2. Assess patient for reversal of anticoagulant/antithrombotic agent. Refer to Procoagulant Medications portion for options.

3. Consider antifibrinolytic agent (i.e., tranexamic acid must be given within 3 hours of onset of bleeding).

4. Prime IV tubing with 0.9% normal saline solution. If the IV fluid is to be infused under pressure, the air must be removed with a needle to avoid an air embolism.

5. Ensure correct patient identification.

6. Draw pre-transfusion bloodwork as requested by physician:
   - CBC and calcium/albumin every hour (administer calcium gluconate 10% [1 gram] for every 2 units of PRBC)
   - PTT, INR every hour
   - venous blood gas, electrolytes, serum creatinine, magnesium, serum lactate every 4-hours

7. Consult Intensivist or Trauma Team Leader via Criticall.

8. Transfuse blood products with monitoring for transfusion reaction, and discontinue transfusion per blood transfusion protocol if symptoms consistent with transfusion reaction develop.

9. Reassess bleeding rate between doses of blood products. If possible, await results of repeat laboratory tests before transfusing additional blood products.

10. Request procoagulant medications if patient continues to bleed despite:
    - large vessel bleeding source ruled out by examination and/or diagnostic imaging
    - INR less than 1.8, PTT less than 45 seconds,
    - platelet count greater than 50 x 10^9/L within past hour
    - hemoglobin greater than 80 g/L within past hour
    - core temperature greater or equal to 32ºC within past hour
    - pH greater than 7.2 within past hour
    - calcium/albumin greater than 0.8 mmol/L ionized calcium equivalent within past hour

Procoagulant Medications and Other Considerations:

- **Antifibrinolytics – Adult**
  - *Tranexamic acid 1 gram IV over 10 minutes followed by infusion of 1 gram over 8-hours.* ***Early administration is important, Caution should be taken for patients presenting several hours after injury.***

- **Heparin reversal**

  Adult dosing:
  - *Protamine 1 mg IV for every 100 units of heparin to be neutralized or as indicated by coagulation studies. The appropriate dose can be calculated based on a 60-minute half-life for heparin.*

  - *Example: For a patient receiving 1,500 units/hour of heparin by continuous IV infusion who had not recently received bolus heparin: this patient would require enough protamine to neutralize all the heparin received in the last hour (1,500 units), plus half the dose in the preceding hour (750 units), plus a quarter of the dose received the hour before that (375 units). Thus, this patient would require 26.25 mg of protamine to neutralize a total of 2,625 units of heparin. The maximum recommended dose within a 2-hour period is 100 mg unless a larger quantity is indicated through confirmation by coagulation tests.*

- Low molecular weight heparin (LMWH) toxicity or hemorrhage associated with enoxaparin therapy

  Adult intravenous dosing:
  - *If enoxaparin was administered in the previous 8 hours, give protamine 1 mg IV for every 1 mg of enoxaparin. If enoxaparin was administered greater than 8 hours previous to the protamine dose or if a second dose is needed, give protamine 0.5 mg IV for every 1 mg of enoxaparin. A second dose of protamine may be administered if the aPTT measured at 2 to 4 hours after the initial infusion remains prolonged. However, even with higher doses of protamine, the aPTT may remain more prolonged than would usually be found with protamine treatment following unfractionated heparin. In all cases, the anti-Xa activity is never completely neutralized (maximum 60 - 75%).*

- Low molecular weight heparin (LMWH) toxicity or hemorrhage associated with dalteparin or tinzaparin therapy

  Adult intravenous dosing:
  - *In general, protamine 1 mg IV for every 100 anti-Xa international units of dalteparin or tinzaparin is given. A second infusion of protamine 0.5 mg IV for every 100 anti-Xa international units of dalteparin or tinzaparin may be administered if the aPTT measured at 2 to 4 hours after the initial infusion remains prolonged. However, even with higher doses of protamine, the aPTT may remain more prolonged than would usually be found with protamine treatment following unfractionated heparin. In all cases, the anti-Xa activity is never completely neutralized (maximum 60 - 75%).*

  Note: As these agents are renally excreted, patients with renal impairment may have more low-molecular weight heparin to neutralize after 8 hours.

- **Warfarin reversal**
  - *Vitamin K 10 mg IV in 50 ml NS mini-bag as ordered at 300 ml/hr over 10 minutes promptly*
  - *Prothrombin complex (octaplex), refer to policy Prothrombin Complex Concentrate (octaplex) for dosing*

- **Clopidogrel (Plavix) reversal**
  - *Require platelets*

- **Dabigatran and Apixaban reversal**
  - *No specific antidote for either medication*

- **Rivaroxaban reversal**
  - *Consult ICU – some experimental evidence that Prothrombin complex (Octaplex) may be helpful*

ADOPTED FROM TBRHSC Massive Transfusion Protocol – Adult

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