TXA – Tranexamic acid
McHenry Western Lake County EMS
TXA Introduction

• Hemorrhagic shock remains a serious problem with the multiple trauma patient. It is the leading cause of preventable trauma death after loss of airway. Rapid and effective control of exsanguinating hemorrhage has been demonstrated to markedly improve survival and outcome.

• Increased use of tourniquets has reduced death from hemorrhagic shock in the most recent wars fought by U.S. and NATO forces.
TXA Introduction

• The tactical and military environment is associated with a higher percentage of penetrating trauma and external hemorrhage than is seen in the civilian sector, in which blunt trauma predominates.
• This leads to the situation of ongoing hemorrhage that is difficult to control.
• Prompt recognition of this with transport to the appropriate facility (Trauma Center) and limiting fluid resuscitation to the level of restoring perfusion (hypotension resuscitation) have been shown in improved survival for the trauma patient.
• Tranexamic acid is a competitive inhibitor of plasminogen activation, which produces antifibrinolytic effects preserving and stabilizing fibrins matrix structure.
• It reversibly binds to plasminogen at the lysine binding site, thus preventing the binding of plasmin to fibrin.
• It is categorized as an anti-fibrinolytic that inhibits the activation of plasminogen to plasmin, and thereby preventing fibrinolysis and the breakdown of clots.
How TXA works

How TXA Works:

Blood clotting involves a complicated interaction between red cells, platelets and a blood protein called fibrin which binds the clot together. Tranexamic acid (TXA), known by its tradename Cyklokapron, speeds up the process of blood clotting by preventing the breakdown of fibrin. Normally, blood clotting is limited by a substance called plasmin, which dissolves clots, but tranexamic acid blocks the formation of plasmin and so speeds up clotting.
TXA Background

• TXA is an antifibrinlytic that has been used for many years to assist with the management of spontaneous hemorrhage in the hemophilia patient.
• The management of hemorrhage in combat wounds has been reported in several papers.
TXA Background

- One of the most significant findings in the CRASH-2 study is that the use of TXA is associated with a 1.5 absolute reduction for the death from hemorrhage.
- Other studies show that TXA is most effective if given within 3 hours of the injury and may be detrimental if given after that time.
TXA Background

• Tranexamic acid in concentrations up to 10mg per mL in blood showed no influence of the platelet count, the coagulation time, or other coagulation factors in whole blood or citrated blood from normal subjects.

• It does not bind to serum albumin, has a half-life of about 2 hours, and urinary excretion is the main route of elimination via glomerular filtration.
TXA Actions

• Anti-fibrinolytic drug and a synthetic equivalent of the amino acid lysine
• Helps reduce mortality in the acutely hemorrhaging adult trauma and OB patient if given within three hours of injury or as soon as post partum hemorrhage is apparent.
TXA Considerations

• The side effects of the agent are minimal and the contraindications are few.
• It is administered as a simple IV infusion, does not require refrigeration or extensive lab studies to allow administration and is relatively inexpensive.

(Note: Use for traumatic hemorrhage in an off label use per the FDA in the US)
TXA Considerations

• On the CRASH-2 trial results, TXA was included in guidelines for the pre-hospital care of the trauma patient.
• Patients with isolated TBI were specifically excluded.
• CRASH-3 trial provided evidence that TXA is safe for patients with TBI and that the treatment given within 3 hours of injury reduced the TBI related deaths.
• Changes to the guidelines and protocols may be changing in the future based on the CRASH-3 data!
https://www.youtube.com/watch?v=smTzWLZCMyl

Video that History, Indications, Contraindications and EMS Applications of TXA
CRASH-2 Data (explained in video)
Role of TXA in Traumatic Hemorrhage

• The current thinking of International Trauma Life Support (ITLS) with regards to the approach to the management of severe hemorrhage/shock in the prehospital setting is that:
  - There is sufficient evidence to support protocols for severely injured patients which should address the administration of TXA and subsequent infusion for treatment.
TXA Indications for EMS

