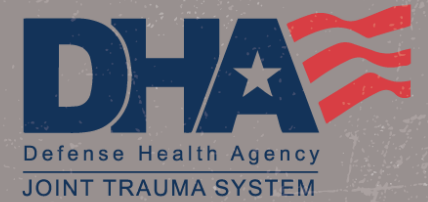




**COMBAT MEDIC/  
CORPSMAN**



# TACTICAL COMBAT CASUALTY CARE COURSE

## MODULE 10: SHOCK RECOGNITION AND MANAGEMENT



Committee on  
Tactical Combat  
Casualty Care  
(CoTCCC)

**TCCC TIER 1**  
All Service Members

**TCCC TIER 2**  
Combat Lifesaver

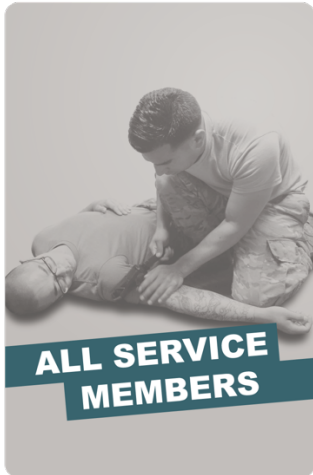
**TCCC TIER 3**  
Combat Medic/Corpsman

**TCCC TIER 4**  
Combat Paramedic/Provider

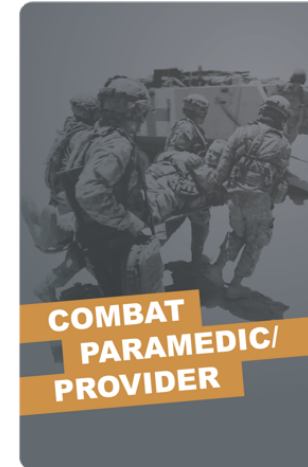
**TACTICAL COMBAT CASUALTY CARE (TCCC) ROLE-BASED TRAINING SPECTRUM**

**ROLE 1 CARE**

**NONMEDICAL  
PERSONNEL**



**MEDICAL  
PERSONNEL**



◀ **YOU ARE HERE**

**STANDARDIZED JOINT CURRICULUM**

## 3 x **TERMINAL LEARNING OBJECTIVES**

### **11 Describe shock assessment in Tactical Field Care in accordance with CoTCCC Guidelines.**

- 11.1 Identify the signs, symptoms, and management steps of hemorrhagic shock in a trauma casualty.
- 11.2 Identify the importance of level of consciousness and radial pulse as indicators of hemorrhagic shock in Tactical Field Care
- 11.3 Describe the lethal triad of hemorrhagic shock and identify preventive measures.
- 11.4 Identify signs, symptoms, and potential causes of refractory shock in Tactical Field Care.

### **12 Given a combat or noncombat scenario, perform intravenous or intraosseous access on a trauma casualty during Tactical Field Care in accordance with CoTCCC Guidelines.**

- 12.1 Identify the indications, contraindications, and preferred methods of intravenous access in Tactical Field Care.
- 🇺🇸 12.2 Demonstrate the initiation of a field-ruggedized intravenous saline lock in Tactical Field Care.
- 12.3 Identify the indications, contraindications, and preferred methods of intraosseous access in Tactical Field Care.
- 🇺🇸 12.4 Demonstrate the initiation of an intraosseous infusion in Tactical Field Care.

### **13 Given a combat or noncombat scenario, perform tranexamic acid administration on a bleeding trauma casualty in accordance with CoTCCC Guidelines.**

- 13.1 Identify the TCCC indications, contraindications, and administration methods of tranexamic acid.
- 🇺🇸 13.2 Demonstrate administration of tranexamic acid to a trauma casualty in Tactical Field Care.

## 10 x **ENABLING LEARNING OBJECTIVES**

# = Terminal Learning Objectives   ● = Cognitive ELOs   🇺🇸 = Performance ELOs

# MARCH PAWS

## LIFE-THREATENING

- M** MASSIVE BLEEDING  
#1 Priority
- A** AIRWAY
- R** RESPIRATION (*Breathing*)
- ▶ **C** CIRCULATION
- H** HYPOTHERMIA / HEAD INJURIES

## AFTER LIFE-THREATENING

- P** PAIN
- A** ANTIBIOTICS
- W** WOUNDS
- S** SPLINTING

# HEMORRHAGIC SHOCK

**SHOCK** – progressive cellular and tissue hypoxia leading to organ damage and, if not treated, death

- Shock is **life-threatening**
- Most commonly manifested as **hypotension**
- The most common cause of shock on the battlefield is hemorrhagic shock

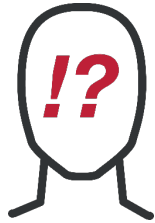
The best TACTICAL indicators of hemorrhagic shock:

- **Altered mental status** in the **absence** of **brain injury**  
and/or
- **Weak or absent radial pulse**



Hemorrhagic shock can result in the casualty's **death**

# SIGNS AND SYMPTOMS OF HEMORRHAGIC SHOCK



Altered  
Mental Status



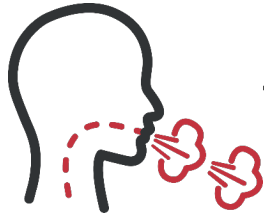
Weak or absent  
radial pulses (or low  
blood pressure)



Make sure you frequently assess casualties during TFC for signs of shock. These symptoms can change and progress over time.



