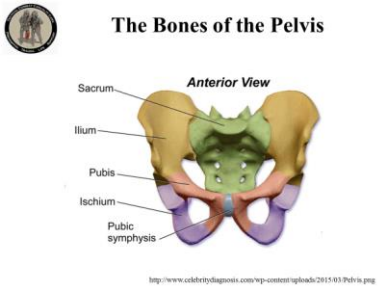
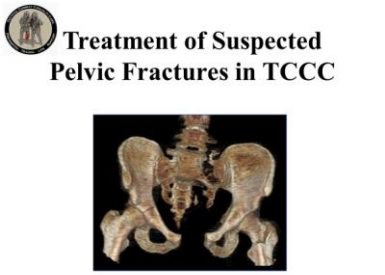
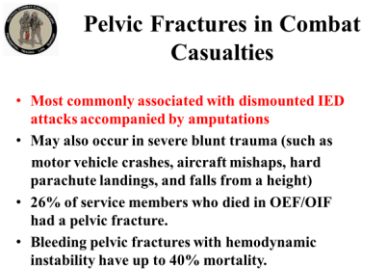
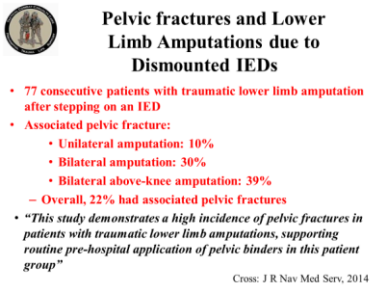
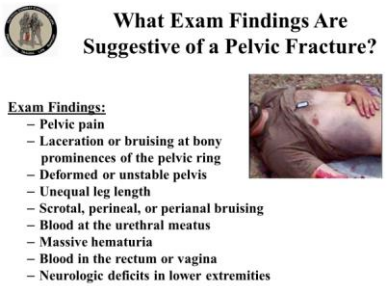
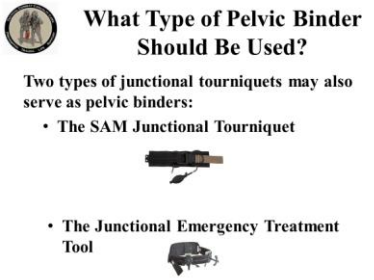
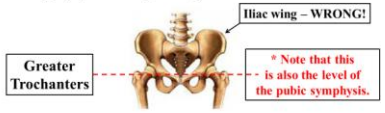
1.	Tactical Combat Casualty Care for Medical Personnel August 2017 (Based on TCCC-MP Guidelines 170131)  Tactical Field Care #2	**Tactical Combat Casualty Care for Medical Personnel** **August 2017** **(Based on TCCC-MP Guidelines 170131)** **Tactical Field Care #2**	We will continue with Tactical Field Care.
2.	**OBJECTIVES** • **LIST** physical findings suggestive of pelvic fracture. • **DEMONSTRATE** the appropriate procedure for application of a pelvic binder. • **DEMONSTRATE** the appropriate procedure for initiating a rugged IV field setup. • **STATE** the rationale for obtaining intraosseous access in combat casualties. • **DEMONSTRATE** the appropriate procedure for initiating an intraosseous infusion.	**OBJECTIVES** • LIST physical findings suggestive of pelvic fracture. • DEMONSTRATE the appropriate procedure for application of a pelvic binder. • DEMONSTRATE the appropriate procedure for initiating a rugged IV field setup. • STATE the rationale for obtaining intraosseous access in combat casualties. • DEMONSTRATE the appropriate procedure for initiating an intraosseous infusion.	Read the text.
3.	**OBJECTIVES** • **STATE** the rationale for administration of tranexamic acid in cases of combat trauma. • **DESCRIBE** the appropriate regimen for battlefield administration of tranexamic acid. • **STATE** the tactically relevant indicators of shock in combat settings. • **DESCRIBE** the pre-hospital fluid resuscitation strategy for hemorrhagic shock in combat casualties.	**OBJECTIVES** • STATE the rationale for administration of tranexamic acid in cases of combat trauma. • DESCRIBE the appropriate regimen for battlefield administration of tranexamic acid. • STATE the tactically relevant indicators of shock in combat settings. • DESCRIBE the pre-hospital fluid resuscitation strategy for hemorrhagic shock in combat casualties.	Read the text.