• Age > 16 years of age
• < 3 hours post bleeding onset
• Hemorrhagic shock with SBP < 90, HR > 110
• Multi system trauma
• Major pelvic fracture
• Solid organ injury with evidence of active hemorrhage
• Traumatic amputations
• Post partum hemorrhage
TXA Precautions/Contraindications

- Subarachnoid hemorrhage; known isolated head injury
- Active intravascular clotting (DIC) and/or known history of thromboembolism
- Known Hx of renal failure
- Concomitant use w/prothrombin complex concentrate (PCC)
TXA Adverse Reactions

• Gastrointestinal disturbances may occur but disappear when the dosage is reduced.
• Hypotension has been observed when intravenous injection is too rapid.
• To avoid this response, the solution should not be injected more rapidly than 10mL per minute.
TXA Side effects

- Anaphylaxis
- Thrombosis
- Nausea, vomiting, diarrhea
- Visual disturbances; blurred vision, changes in color
- Hypotension with rapid infusion rate > 100 mg/min
TXA Dosing

- Loading dose: Tranexamic Acid (TXA) 1 Gram in 100mL Sodium Chloride 0.9% IVPB (10 ml/min) over 10 minutes
The following are protocols that have TXA as a treatment
Acute ABDOMINAL/FLANK PAIN

1. IMC special considerations:
   - Inspect, auscultate, palpate abdomen in all quadrants
   - Compare pulses in upper vs. lower extremities
   - Note and record nature & amount of vomiting/diarrhea, jaundice: vomiting precautions
   - Adjust IV rate to maintain hemodynamic stability
   - Document OPQRST of the pain; menstrual history in females of childbearing age; last BM; orthostatic VS; travel history
   - Rx per PAIN Mgt SOP (pg. 8)

LOWER ACUITY: NONE to MILD cardiorespiratory compromise
Alert, SBP 5 80 (MAP 6 60), no evidence of tissue hypoperfusion or shock
1. Transport in position of comfort

EMERGENT to CRITICAL: Moderate to Severe cardiorespiratory compromise
Alerted hemostasis, signs of hypoperfusion
2. IMC special considerations:
   - Consider need for NS IVF challenges if pt severely dehydrated/hypovolemic (Ex: appendicitis, cholecystitis, pancreatitis, hepatitis, sepsis. upper/lower GI bleed. bowel obstruction, sepsis)
   - If suspected abdominal aortic aneurysm (AAA). Do not give IV fluid challenges unless SBP < 80
   - Acute and active GI bleed: may seek OLMC order for TXA 1 6gm in 100ml NS IVPB over 10 min

DIALYSIS / Chronic Renal Failure Emergencies
Vascular access in dialysis patients is often through an AV fistula or graft (a surgical connection of an artery and vein). This access is the patient's lifetime, take meticulous care to protect it.

1. IMC special considerations:
   - BP's, venipunctures, and IV's should NOT be performed on an extremity with a shunt
   - If patient unresponsive: Vascular access by IO
   - When emergencies occur during dialysis, the staff may leave access needles in place, clamping the tubing.
   - If this is the only site, request their assistance to connect IV tubing.
   - Treat per appropriate SOP and with special considerations listed below

HYPOTENSIVE (CRITICAL):
SBP < 50 (MAP < 65), S&S hypoperfusion
Occurs during dialysis due to rapid removal and acute reduction in fluid volume. Other causes: hemorrhage, cardiogenic shock, sepsis, electrolyte disorders, anaphylactic, peritoneal tamponade, or pulmonary embolism.