Tachycardia



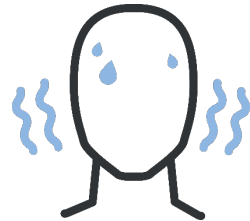
Tachypnea



Excess  
thirst



Cyanosis



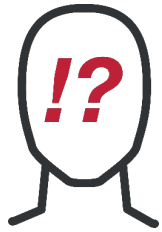
Diaphoresis



Nausea and/  
or vomiting

M A R **C** H

# SIGNS AND SYMPTOMS OF SHOCK (cont.)



## Altered Mental Status

### Level of Consciousness

Check casualty every 15 minutes for **AVPU**



**Alertness** - Knows who, where they are

**Verbal** - Orally responds to verbal commands

**Pain** – Level of pain felt when the sternum is briskly rubbed with the knuckle (**if needed**)

**Unconscious** - Unresponsive

**Decreasing AVPU** could indicate condition worsening



## Weak or absent radial pulses

### Pulse Assessment

Assess for weak or absent **radial pulses** and confirm all **bleeding control** measures are still effective

It is better to prevent shock with hemorrhage control than to treat it

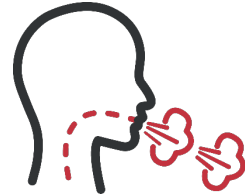
**DO NOT WAIT** for signs and symptoms of shock to occur

# SIGNS AND SYMPTOMS OF HEMORRHAGIC SHOCK *(cont.)*



## Tachycardia

Tachycardia is typically the first abnormal vital sign of hemorrhagic shock.



## Tachypnea

When cardiovascular changes occur, it could then cause tachypnea



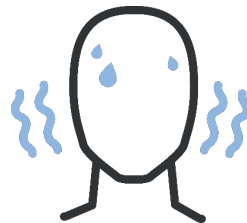
## Excess Thirst

Rapid and substantial loss of blood or decreases in intravascular volume can cause dehydration



## Cyanosis

The body's response to blood loss are compensatory in nature



## Diaphoresis

High levels of epinephrine and other related hormones release to counteract the shock



## Nausea and/ or vomiting

When the body begins to overcompensate it will release non-vital fluids and chemicals

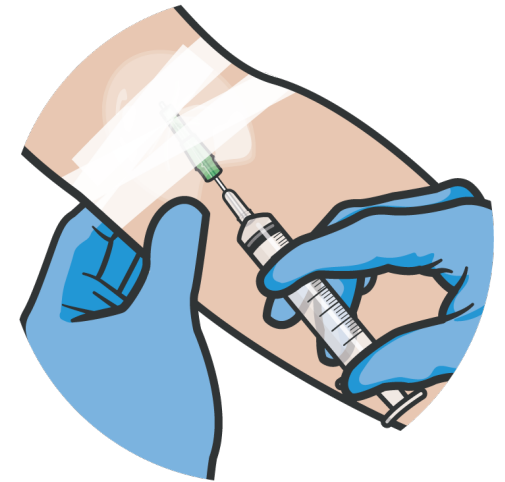


# SHOCK MANAGEMENT



If tactical indicators of hemorrhagic shock are present:

- 2 grams TXA (IV/IO access)
- Fluid resuscitation
- Active
- Passive
- Hypothermia prevention
- Continuous reassessment and prevention of Refractory Shock



*Saline Lock*

Fluids by mouth are permissible if the casualty is conscious and can swallow

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# LEVEL OF CONSCIOUSNESS & PERIPHERAL PULSE CHANGES IN SHOCK

## RELIABLE indicators of shock:



### Altered mental status

**Altered level of consciousness** as blood shunts from the cortex to preserve brainstem function



### Weak or absent radial pulse

**Diminishing peripheral pulses** as blood is diverted to preserve essential organs



M A R C H

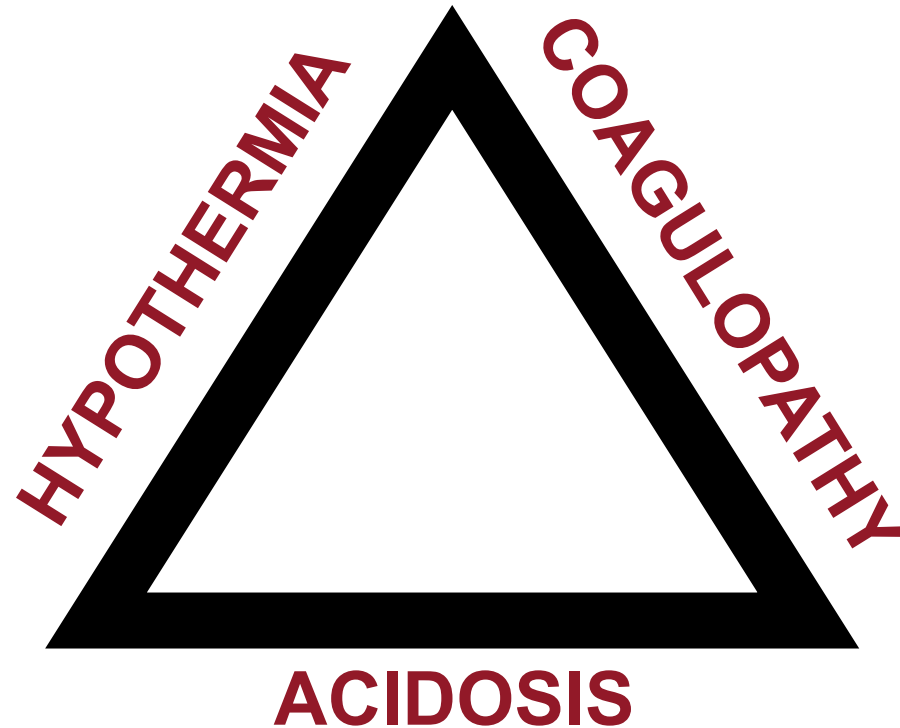
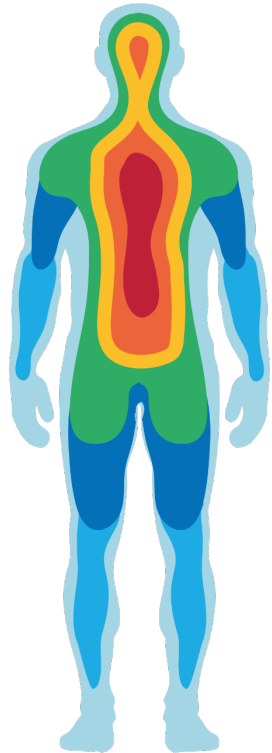
# PROGRESSIVE CHANGES IN SHOCK