4.	 **OBJECTIVES** • **DESCRIBE** how to prevent blood clotting problems from hypothermia. • **DESCRIBE** the management of penetrating eye injuries in TCCC. • **LIST** the recommended agents for pain relief in tactical settings along with their indications, dosages, and routes of administration.	**OBJECTIVES** • DESCRIBE how to prevent blood clotting problems from hypothermia. • DESCRIBE the management of penetrating eye injuries in TCCC. • LIST the recommended agents for pain relief in tactical settings along with their indications, dosages, and routes of administration.	Read the text.
5.	 **Tactical Field Care Guidelines** 6. Circulation a. Bleeding • A pelvic binder should be applied for cases of suspected pelvic fracture: - Severe blunt force or blast injury with one or more of the following indications: ◦ Pelvic pain ◦ Any major lower limb amputation or near amputation ◦ Physical exam findings suggestive of a pelvic fracture ◦ Unconsciousness ◦ Shock	**Tactical Field Care Guidelines** **6. Circulation** a. Bleeding • A pelvic binder should be applied for cases of suspected pelvic fracture: - Severe blunt force or blast injury with one or more of the following indications: ◦ Pelvic pain ◦ Any major lower limb amputation or near amputation ◦ Physical exam findings suggestive of a pelvic fracture ◦ Unconsciousness ◦ Shock	Read the guideline.

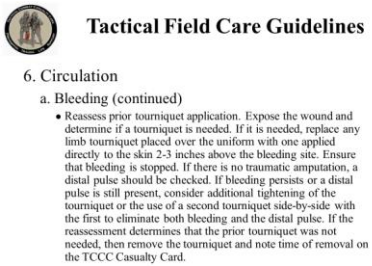
6.		**The Bones of the Pelvis**	The pelvis is a butterfly-shaped group of bones at the base of the spine. The pelvis consists of the pubis, ilium and ischium bones and the sacrum held together by tough ligaments to form one major ring and two smaller rings of bone that support and protect the bladder, intestines and rectum.
7.		**Treatment of Suspected Pelvic Fractures in TCCC**	Fractures of the pelvis are uncommon and range widely from mild (if the minor ring is broken) to severe (if the major ring is broken). Pelvic rings often break in more than one place. When you suspect the casualty may have a pelvic fracture, you should apply a pelvic binder. The binder is the field treatment.
8.		**Life-threatening Pelvic Fractures** Open book Vertical shear Lateral compression	In an open book pelvis injury, the front of the pelvis opens like a book. This injury results in tears of the strong pelvic ligaments that hold the pelvis bones together at the symphysis pubis and the sacroiliac joints. In a vertical shear pelvis injury, one half of the pelvis is forcefully shifted upward. In a lateral crush injury, half of the pelvis is crushed either inward or outward. In each of these types of injury, large arteries and veins can get torn resulting in massive blood loss that can threaten the casualty's life.

9.		**Pelvic Fractures in Combat Casualties** • Most commonly associated with dismounted IED attacks accompanied by amputations • May also occur in severe blunt trauma (such as motor vehicle crashes, aircraft mishaps, hard parachute landings, and falls from a height) • 26% of service members who died in OEF/OIF had a pelvic fracture. • Bleeding pelvic fractures with hemodynamic instability have up to 40% mortality	Read the text.
10.		**Pelvic Fractures and Lower Limb Amputations due to Dismounted IEDs** • **77 consecutive patients with traumatic lower limb amputation after stepping on an IED** • **Associated pelvic fracture:** • **Unilateral amputation: 10%** • **Bilateral amputation: 30%** • **Bilateral above-knee amputation: 39%** – **Overall, 22% had associated pelvic fractures** • ***"This study demonstrates a high incidence of pelvic fractures in patients with traumatic lower limb amputations, supporting routine pre-hospital application of pelvic binders in this patient group"***	This study by Cross in 2014 is based upon data from the United Kingdom's Joint Theater Trauma Registry.

11.		**What Exam Findings Are Suggestive of a Pelvic Fracture?** **Exam Findings:** – Pelvic pain – Laceration or bruising at bony prominences of the pelvic ring – Deformed or unstable pelvis – Unequal leg length – Scrotal, perineal, or perianal bruising – Blood at the urethral meatus – Massive hematuria – Blood in the rectum or vagina – Neurologic deficits in lower extremities	Durkin A, Sagi HC, Durham R, et al. Contemporary management of pelvic fractures. Am J Surg 2006;192:222
12.		**What Type of Pelvic Binder Should Be Used?** There are 3 commercially available pelvic binders: The Pelvic Binder The T-POD The SAM Pelvic Sling II	Read the text.
13.		**What Type of Pelvic Binder Should Be Used?** Two types of junctional tourniquets may also serve as pelvic binders: • The SAM Junctional Tourniquet • The Junctional Emergency Treatment Tool	Read the text.