2. Supine position with legs elevated unless contraindicated
3. If lungs clear: treat per Hypovolemic shock SOP: IVIO NS fluid boluses in 200 mL, increments up to 1 L
4. If unresponsive to IVF or pulmonary edema is present: Rx per HPE/Pulmonary edema/Cardiogenic Shock SOP (pg. 23)

Suspected significant HYPERKALEMIA with cardiotoxicity or cardiac arrest (CRITICAL)
Wide QRS w/ tall, peaked T wave; flattened or absent P waves, prolonged PR, sine-wave pattern. IIV, asystolic cardiac arrest, high index of suspicion if patient is in lisonapt (retains K

2. Treat dysrhythmias per appropriate SOP with one or both of the following addition(s):
   - SODIUM BICARBONATE 50 mEq slow IV over 5 min followed by 50 mL NS IV flush
   - No IV: In-line ALBUTROL 5 mg continuous neb up 20 mg (throughout transport) [BLS]
3. Do NOT give magnesium sulfate to these patients.
INITIAL TRAUMA CARE (ITC)

SCENE SIZE UP: Situational awareness: dynamic risk assessment – Assess/Intervene as needed:
- Scene safety
- Mechanism of injury (MOI): anticipate type/severity of injury; universal precautions; use appropriate PPE
- Number of pts: triage request additional resources if needed. Consider if medium or large scale MCI declaration is needed.
- Bring essential resources to pt: hemorrhage control: airway & O2; spine splinting; vascular access/IVF: pain mgmt

PRIMARY ASSESSMENT
1. General impression: Age, gender, wt; general appearance; position/surroundings; obvious injuries/bleeding; purposeful movements
- Determine if immediate life threat exists as found
3. Level of consciousness: AVPU or GCS; chief complaint S&S
4. Hemorrhage control first. Priorities change if excruciating external hemorrhage: C-A-B-D-E:
- AIRWAY/SPINE: Consider possible spine injury
  - Open/maintain using position, suction, appropriate adjuncts, & manual spine precautions pm
  - Once airway controlled: Apply appropriate size 0-9, select size spine precautions if indicated
- Breathing/gas exchange/ adequacy of ventilation:
  - Air movement, symmetry of chest expansion, accessory muscle use: retractions; lung sounds if vent. distress
  - SpO2: Note before and after O2 if allowed - ETCO2
  - Correct/respiratory rate/adequate ventilations: Target SpO2: 94-98% (92% COPD) unless hypoxia constrained
  - O2 1-5 LNC: Adequate rate/death; minimal distress; SpO2: 92-95% (88-92% COPD)
  - O2 8-15 LNEB: Severe distress: SpO2 ≤ 92% (<88% COPD)
  - O2 10 L BVM: Apnea and/or shallow/inadequate rate/death with mod/severe distress; unstable
  - Adults: 1 breath every 6 sec (10 breaths/min) (Anesthesia: 0-0 BPM)
  - CPAP: Per appropriate SOP. If tension or open pneumothorax/flail chest => Chest Trauma SOP (pg 40)
5. CIRCULATION/perfusion:
- Compare radial/carpal pulses; assess skin- color, temp, moisture
  - No carotid pulse =>Traumatic Arrest SOP (pg 49)
- Assess bleeding type, amount, source(s) and rate: hemorrhage control per System procedure
- Direct pressure: pressure dressings to injury. If direct pressure ineffective or impractical:
  - Pack wound w/ topical hemostatic gauze / apply direct pressure. Freq. for bleeding.
  - Limit w/t uncontrolled bleeding: Tourniquet
  - Pelvic Fx: Wrap w/ pelvic binder or in upside down KED
- If suspected cardiac tamponade, blunt aortic or cardiac injury => Chest Trauma SOP (pg 40)
- Mascular access: Actual/potential volume replacement and/or IV meds prior to hospital arrival
  - IV 0.9% NS (warm if possible)
  - In shock: 14-16 g NS. up to 1 L (wide open) based on SBP (MAP); radial pulse & coherent mental status.
  - Do not exceed BP targets. Excess IVF may lead to uncontrolled hemorrhage, hypothermia, hypocalcemic state, & abdominal compartment syndrome
  - Penetrating trauma to torso: Target SBP 80 (MAP 50-00) (permissive hypotension)
  - Blunt trauma: Target SBP 90 (MAP 80-85); TBI: target SBP 110 (MAP >85) or higher
  - Do not delay transport in time-sensitive pts to establish elective vascular access on scene; Limit 2 attempts/routes unless situation demands/OLMC order; may go while stationary
  - IO indications: Critical pts needing urgent IVF/meds when venous access is difficult/delayed/impossible
    - Hypovolemic shock/active bleeding (<3 hours): TXA 1 gm in 100mL NS IVPH over 10 min.
    - Monitor ECG
7. Disability: Rapid neuro exam: GCS; pupils; ability to move all four extremities (S&S 1CP & hemorrhage)
  - If AMG: blood glucose by System procedure. If <70: Treat per Hypoglycemia SOP (pg. 34)
8. Pain mgmt if SBP > 90 (MAP > 50): Rx per PAIN Mgt SOP (pg 5)
- Nausea: Ondansetron standard dose per IMC (pg 4)