	Blood Volume	Blood Loss	Signs/Symptoms	Effects/Outcome
	4,500 ml	500 ml	Possible mild tachycardia	Usually no effects
	4,000 ml	1,000 ml	Radial pulse >100 Normal respiratory rate	Low likelihood of effects, if bleeding stopped
	3,500 ml	1,500 ml	Mental status changes Weak radial pulse >100 Tachypnea	Requires quick management, but not necessarily fatal
	3,000 ml	2,000 ml	Confusion and lethargy Very weak radial pulse >120 Significant tachypnea (>35)	Fatal if not managed properly
	2,500 ml	2,500 ml	Unconscious No radial pulse or carotid pulse HR >140 Respiratory rate >35	Fatal without immediate and rapid interventions



# THE LETHAL TRIAD OF HEMORRHAGIC SHOCK

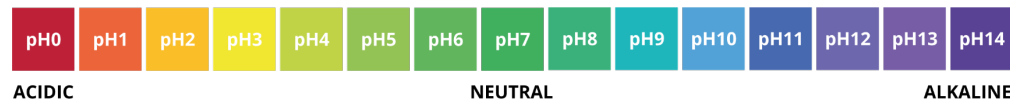
- Environmental factors
- Physiologic response to **BLOOD LOSS**



- Direct losses of clotting factors and platelets



Buildup of lactic acid



# LETHAL TRIAD IDENTIFY PREVENTIVE MEASURES

## Preventative Measures Include:

- Control hemorrhage
- Prevent and treat shock
- TXA and fluid resuscitation
- Hypothermia Prevention (active/passive)
- Reassess frequently for recurrence

## Indications for establishing IV/IO access:

- Shock
- Significant risk of developing shock
- Needs medications, **cannot** take orally

- **18-gauge IVs** are adequate, even for rapid blood transfusions
- **Flush saline locks** after insertion and every 2 hours
- When administering fluids, secure the IV lines to avoid dislodging the catheter

## Field-ruggedized **saline lock** advantages:

- **Easier to move a casualty** without an IV line and bag
- **Less likely to dislodge** during movement
- Conservation of limited IV fluids
- **Rapid IV access** is still available
- **Reduced equipment loads** for the Combat Medic



**Not every** casualty needs an IV

# REFRACTORY HEMORRHAGIC SHOCK

Refractory shock is potentially a fatal manifestation of cardiovascular failure with inadequate response to shock interventions resulting in poor tissue perfusion, hypotension, and organ failure. Management of refractory shock involves treating the cause and restoring organ perfusion with fluid resuscitation.

## Signs and Symptoms of tension pneumothorax:

- Thoracic trauma
- Persistent respiratory distress
- Absent breath sounds
- SPO2 < 90%

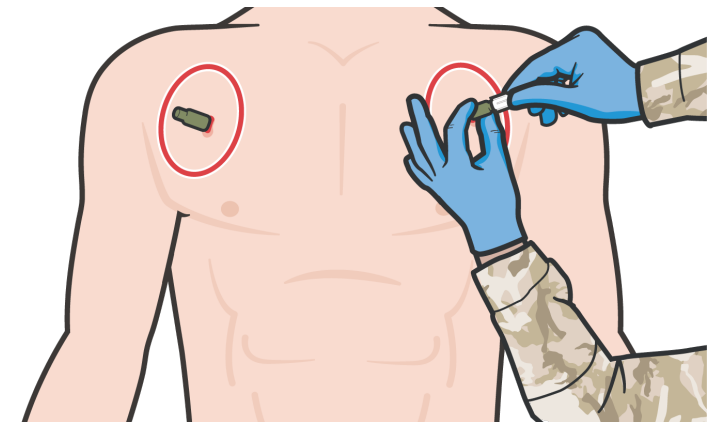


If a casualty in shock is not responding to fluid resuscitation, **CONSIDER** unrecognized tension pneumothorax (PTX)

If a casualty in shock is **not responding** to fluid resuscitation, consider untreated tension pneumothorax:

■ If not already done, treat indications with repeated Needle Decompression of the Chest (NDC), up to 2 times

■ If shock persists, Consider decompressing the opposite side of the chest if indicated based on the mechanism of injury and physical findings.




M A R C H

# INDICATIONS/METHODS OF INTRAVENOUS (IV) ACCESS

**Indications** for establishing IV access:

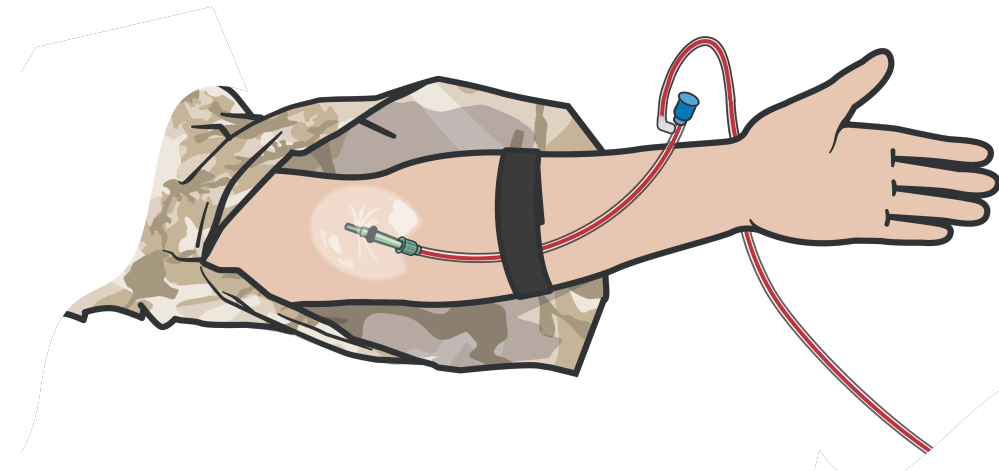
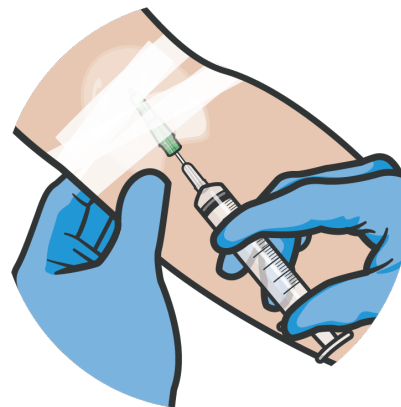
- Shock
- Significant risk of developing shock
- **Cannot** take medications orally