14.	**What Type of Pelvic Binder Should Be Used?** • Any of these five devices may be used as a pelvic binder: – Pelvic Binder – T-Pod – SAM Pelvic Sling II – SAM Junctional Tourniquet – Junctional Emergency Treatment Tool	**What Type of Pelvic Binder Should Be Used?** • Any of these five devices may be used as a pelvic binder: – Pelvic Binder – T-Pod – SAM Pelvic Sling II – SAM Junctional Tourniquet – Junctional Emergency Treatment Tool	Read the text.
15.	**Placement of a Pelvic Binder** • At the level of greater trochanters, NOT the iliac wings (top of the hip bone.)  • *In one study 40% of the pelvic binders were placed too high, resulting in inadequate reduction of the pelvic fracture and possibly increased bleeding.*	**Placement of a Pelvic Binder** • At the level of greater trochanters, NOT the iliac wings (top of the hip bone.) • *In one study 40% of the pelvic binders were placed too high, resulting in inadequate reduction of the pelvic fracture and possibly increased bleeding.*	A note on placement: pelvic binders should be placed at the level of the greater trochanters of the femurs, and not up around the iliac wings.
16.	**Pelvic Binder Practical** 	**Pelvic Binder Practical**	Separate into small groups of up to six students per instructor. Use the supplemental module for the device you are training.

17.	**Don't Forget!** • External rotation of the lower extremities is commonly seen in persons with displaced pelvic fractures. – This may increase the dislocation of pelvic fragments. – External rotation can be prevented or reduced by securing the knees or feet together, improving the effect achieved by the pelvic binder. • Don't logroll casualties with suspected pelvic fractures – this may increase internal bleeding. 	**Don't Forget!** • External rotation of the lower extremities is commonly seen in persons with displaced pelvic fractures. – This may increase the dislocation of pelvic fragments. – External rotation can be prevented or reduced by securing the knees or feet together, improving the effect achieved by the pelvic binder. • Don't logroll casualties with suspected pelvic fractures – this may increase internal bleeding.	Read the text.
18.	**Don't Forget!** • Once a binder is on, if additional procedures at the Role II require access to the abdomen or groin (i.e., REBOA), the binder may be moved down to the upper thigh. This will limit external rotation and minimize the reopening of the pelvis. • If definitive care is delayed beyond approximately 8-12 hours, the need for a binder should be reassessed and the binder loosened if the patient remains hemodynamically stable.	**Don't Forget!** • Once a binder is on, if additional procedures at the Role II require access to the abdomen or groin (i.e., REBOA), the binder may be moved down to the upper thigh. This will limit external rotation and minimize the reopening of the pelvis. • If definitive care is delayed beyond approximately 8-12 hours, the need for a binder should be reassessed and the binder loosened if the patient remains hemodynamically stable.	Reminder for physicians and anyone providing prolonged care in the field.
19.	**Don't Forget!** • Pelvic binders may mask the presence of a pelvic fracture on CT scanning.  	**Don't Forget!** • Pelvic binders may mask the presence of a pelvic fracture on CT scanning.	This is a reminder for physicians receiving casualties.

20.			
21.		**Tactical Field Care Guidelines** 6. Circulation a. Bleeding (continued) • Reassess prior tourniquet application. Expose the wound and determine if a tourniquet is needed. If it is needed, replace any limb tourniquet placed over the uniform with one applied directly to the skin 2-3 inches above the bleeding site. Ensure that bleeding is stopped. If there is no traumatic amputation, a distal pulse should be checked. If bleeding persists or a distal pulse is still present, consider additional tightening of the tourniquet or the use of a second tourniquet side-by-side with the first to eliminate both bleeding and the distal pulse. If the reassessment determines that the prior tourniquet was not needed, then remove the tourniquet and note time of removal on the TCCC Casualty Card.	Read the guideline.

