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ED Report Outline: Traumatic Wounds: Control of Bleeding, Tranexamic Acid (TXA), and Massive Transfusion Protocol (MTP)

Etiology/pathophysiology

- Three Types of Blood Loss
    - Capillary → most common type, blood oozes out
        - Ex. Cutting your finger
    - Venous → blood has a steady flow leaving body
    - Arterial → most serious, spurts out of body with each heartbeat
        - Arteries have the most pressure in them so bleeding can cause death quickly
- Hemorrhage
    - Damage to tissue causes the body to clot and break down clots at the same time
        - The body releases tissue plasminogen activator (tPA) which binds with plasminogen
        - Together, tPA and plasminogen bind to fibrin to break down clots which is called fibrinolysis
    - As more blood is lost, the body will progress into shock and cause tissue hypoperfusion
        - As time goes on, hyperfibrinolysis and anticoagulation being systemically
            - This is cause more excessive bleeding
        - Hyperfibrinolysis
            - Excessive and premature breakdown of blood clots
            - Occurs when there is increased plasmin being released after tissue damage
                - More plasmin is being generated because the body naturally release more tPA
            - This is why it is so important for intervention to happen to stop further bleeding before excessive blood loss
    - Factors that affect hemorrhage
        - The extend of the injury & trauma induced coagulopathy/hyperfibrinolysis
        - Amount of time that pasts prior to receiving medical attention
        - Results of untreated/addressed hemorrhage is hemorrhagic shock
    - Hemorrhagic Shock
        - Classified as a type of hypovolemic shock because of the reduction in intravascular blood volume
        - Results in tissue hypoxia and multi-system organ failure
        - Many patients die form shock due to blood loss
- Tranexamic Acid (TXA)
    - Is given to patients with bleedings disorders

- It will help control/prevent bleeding complications and decrease mortality with minimal adverse effects
  - Mechanisms of Action
    - Antifibrinolytic agent and a molecular analogue of lysine
    - Inhibits the conversion of plasminogen to plasmin and the breakdown of fibrin in blood clots by competing for the binding sites
      - TXA does **not** promote coagulation, its goal is to stop clots from breaking down (the clot is staying active because it is not being broken down)
  - Trauma/hemorrhage Use
    - Used to prevent blood loss
    - Will decrease the need for blood transfusions
    - Can be used surgically, in trauma situations, and postpartum hemorrhages
  - Administration and Monitoring
    - Can be given intravenously or orally
      - Standard dose for trauma use is 1 gram IV loading dose over 10 minutes and infusing an additional 1 gram over 8 hours for continued bleeding
      - Do not exceed a total of two grams
      - Should be administered within the first 3 hours after injury
    - Monitoring
      - Any more active bleeding, monitor hemodynamics, watch for thromboembolic events, and hypotension, the time frame from injury to administration of TXA
    - Side effects
      - Headache, fatigue
      - Seizures
      - DVT or PE
      - Abdominal pain
    - Contraindications
      - Hypersensitivity to TXA
      - Known history of DVT or PE

- Massive Transfusion Protocol (MTP)
  - Facilitates rapid restoration of circulating blood volume for anyone who has rapid/massive blood loss
  - Massive blood loss and massive transfusion will be activated by a physician and meet one of the listed requirements;
    - 8-10 units of red blood cells (RBCs) in less than 24 hours
    - 4-5 units of RBCs in 1 hour
    - A loss of more than 40% of a person’s volume of blood in 3 hours

        - Losing more than 150 mL of blood per minute
- Hemostatic Dressings
    - Should be used in the presence of bleeding with direct manual pressure
    - Dressings are infused with agents that will help enhance blood clotting
    - They are well tolerated with no adverse effects to be noted

On-scene Treatment

- Assessment of Scene
    - Ensure that the scene/situation is safe
    - Check patients airway for patency, assess breathing efforts, and the check their circulation (ABC's)
- External Bleeding – "Stop the Bleed"
    - "Stop the Bleed" version of ABC's
        - **A**lert 911
        - Identify the source of **B**leeding
            - Open or remove clothing over a wound so it can be clearly seen
            - Is the blood spurting out?
            - Is there blood pooling on the ground?
            - Are clothing or bandages soaked with blood?
        - **C**ompress with manual pressure, wound packing, or tourniquet application
            - They all have the common goal of compressing the blood vessel in order to stop the hemorrhage
            - Applying direct pressure
                - Use a clean cloth to cover the wound and apply pressure
                    - Push directly down with 2 hands pushing as hard as you can
                - Continue to hold pressure until relieved by medical responders
                - Do not remove a dressing or cloth once it is applied, just place another one on top and hold them both in place
            - Packing the wound
                - "Stuff" or pack a wound if it is large and deep enough
                    - There is no exact measurement to determine what is "large and deep" so use clinical judgement
                - Use a clean cloth like a shirt or gauze if available on scene
            - Tourniquets
                - Used for bleeding from bodily extremities and are placed on the arms or legs
                - Place tourniquet 2 to 3 inches above the bleeding site
                    - Do not place on a joint, if needed apply one above the joint