 **Not every** casualty needs an IV

**Contraindications** for establishing IV access:

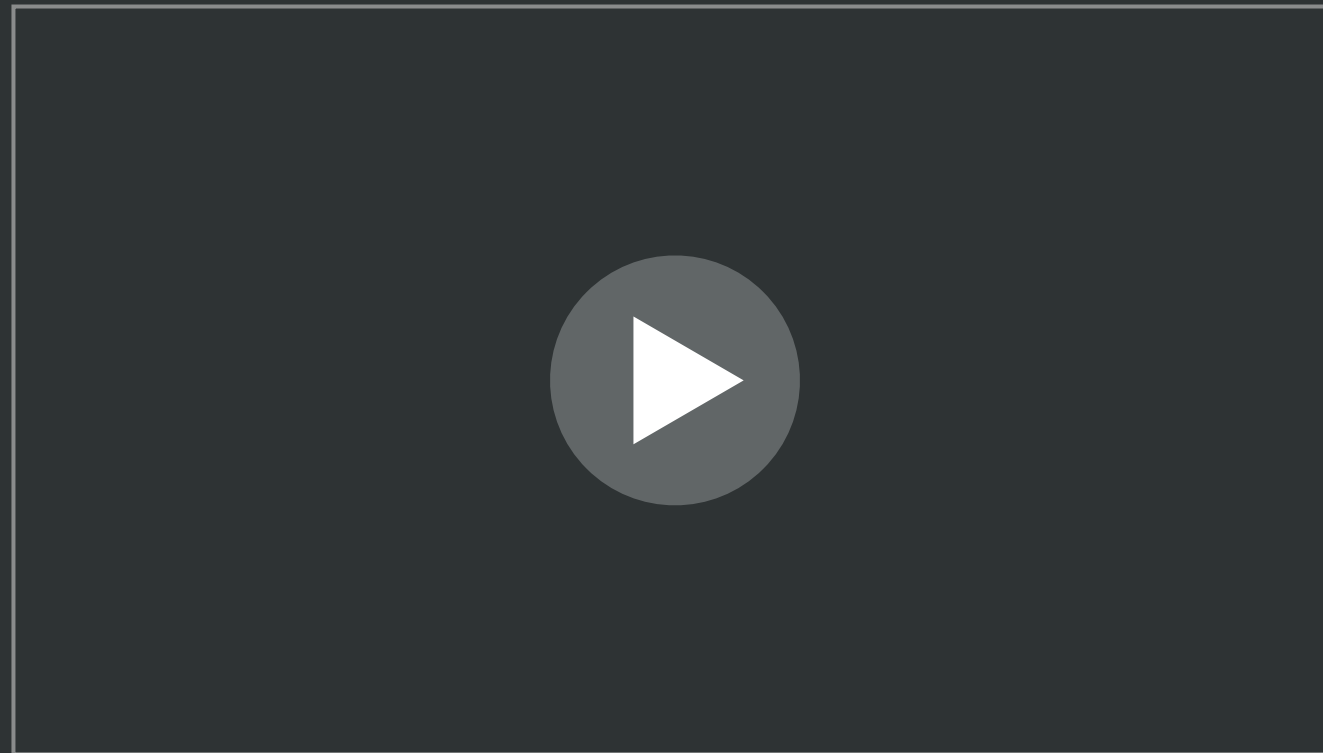
- Trauma (vascular injury or fracture) proximal to IV site
- If vascular access is needed but not quickly obtainable via IV route, use the IO route

- **18-gauge IVs** are adequate for administering fluid/blood
- When administering fluids, secure the IV lines to avoid dislodging the catheter
- Saline Locks are preferred compared to Direct Line IV's.



M A R C H

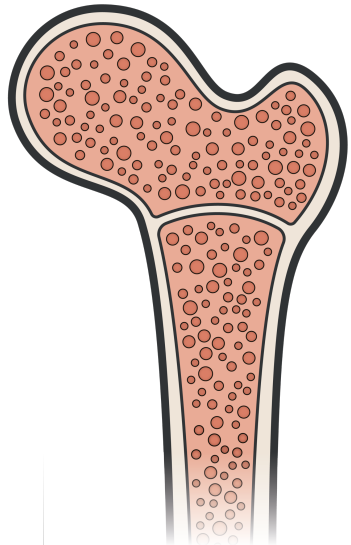
# FIELD-RUGGEDIZED IV SALINE LOCK



*Video can be found on [deployedmedicine.com](http://deployedmedicine.com)*



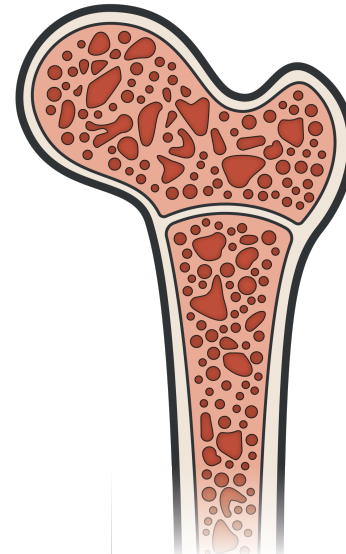
# INDICATIONS/CONTRAINDICATIONS OF INTRAOSSEOUS (IO) ACCESS



Healthy Bone

Significant **Indications** for establishing IO access:

- Two failed peripheral vascular access attempts
- IV access was difficult or unattainable
- Intraosseous access has a higher success rate when compared to IV access in limited visibility environments



Osteoporosis

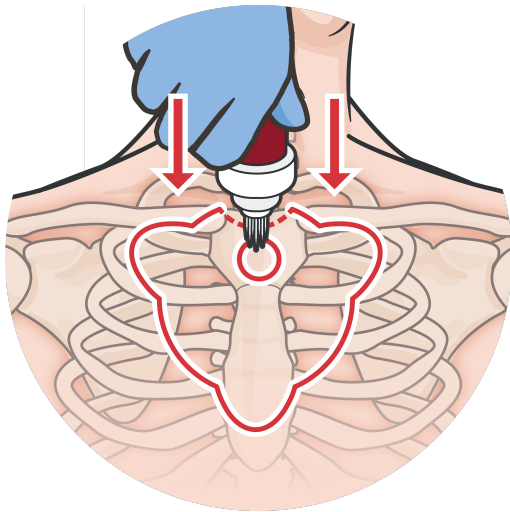
**Contraindications** for establishing IO access:

- Fractures, infections, and/or injury at the IO site
- Osteoporosis
- Osteogenesis imperfecta
- FAST1**<sup>®</sup> Casualties of small stature or less than 50 kg (110 lbs)
- Scar indicating a prior sternotomy




**Osteomyelitis**, can result from IO devices

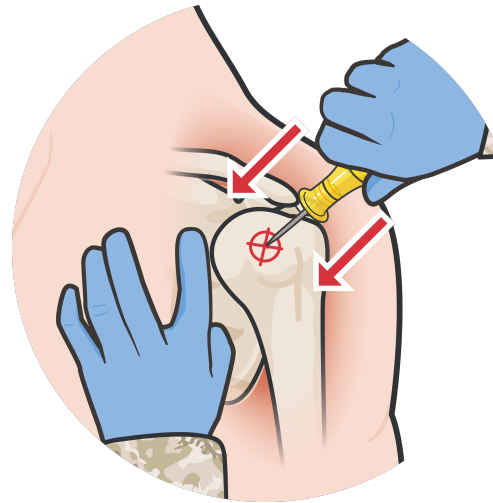
# METHODS OF INTRAOSSEOUS (IO) ACCESS



## FAST1® Sternum


Flow Rate: **80 ml/min** (based on manufacturers guidelines)

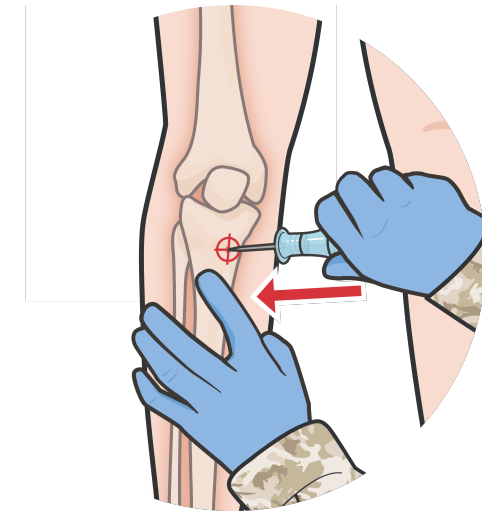
 **FAST1®** infusion should not be left in place for more than 24 hours



## EZ-IO® Humerus

Flow Rate: **105 ml/min** (based on manufacturers guidelines)

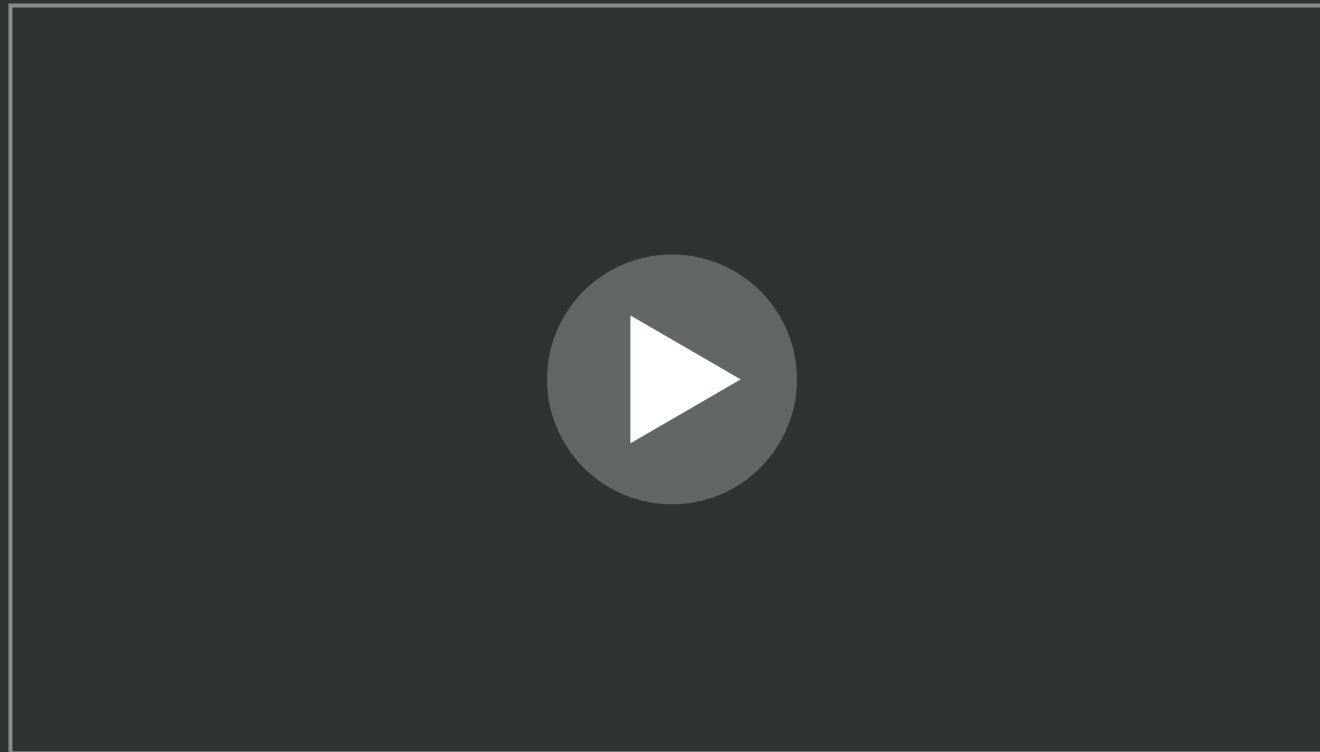
 **EZ-IO** can be inserted manually or with drill kits  
**EZ-IO** has varying needle sizes based on insertion site and casualty size