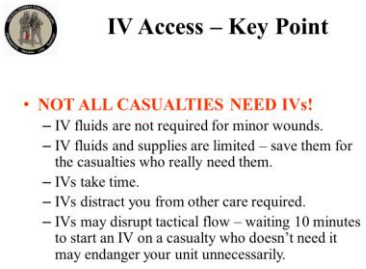
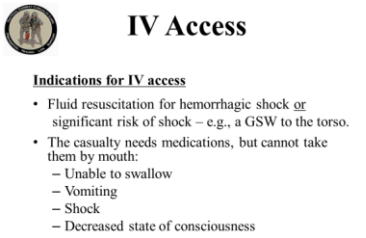
22.	**Tourniquets: Points to Remember** Tightening the tourniquet enough to eliminate the distal pulse will help to ensure that all bleeding is stopped, and that there will be no damage to the extremity from blood entering the extremity but not being able to get out.  Photo courtesy Dr. Warren Dorlac	**Tourniquets: Points to Remember** Tightening the tourniquet enough to eliminate the distal pulse will help to ensure that all bleeding is stopped, and that there will be no damage to the extremity from blood entering the extremity but not being able to get out.	Although a tourniquet may stop the active bleeding, it also prevents venous blood from returning to the heart. If arterial blood continues to flow past the tourniquet, pressure can build up distally in the limb and create a compartment syndrome. This is why the tourniquet should be tightened until there is no longer a distal pulse even if bleeding is controlled – to minimize the chance of harm from a developing compartment syndrome. Compartment Syndrome can cause unnecessary loss of the extremity.
23.	**Tourniquet Repositioning** 1. Expose the wound(s) and place a second tourniquet 2-3 inches above the most proximal bleeding site. 2. Loosen the "high-and-tight" tourniquet. 	**Tourniquet Repositioning** 1. Expose the wound(s) and place a second tourniquet 2-3 inches above the most proximal bleeding site. 2. Loosen the "high-and-tight" tourniquet.	Tourniquets placed hastily over the uniform may be less effective than tourniquets applied directly to the skin. Furthermore, all "high-and-tight" tourniquets require repositioning or conversion at the EARLIEST opportunity (2 hours max). During reassessment, if a tourniquet needs to be repositioned, remove sufficient uniform materiel to place another tourniquet directly over the skin, place the second tourniquet 2-3 inches above the (most proximal) bleeding site, and tighten it. Slowly loosen the first tourniquet while watching for continued bleeding control by the second tourniquet. Check also to make sure the distal pulses do not return.
24.	**Tourniquet Repositioning** 3. If needed for hemorrhage control or to eliminate distal pulses, a "high-and-tight" tourniquet can be moved to a position side-by-side with the second tourniquet and tightened there. 	**Tourniquet Repositioning** 3. If needed for hemorrhage control or to eliminate distal pulses, a "high-and-tight" tourniquet can be moved to a position side-by-side with the second tourniquet and tightened there.	Read the text.

25.	 **Tourniquets: Points to Remember** • **Damage to the arm or leg is rare if the tourniquet is left on for less than two hours.** • Tourniquets are often left in place for several hours during surgical procedures. • In the face of massive extremity hemorrhage, it is better to accept the small risk of damage to the limb than to have a casualty bleed to death.	**Tourniquets: Points to Remember** • Damage to the arm or leg is rare if the tourniquet is left on for less than two hours. • Tourniquets are often left in place for several hours during surgical procedures. • In the face of massive extremity hemorrhage, it is better to accept the small risk of damage to the limb than to have a casualty bleed to death.	Tourniquets have historically been frowned upon in civilian trauma settings. **In combat settings, they are the biggest lifesaver on the battlefield!** They are NOT A PROBLEM if not left in place for too long.
26.	 **Tactical Field Care Guidelines** 6. Circulation a. Bleeding (continued) • Limb tourniquets and junctional tourniquets should be converted to hemostatic or pressure dressings as soon as possible if three criteria are met: the casualty is not in shock; it is possible to monitor the wound closely for bleeding; and the tourniquet is not being used to control bleeding from an amputated extremity. Every effort should be made to convert tourniquets in less than 2 hours if bleeding can be controlled with other means. Do not remove a tourniquet that has been in place more than 6 hours unless close monitoring and lab capability are available.	**Tactical Field Care Guidelines** 6. Circulation a. Bleeding (continued) • Limb tourniquets and junctional tourniquets should be converted to hemostatic or pressure dressings as soon as possible if three criteria are met: the casualty is not in shock; it is possible to monitor the wound closely for bleeding; and the tourniquet is not being used to control bleeding from an amputated extremity. Every effort should be made to convert tourniquets in less than 2 hours if bleeding can be controlled with other means. Do not remove a tourniquet that has been in place more than 6 hours unless close monitoring and lab capability are available.	Read the guideline.
27.	 **Tourniquets: Points to Remember** • Every effort should be made to convert tourniquets in less than 2 hours if bleeding can be controlled by other means. If bleeding remains controlled with Combat Gauze, leave the loosened tourniquet in place. If the bleeding is not controlled with Combat Gauze, re-tighten the tourniquet until bleeding stops. • Restoring blood flow to the limb by transitioning to Combat Gauze at the 2-hour mark will minimize the chance of ischemic damage due to the tourniquet.	**Tourniquets: Points to Remember** • Every effort should be made to convert tourniquets in less than 2 hours if bleeding can be controlled by other means. If bleeding remains controlled with Combat Gauze, leave the loosened tourniquet in place. If the bleeding is not controlled with Combat Gauze, re-tighten the tourniquet until bleeding stops. • Restoring blood flow to the limb by transitioning to Combat Gauze at the 2-hour mark will minimize the chance of ischemic damage due to the tourniquet.	Read the text.