    - If a tourniquet is available, pull the free end of it to make it as tight as possible
        - Twist the windlass until bleeding stops
    - If a tourniquet is not available, you can use a belt or piece of clothing to tie around body part to control bleeding
    - Document the time the tourniquet was applied
        - It can be applied and used for up to 2 hours without causing additional damage
    - Know that tourniquets will cause pain but are essential in stopping life-threatening blood loss
- Pressure Points
    - Can be used to control bleeding when a tourniquet is unavailable or cannot be used
        - Tourniquets cannot be used if an injury is too close to the trunk of the body
        - Tourniquets will always be the preferred method over using pressure points
    - Goal is to compress a major artery against the bone
        - Brachial artery pressure point
            - Position the arm in a 90^{o} angle
            - Hold upper arm away from the patient's body
            - Use fingers to feel the inside of the patient's biceps halfway between the elbow and shoulder
            - Push the bicep muscle out of the way
            - "Squeeze or press your hand down on the patient's humerus
            - If done correctly you should be able to feel a pulse as you are pressing down
        - Femoral artery pressure point
            - Is in the groin

ED Treatment

- Initiate the Blood Transfusion
    - The amount to be transfused depends on the estimated percentage of circulatory blood volume that is lost and how the body is compensating due to that loss
- Stabilizing the Patient
    - Follow essential components of standard ABC's (airway, breathing, circulation, and disability/neurologic status)
    - Try to identify where the bleeding is coming form
        - The patient may need to go straight to the operating room to stabilize large amounts of bleeding
            - If enough blood is lost, the patient my need to be intubated to maintain oxygenation and tissue profusion

        - Follow “Stop the Bleed” steps
    - Determine if any other diagnostic procedures or scans need to be completed
        - CT
        - X-ray
- Preventing/treating Shock
    - Recognize early signs and symptoms of shock
        - Confusion
        - Rapid HR
        - Cold/clammy skin
        - Rapid breathing
    - Treat with 0.9% of Sodium Chloride or Lactated Ringers, hug warmer, stop any progressive bleeding

Role of the ED Nurse

- Establish IV Access
    - Multiple large-bore IV lines will be needed to initiate the transfusion quicker
    - Administer fluids as ordered
        - Watch for signs and symptoms of fluid overload
            - Edema, hypertension, check pain, crackles in the lungs, etc.
- Massive Transfusion Protocol (MTP)
    - Once MTP is activated, it will remain active until the attending physician discontinues the order
    - The nurse should have a dedicated person to be the liaison with the Blood Bank
        - Their job is to keep the Blood Bank informed of the status of the patient and patient location
    - Contact the Blood Bank
        - Extension 3569 in the hospital
    - Ensure that a properly labeled blood bank specimens are collected and delivered to the Blood Bank
    - Make sure there is a MTP order and other lab requests are in Cerner
- Obtain Labs
    - Check CBC, coagulation panel, fibrinogen level, lactate, and electrolyte levels
        - Monitor lab values prior to the start of, periodically throughout, and after the acute transfusion episode
    - Blood type and screen if applicable
        - Patients may receive uncrossed blood to begin the transfusion
            - Within 7 minutes of the request, uncrossed blood will be sent
            - Once the type and screen is completed than that specific blood type will be sent
        - For initial emergency release of blood
            - The nurse will receive 2 bags of red blood cells (RBC)

- After a total of 6 RBC, there will be 6 Fresh Frozen Plasma (FFP) and 1 platelet sent
- The Blood Bank will discontinue serologic compatibility once the patient has been transfused with ten units of RBC

- Obtain Vital Signs
  - Watch for transfusion reactions
    - Temperature, HR, BP, RR, oxygen saturation
      - MAP > 60 to ensure sufficient perfusion
- Monitor for Adverse Reactions
  - Hemolytic reactions
    - Reaction to plasma proteins
    - May turn into anaphylaxis
    - Watch for itching and wheezing
  - Febrile Reaction
    - Fever
    - Chills
  - Circulatory Overload
    - The heart is not functioning properly
    - Shortness of breath, cough, back pain
  - Air Embolism
    - Happens when blood is going in too fast
    - Air may get into the vein if not being careful
    - Shortness of breath, anxiety, chest pain
- Monitor for Complications of Massive Transfusion
  - Rate-related complications – “washed out”
    - Hypocalcemia
      - Due to the chelation of calcium during the transfusion
        - Calcium will need to be given after a few bags are transfused
      - Pins and needles sensation, cramping, muscle weakness
    - Hyperkalemia
      - Dysrhythmias
    - Hypomagnesemia
      - N/V, sleepiness, weakness, hyperreflexia
    - Acidosis
    - Hypothermia
      - The blood product may be cold which would cause the body to become chilled
      - Confusion, shivering, weak pulse
  - Volume-related complications
    - Dilutional thrombocytopenia
    - Dilutional procoagulant factors

        - Dilution of anticoagulant factors
- Administer TXA if ordered
    - Help control the bleeding
- Keep the patient calm
    - Determine level of consciousness
    - If the patient is alert, instruct them to report any shortness of breath, itchiness, back pain, etc.
- Emergency Consent
- Determine the Patient's Wishes
    - Religious, cultural, or spiritual beliefs conflicting with receiving a blood transfusion?
- Support the Family
    - Include the family in care
    - Explain procedures when appropriate

Discharge/prevention Instructions

- Discharge Teaching r/t "Stop the Bleed"
    - How to apply direct pressure
    - How to use a tourniquet/pressure points to control bleeding
    - What a "Stop the Bleed" kit looks like in the community
- Discharge Teaching r/t MTP
    - Watch for any new signs or worsening bleeding
    - Watch for signs of late blood transfusion reactions
        - Fever
        - Mild jaundice
        - Decrease in hemoglobin
    - Importance of follow up labs
        - CBC, coagulation panel, electrolytes
    - Follow up with doctor

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