## EZ-IO® Tibia

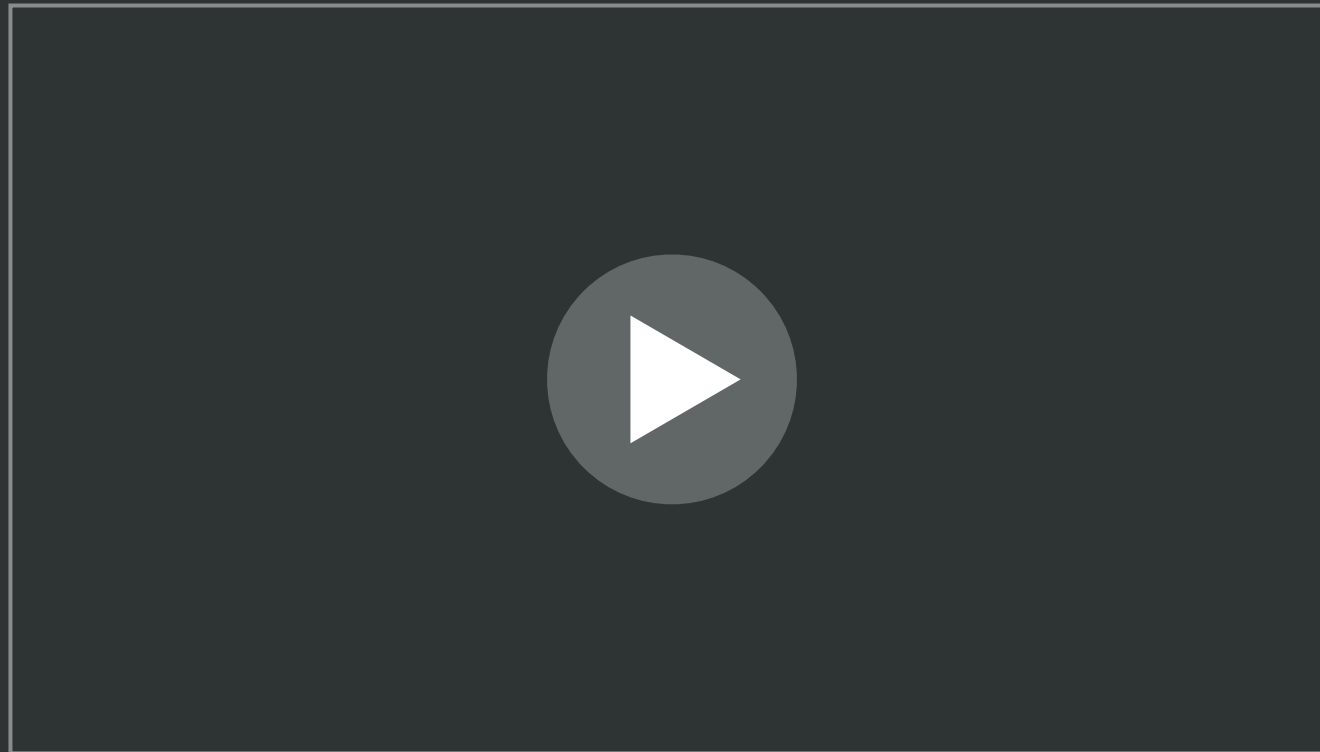
Flow Rate: **16.6 ml/min** (based on manufacturers guidelines)

# FAST1® INTRAOSSEOUS ACCESS



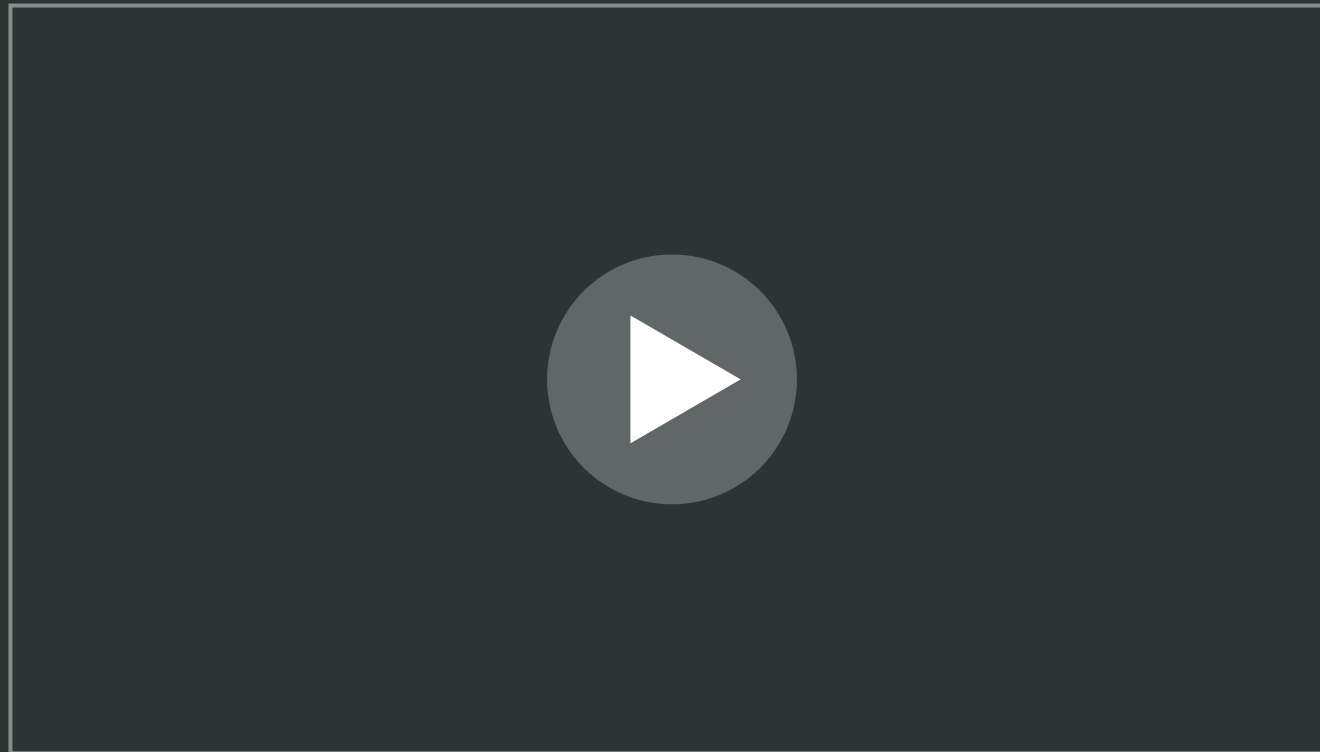
*Video can be found on [deployedmedicine.com](http://deployedmedicine.com)*