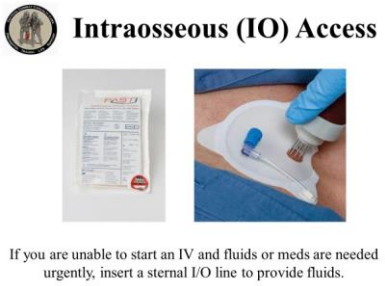
28.	**Tourniquet Conversion** 1. Expose the wound(s) 	**Tourniquet Conversion** 1. Expose the wound(s).	Converting a tourniquet to a hemostatic dressing is a simple stepwise procedure. The first step is to expose the wound by cutting away the overlying uniform. The following sequence of slides shows the conversion of a tourniquet placed "high-and tight" during Care Under Fire, but the procedure is the same for conversion of a tourniquet placed anywhere.
29.	**Tourniquet Conversion** 2. Apply Combat Gauze and a pressure dressing. 	**Tourniquet Conversion** 2. Apply Combat Gauze and a pressure dressing.	Read the text.
30.	**Tourniquet Conversion** 3. Loosen "high-and-tight" tourniquet and move it down to just above the pressure dressing. (Leave it loose here just in case it's needed later.) 4. Monitor for re-bleeding. 	**Tourniquet Conversion** 3. Loosen "high-and-tight" tourniquet and move it down to just above the pressure dressing. (Leave it loose here just in case it's needed later.) **4.** Monitor for re-bleeding.	Read the text.

31.	**Tourniquets: Points to Remember** • If the transition to Combat Gauze at 2 hours failed, try again at 6 hours using the steps outlined in the previous slides. • Do not release the tourniquet after 6 hours of application unless close monitoring and lab support are available to evaluate for metabolic complications of prolonged tourniquet use.	**Tourniquets: Points to Remember** • If the transition to Combat Gauze at 2 hours failed, try again at 6 hours using the steps outlined in the previous slides. • Do not release the tourniquet after 6 hours of application unless close monitoring and lab support are available to evaluate for metabolic complications of prolonged tourniquet use.	Release of a tourniquet that has been in place for some time typically results in acidosis, hyperkalemia, and rhabdomyolysis. These conditions will require monitoring and treatment in a medical treatment facility.
32.	**Tourniquets: Points to Remember** ***Do not convert the tourniquet if:*** – The casualty is in shock. – You cannot closely monitor the wound for re-bleeding. – The extremity distal to the tourniquet has been traumatically amputated. – The tourniquet has been on for more than 6 hours. – The casualty will arrive at a medical treatment facility within 2 hours after time of application. – Tactical or medical considerations make transition to other hemorrhage control methods inadvisable.	**Tourniquets: Points to Remember** ***Do not convert the tourniquet if:*** – The casualty is in shock. – You cannot closely monitor the wound for re-bleeding. – The extremity distal to the tourniquet has been traumatically amputated. – The tourniquet has been on for more than 6 hours. – The casualty will arrive at a medical treatment facility within 2 hours after time of application. – Tactical or medical considerations make transition to other hemorrhage control methods inadvisable.	Pay very close attention to these rules about tourniquet removal.
33.	**Tourniquets: Points to Remember** • Only medics, physician assistants, or physicians should re-position or convert tourniquets. 	**Tourniquets: Points to Remember** • Only medics, physician assistants, or physicians should re-position or convert tourniquets.	Read the text.

34.	**Tactical Field Care Guidelines** 6. Circulation a. Bleeding (continued) • Expose and clearly mark all tourniquets with the time of tourniquet application. Note tourniquets applied and time of application; time of re-application; time of conversion; and time of removal on the TCCC Casualty Card. Use a permanent marker to mark on the tourniquet and the casualty card.	**Tactical Field Care Guidelines** 6. Circulation a. Bleeding (continued) • Expose and clearly mark all tourniquets with the time of tourniquet application. Note tourniquets applied and time of application; time of re-application; time of conversion; and time of removal on the TCCC Casualty Card. Use a permanent marker to mark on the tourniquet and the casualty card.	Read the guideline. Documentation of all actions taken with regard to tourniquets is important.
35.			
36.	**Tactical Field Care Guidelines** 6. Circulation (continued) b. IV access • Intravenous (IV) or intraosseous (IO) access is indicated if the casualty is in hemorrhagic shock or at significant risk of shock (and may therefore need fluid resuscitation), or if the casualty needs medications, but cannot take them by mouth. - An 18-gauge IV or saline lock is preferred. - If vascular access is needed but not quickly obtainable via the IV route, use the IO route.	**Tactical Field Care Guidelines** 6. Circulation (continued) b. IV access • Intravenous (IV) or intraosseous (IO) access is indicated if the casualty is in hemorrhagic shock or at significant risk of shock (and may therefore need fluid resuscitation), or if the casualty needs medications, but cannot take them by mouth. - An 18-gauge IV or saline lock is preferred. - If vascular access is needed but not quickly obtainable via the IV route, use the IO route.	Read the guideline.