TRANSPORT DECISION
- Consider need for trauma surgeon scene response per Region IX policy & local procedure; start early notifications
  - Transport to nearest appropriate trauma center per Region triage criteria and OLMC order
- Consider scene use of helicopter or alternate transport means
NEWBORN AND POST-PARTUM CARE

NEWBORN
1. Assess newborn’s ABCs. If distressed → Newborn Resuscitation SOP
2. Care immediately after delivery:
   - Keep infant level with uterus or place on mom’s abdomen in a 15° head-down position (unless preterm, then keep horizontal) until cord stops pulsating.
   - Ventilations should begin in 30 sec. Gently rub back or flick soles of feet. If no ventilations → newborn resuscitation.
   - Dry and warm infant, wrap in blanket or cloth. Cover head with sterile cap.
3. When cord pulsations stop: Clamp cord at 6” and 8” from infant’s body; cut between clamps with sterile scalpel.
   - If no sterile implement available, clamp cord but do not cut; safety secure infant for transport
   - Check cord ends for bleeding.
4. Obtain 1 minute Apgar score. If 0 or less → Newborn Resuscitation SOP (pg 89)
   - If RR < 40; assist with neonatal BVM → Newborn Resuscitation SOP (pg 80).
   - If frisky but breathing spontaneously at a rate of ≥ 40/min; place neonatal NRM 1” from the baby’s face with blow-by oxygen at 10 L/min.
5. Place ID tags on the mother and infant with mother’s name, delivery date and time, infant gender.
6. Obtain 5 minute Apgar score.
7. Transport considerations: Transport baby in an infant car seat secured so the infant rides facing backwards or per local procedure. Pad around infant pm. Do NOT carry infant to ED or OB in rescuer’s arms d/t risk of infection & trauma. Transport mom & baby to a hospital with OB services (keep together if safe transport possible). Do not separate in different ambulances unless absolutely necessary.

<table>
<thead>
<tr>
<th>Apgar Assessment</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance (color)</td>
<td>Blue or pale</td>
<td>Blue hands or feet</td>
<td>Entirely pink</td>
</tr>
<tr>
<td>Pulse (heart rate)</td>
<td>Absent</td>
<td>&lt; 100</td>
<td>≥ 100</td>
</tr>
<tr>
<td>Grimace (reflex irritability)</td>
<td>Absent</td>
<td>Grimace</td>
<td>Cough or sneeze</td>
</tr>
<tr>
<td>Activity (muscle tone)</td>
<td>Limp</td>
<td>Some extremity flexion</td>
<td>Active motion</td>
</tr>
<tr>
<td>Respirations (effort)</td>
<td>Absent</td>
<td>Weak cry, &lt; 40</td>
<td>Strong cry</td>
</tr>
</tbody>
</table>

Infant’s patient care report - Document the following:
1. Date and time of delivery
2. Presence/absence of meconium cord. If present, how many times.
3. Appearance of amniotic fluid, if present.
4. Apgar scores at 1 minute and 5 minutes.
5. Time placenta delivered and whether or not it appeared intact (if applicable).
6. Any infant resuscitation initiated and response.