# EZ-IO® HUMERUS INTRAOSSEOUS ACCESS



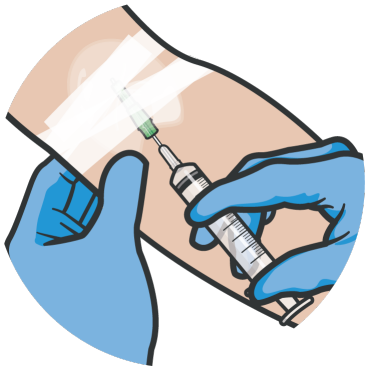
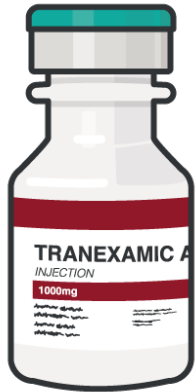
*Video can be found on [deployedmedicine.com](http://deployedmedicine.com)*

# EZ-IO® TIBIA INTRAOSSEOUS ACCESS



*Video can be found on [deployedmedicine.com](http://deployedmedicine.com)*

## TRANEXAMIC ACID (TXA) ADMINISTRATION



### DOSAGE:

**2 gm** slow IV or IO push (over 1 minute), as soon as possible (NOT later than 3 hours after injury)

### ROUTE(S):

Tranexamic Acid is available IV or IO form

### INDICATIONS for administering TXA include:

- Hemorrhagic shock
- Elevated lactate
- One or more major amputations
- Penetrating torso trauma
- Evidence of severe bleeding

### OR

- Signs or symptoms of significant TBI
- Altered mental status associated with blast injury or blunt trauma



Only absolute **contraindication**: Prior allergic reaction to TXA

# TRANEXAMIC ACID (TXA) ADMINISTRATION

## CONTRAINDICATIONS:

Hypersensitivity to TXA, subarachnoid hemorrhage, active intravascular clotting, if clinically indicated

## POTENTIAL SIDE EFFECTS:

Blurred vision or impaired color vision, nausea, vomiting, diarrhea (temporary)

## DRUG INTERACTIONS:

Factor IX complex concentrates or anti-inhibitor coagulant concentrates (risk of thrombosis may be increased)



## ONSET/PEAK/DURATION:

30 sec-5 min/30 min-2 hr/24 hr

## TACTICAL CONSIDERATIONS:





Administer as soon as possible but not later than 3 hours after injury



**TXA** can be safely administered in the same IV line as blood, crystalloid fluids and Hextend® (flush line before and after administration)