37.		**IV Access – Key Point** • **NOT ALL CASUALTIES NEED IVs!** – IV fluids not required for minor wounds – IV fluids and supplies are limited – save them for the casualties who really need them – IVs take time – IVs distract you from other care required. – IVs may disrupt tactical flow – waiting 10 minutes to start an IV on a casualty who doesn't need it may endanger your unit unnecessarily.	DO NOT start IVs on casualties who are unlikely to need fluid resuscitation for shock or IV medications. The alleged need to start two large-bore IVs on every casualty is a medical "urban myth." That concept is outdated on the modern battlefield. Combat leaders need to know this fact, too.
38.		**IV Access** **Indications for IV access** • Fluid resuscitation for hemorrhagic shock or significant risk of shock – e.g., a GSW to the torso. • The casualty needs medications, but cannot take them by mouth: – Unable to swallow – Vomiting – Shock – Decreased state of consciousness	Here are the casualties who really need IVs. Casualties with a gunshot wound to the torso may not be in shock at first, BUT they may continue to bleed internally and go into shock later.

39.	 **IV Access** A single 18ga catheter is recommended for access: • Easier to start than larger catheters • Minimizes supplies that must be carried • All fluids carried on the battlefield can be given rapidly through an 18-gauge catheter. • Two larger gauge IVs will be started later in hospitals if needed.	**IV Access** A single 18ga catheter is recommended for access: • Easier to start than larger catheters • Minimizes supplies that must be carried • All fluids carried on the battlefield can be given rapidly through an 18-gauge catheter. • Two larger gauge IVs will be started later in hospitals if needed.	You do not need a 14-gauge IV in the field – they are harder to start.
40.	 **IV Access – Key Points** • Don't insert an IV distal to a significant wound! • A saline lock is recommended instead of an IV line unless fluids are needed immediately. – It's much easier to move a casualty without an IV line and bag attached. – There's less chance of traumatic disinsertion. – Provides rapid subsequent access if needed. – Conserves IV fluids. • Flush the saline lock with 5cc NS immediately and then every 1-2 hours to keep it open.	**IV Access – Key Points** Don't insert an IV distal to a significant wound! • A saline lock is recommended instead of an IV line unless fluids are needed immediately. – It's much easier to move a casualty without the IV line and bag attached. – There's less chance of traumatic disinsertion. – Provides rapid subsequent access if needed. – Conserves IV fluids. • Flush saline lock with 5cc NS immediately and then every 1-2 hours to keep it open.	Don't hang fluids unless the casualty really needs them.

41.		**Rugged Field IV**	Click on the photo to play the video. Here's is an excellent way to ruggedize an IV developed by the Army Rangers. Don't forget to flush the saline lock! It will clot off if you don't. It must be flushed immediately (within 2-3 minutes), and then flushed every 2 hours if IV fluid is not running. The 2nd catheter for the IV line is inserted right through the Tegaderm. The Velcro strap helps prevent traumatic disinsertion of IV line. Even if the IV line is pulled out, the saline lock will remain in place. This ruggedized IV technique has worked very well on the battlefield. .
42.		**Questions?**	
43.		**Intraosseous (IO) Access** If unable to start an IV and fluids or meds are needed urgently, insert a sternal I/O line to provide fluids.	The current IO device in most military medical sets is the Pyng FAST1®. The FAST1® was selected due to concerns about multiple extremity trauma precluding adequate site selection for extremity IV devices. Body armor use also generally protects the sternal insertion site. Hand out the FAST1® device. You'll go through the contents on the next slide.

44.	**FAST1® IO Device** 	**FAST1® IO Device** 	Go through the various components of the FAST1® as shown.

45.	**FAST1® Warnings**
	FAST1® NOT RECOMMENDED IF:
	• Patient is of small stature:
	  • Weight of less than 50 kg (110 pounds)
	  • Less than 12 years old
	• Fractured manubrium/sternum – flail chest
	• Significant tissue damage at site – trauma, infection
	• Severe osteoporosis
	• Previous sternotomy and/or scar
	• **NOTE: FAST1® INFUSION TUBE SHOULD NOT BE LEFT IN PLACE FOR MORE THAN 24 HOURS**
		FAST1® Warnings
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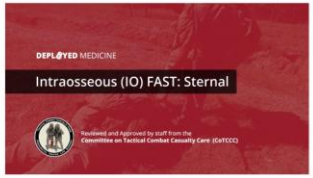
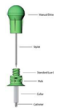
		• Previous sternotomy and/or scar
		• **NOTE: FAST1® INFUSION TUBE SHOULD NOT BE LEFT IN PLACE FOR MORE THAN 24 HOURS**
			A few things to be aware of about the FAST1®.