MOTHER
1. Placenta should deliver in 20-30 minutes. If delivered, collect in bag from OB kit and transport for inspection.
   - Do NOT pull on cord to facilitate delivery of the placenta.
   - Do NOT DELAY TRANSPORT waiting for PLACENTA to deliver.
2. Mother may be shivering; cover with a blanket.
3. If perineum torn/bleeding; apply direct pressure with sanitary pads and have patient bring legs together.
4. Apply cold packs (ice bag) to perineum (over pad) for comfort and to reduce swelling.
5. If blood loss > 500 mL, or S&O of shock/hypoperfusion;
   - IV NS fluid challenges in 200 mL increments liberal to patient response up to 1 L
   - TXA 1 Gm in 100mL NS IVPS over 10 min.
   - Massage fundus until firm; breast feeding may increase uterine tone. (Do not transport with baby breastfeeding).
6. If blood loss continues despite above with SBP < 80 (MAP < 60); Transport ASAP, alert OLMC.
DELIVERY COMPLICATIONS

BREECH BIRTH

- A footling/breech generally delivers in 3 stages: legs → abdomen; abdomen → shoulders, and head.

1. IMC special considerations:
   - IV NS; anticipate need for pressure infusers
   - Obtain a quick pregnancy history per the Emergency Childbirth SOP
   - Prepare for delivery per Emergency Childbirth SOP if birth is imminent
   - Prepare to transport with care enroute if only the buttocks or lower extremities are delivered.
   - Stay on scene for ONE contraction if the baby is delivered to the shoulders, while attempting delivery of the head.
   - If enroute, stop the vehicle to attempt delivery of the head.

Delivery Procedure

3. Legs delivered: Support baby’s body wrapped in a towel/blanket.
   - If cord is accessible, gently palpate for pulsations. Do not manipulate cord more than necessary.
   - Attempt to loosen the cord to create slack for delivery of the head.

4. After forso and shoulders are delivered: Gently sweep down the arms.
   - If face down may need to lower body to help deliver head. Do not hyperextend the neck.
   - Apply firm pressure over mother’s fundus to facilitate delivery of the head.
   - NEVER ATTEMPT TO PULL THE INFANT BY THE LEGS OR TRUNK FROM THE VAGINA.
   - May precipitate an entrapped head in an incompletely dilated cervix or it may precipitate nuchal arms

5. The head should deliver in 30 seconds (with the next contraction).
   - If NOT, reach 2 gloved fingers into vagina to locate baby’s mouth and pull chin down.
   - Push vaginal wall away from baby’s mouth to form an airway.
   - Keep your fingers in place and transport immediately, alerting the receiving hospital of the baby’s position.
   - Keep delivered portion of baby’s body warm and dry.

6. If head delivers: anticipate neonatal distress. Refer to Newborn Resuscitation SOP as necessary. (pg. 70)

7. Anticipate maternal hemorrhage after the birth of the infant. Refer to Post-Partum Care of Mother. (pg. 67)

Note: Single limb presentation (arm, leg) or other abnormal presentations may require C-section.

Do NOT attempt field delivery.

PROLAPSED CORD

- Check for prolapsed cord whenever a patient claims her bag of water has ruptured.

1. IMC special considerations: OS-12-15 L/N/RM

2. Elevate the mother’s hips. Instruct the patient to pant during contractions.

3. Place gloved hand into vagina and place fingers between pubic bone and presenting part, with cord between fingers.

4. Apply continuous steady upward pressure on the presenting part.

5. Avoid cord manipulation as much as possible. Cover with a moist dressing and keep warm.

6. Transport with hand pressure in place.

UTERINE INVERSION

1. IMC special considerations: OS-12-15 L/N/RM; IV NS titrated to patient response

2. Anticipate significant hemorrhage
   - If only partially extended, ONE attempt to replace uterus per protocol. Push fundus toward vagina with palm of hand.
   - Apply saline moistened sterile towels or dressings around uterus.

3. TXA 1 Gm in 100ml NS IVPS over 10 min
Reference Materials

McHenry Western Lake County Region IX Protocols
ITLS TXA Resource Guide
Mercyhealth TXA education
Quiz for CE Credit

Please complete the quiz for this lesson and follow the directions on how to submit for credit.
Thank You!