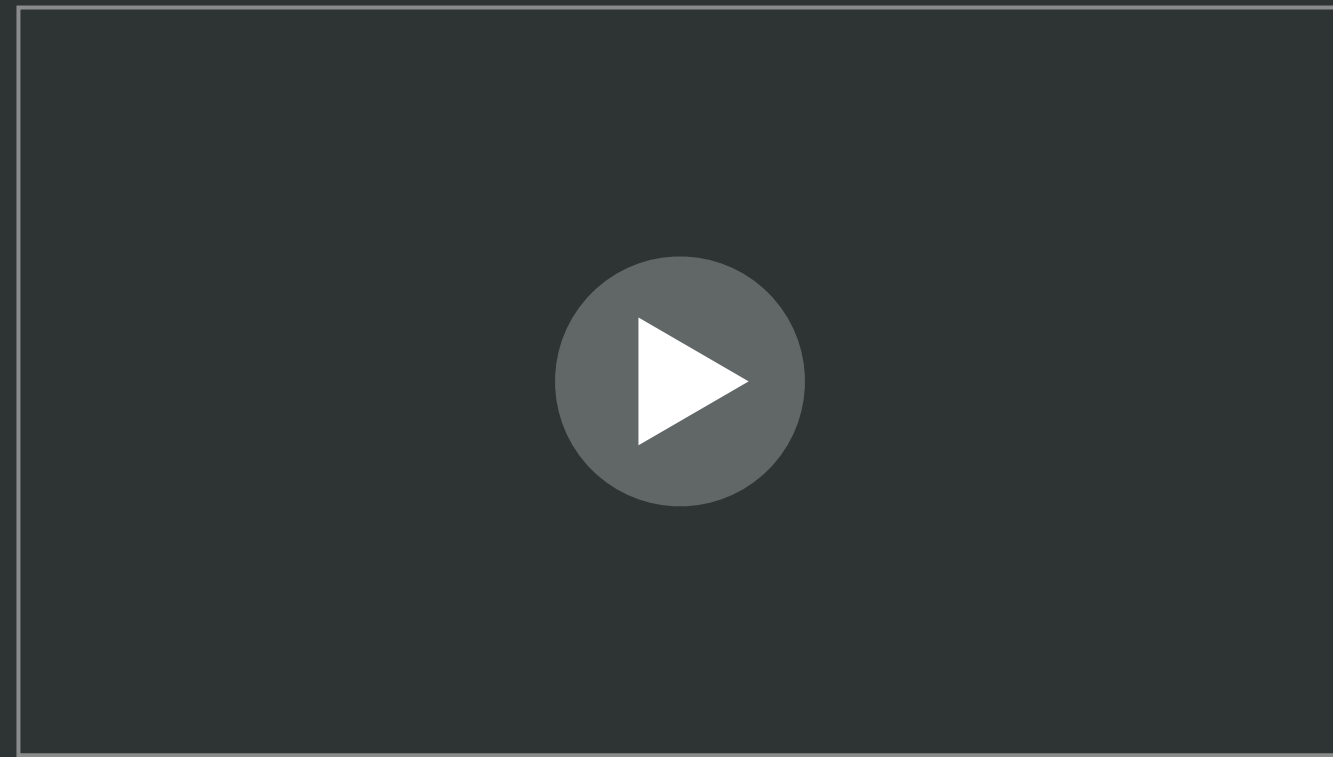
# SKILL STATION

## Intravenous and Intraosseous Access and TXA Administration Skill Station

-  Field-Ruggedized Saline Lock Insertion
-  FAST1 Intraosseous Access
-  EZ-IO Intraosseous Access
-  TXA Administration



# CIRCULATION (SHOCK RECOGNITION AND MANAGEMENT) HIGHLIGHTS



*Video can be found on [deployedmedicine.com](http://deployedmedicine.com)*

# SUMMARY

- **Signs and symptoms** of shock
- Use of peripheral pulses and mental status to **identify shock**
- The **lethal triad** of hemorrhagic shock
- **Refractory shock**
- Indications for establishing both **intravenous** and **intraosseous access**
- Indications for administering **TXA**
- Insertion of field-ruggedized **saline locks**
- Insertion of **FAST1** and **EZ-IO** intraosseous devices
- Administration of **TXA**

# CHECK ON LEARNING



What are the most reliable indicators of shock in a TFC setting?



What is the definition of shock?



If all hemorrhage control measures have been applied and fluid resuscitation does not improve shock (refractory shock), what potentially unrecognized injury should be considered, and how would you treat it?



Should you establish IV access on all casualties in case they deteriorate?

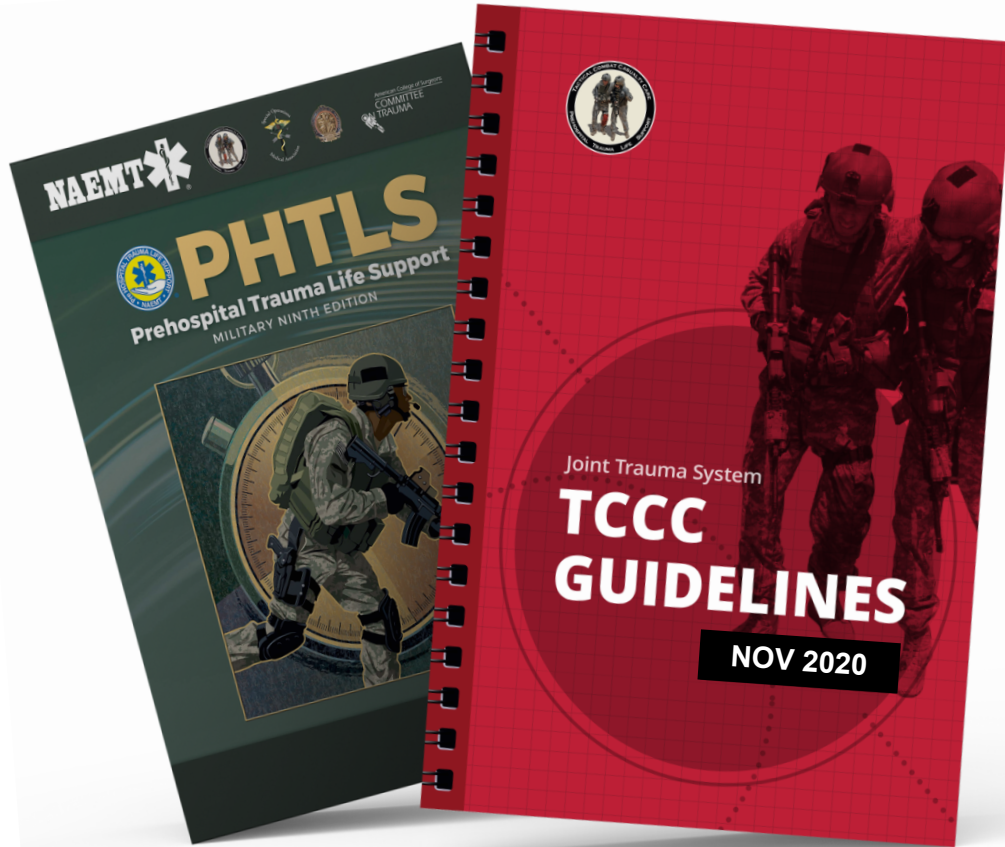


What is the proper protocol for administering tranexamic acid?



**ANY QUESTIONS?**

# REFERENCES



## **TCCC: Guidelines**

by JTS/CoTCCC

Updated regularly – latest edition dated  
**5 November 2020**

These guidelines are the result of decisions made by the Committee on Tactical Combat Casualty Care as they explore evidence-based research regarding best practices

## **PHTLS: Military Edition, Chapter 25**

by NAEMT

**Prehospital Trauma Life Support,  
Military Ninth Edition**