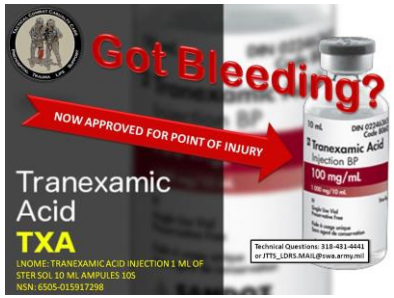
46.	**FAST1® Flow Rates** • 30-80 ml/min by gravity • 120 ml/min utilizing pressure infusion • 250 ml/min using syringe forced infusion	**FAST1® Flow Rates** • 30-80 ml/min by gravity • 120 ml/min utilizing pressure infusion • 250 ml/min using syringe forced infusion	How fast do fluids flow through the FAST1®? Note that IO space connects directly with the intravenous space. Use pressure to force in the Hextend fluid bolus, for instance, that we will discuss later.
47.	**FAST1® Insertion (1)**  1. Prepare site using aseptic technique: – Betadine – Alcohol	**FAST1® Insertion (1)** 1.Prepare site using aseptic technique: – Betadine – Alcohol	Show them where the suprasternal notch is on yourself. It is important to sterilize the site before inserting the IO device. Introduction of bacteria from dirty skin into the medullary cavity of the sternum can lead to infection inside the bone (osteomyelitis). This is a particularly undesirable complication because treatment may require removal of the sternum with resultant loss of the very important protection it provides for the heart.
48.	**FAST1® Insertion (2)** • Remove backing labeled #1 • Put index finger in sternal notch 	**FAST1® Insertion (2)** • Remove backing labeled #1 • Put index finger in sternal notch	The Target Patch has a two-piece peel-off backing.

49.	**FAST1® Insertion (3)**  • Place Target Patch notch under index finger in sternal notch • Press down firmly over top of Patch • Remove backing labeled #2, press Patch down firmly	**FAST1® Insertion (3)** • Place Target Patch notch under index finger in sternal notch • Press down firmly over top of Patch • Remove backing labeled #2, press Patch down firmly	Recheck position of notch and apply target patch.
50.	**FAST1® Insertion (4)**  • Place introducer needle cluster in target area • Assure firm grip • **Introducer device must be perpendicular to the surface of the manubrium!**	**FAST1® Insertion (4)** • Place introducer needle cluster in target area • Assure firm grip • **Introducer device must be perpendicular to the surface of the manubrium!**	The manubrium is the top part of the sternum – this is where infuser will go. Introducer MUST be perpendicular to the manubrium, or it won't work.
51.	**FAST1® Insertion (5)** • Align introducer perpendicular to the manubrium. • Insert using increasing pressure till device releases. (~60 pounds) • Maintain 90-degree alignment to the manubrium throughout. 	**FAST1® Insertion (5)** • Align introducer perpendicular to the manubrium. • Insert using increasing pressure till device releases. (~60 pounds) • Maintain 90-degree alignment to the manubrium throughout.	Slow, steady pressure….

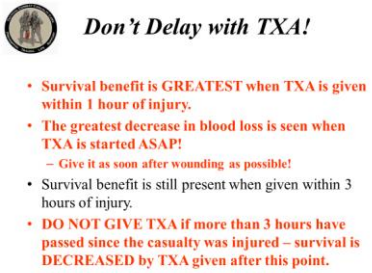
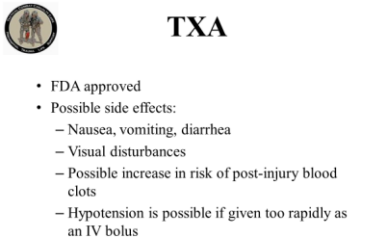
52.	**FAST1® Insertion (6)**  • Following device release, infusion tube separates from introducer • Remove introducer by pulling straight back • Cap introducer using post-use sharps plug and cap supplied	**FAST1® Insertion (6)** • Following device release, infusion tube separates from introducer • Remove introducer by pulling straight back • Cap introducer using post-use sharps plug and cap supplied	Careful with sharp introducer when done.
53.	**FAST1® Insertion (7)**  • Connect infusion tube to tube on the target patch • NOTE: Must flush bone plug with 5 cc of fluid to get flow. • Assure patency by using syringe to aspirate small bit of marrow.	**FAST1® Insertion (7)** • Connect infusion tube to tube on the target patch • NOTE: Must flush bone plug with 5 cc of fluid to get flow. • Assure patency by using syringe to aspirate small bit of marrow.	KEY POINT – MUST FLUSH BONE PLUG WITH 5cc of IV fluid run through the infuser. Use more if needed.
54.	**FAST1® Insertion (8)**  • Connect IV line to target patch tube • Open IV and assure good flow • Place dome to protect infusion site	**FAST1® Insertion (8)** • Connect IV line to target patch tube • Open IV and assure good flow • Place dome to protect infusion site	Run fluid through IV line before connecting to remove air from line.

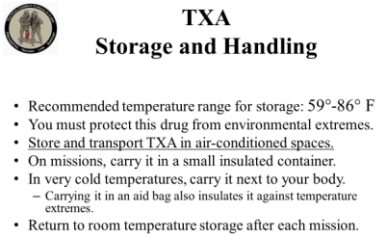
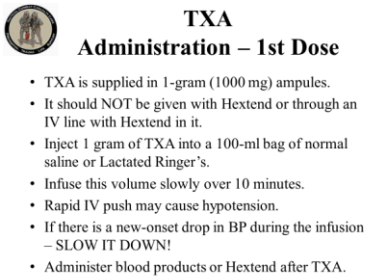
55.	**FAST1® Insertion (9)** Potential Problems: • Infiltration –Usually due to insertion not perpendicular to sternum • Inadequate flow or no flow –Infusion tube occluded with bone plug –Use additional saline flush to clear the bone plug	**FAST1® Insertion (9)** Potential Problems: • Infiltration – Usually due to insertion not perpendicular to sternum • Inadequate flow or no flow – Infusion tube occluded with bone plug – Use additional saline flush to clear the bone plug	What are some of the things that can go wrong when you are inserting the FAST1®?
56.	**FAST1® Insertion Video** 	**FAST1® Insertion Video**	Click on the photo to play the video.
57.	**EZ-IO®** • After Pyng FAST1 ®, Vidacare's EZ-IO ® is the next most commonly used IO device in combat. • Overall experience with these devices has been favorable. • Multiple EZ-IO devices are available. It is absolutely essential to use the right device for the chosen anatomical location. 	**EZ-IO®** • After Pyng FAST1 ®, Vidacare's EZ-IO ® is the next most commonly used IO device in combat. • Overall experience with these devices has been favorable. • Multiple EZ-IO devices are available. It is absolutely essential to use the right device for the chosen anatomical location.	The device made for sternal insertion has a green plastic hub and 7.5mm-long needle. The EZ-IO device made for long bone insertion (humerus, tibia) has a blue hub and its needle is 25mm long. There are also pediatric and large patient devices. The packaging for these devices is markedly different. The long bone device package is marked "NOT FOR STERNAL USE." Intraosseous needles designed for long bone insertion have the potential to perforate the sternum, a thinner and less dense bone. In this situation, IV fluids may be introduced into the mediastinum. MAKE SURE YOU USE THE CORRECT DEVICE FOR THE SITE CHOSEN!

58.	**IO Training Safety** • DO NOT PRACTICE ON ONE ANOTHER! – In the past, a number of student volunteers have been taken to the OR to have sternal needles removed. – There is a risk of sternal osteomyelitis. – Train on sternal intraosseous simulators, not classmates!	**IO Training Safety** • DO NOT PRACTICE ON ONE ANOTHER! – In the past, a number of student volunteers have been taken to the OR to have sternal needles removed. – There is a risk of sternal osteomyelitis. – Train on sternal intraosseous simulators, not classmates!	Read the text.
59.		**IV/IO Practical**	IV Skill Sheet IO Skill Sheet
60.	**Tactical Field Care Guidelines** 6. Circulation (continued) c. Tranexamic acid (TXA) • If a casualty is anticipated to need significant blood transfusion (for example: presents with hemorrhagic shock, one or more major amputations, penetrating torso trauma, or evidence of severe bleeding): - Administer 1 gm of tranexamic acid in 100 ml Normal Saline or Lactated Ringer's as soon as possible but NOT later than 3 hours after injury. When given, TXA should be administered over 10 minutes by IV infusion. - Begin the second infusion of 1 gm TXA after initial fluid resuscitation has been completed.	**Tactical Field Care Guidelines** 6. Circulation (continued) c. Tranexamic acid (TXA) • If a casualty is anticipated to need significant blood transfusion (for example: presents with hemorrhagic shock, one or more major amputations, penetrating torso trauma, or evidence of severe bleeding): - Administer 1 gm of tranexamic acid in 100 ml Normal Saline or Lactated Ringer's as soon as possible but NOT later than 3 hours after injury. When given, TXA should be administered over 10 minutes by IV infusion. - Begin the second infusion of 1 gm TXA after initial fluid resuscitation has been completed.	Read the guideline.

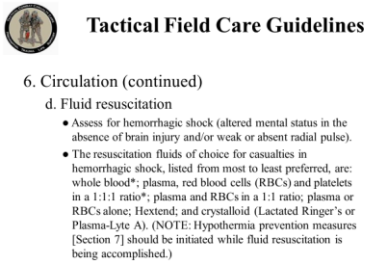
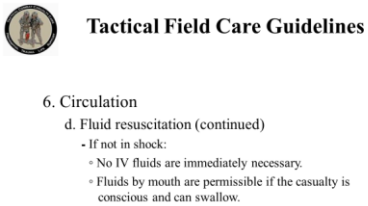
61.	**Stop All Bleeding Now!** • **TXA helps with hemorrhage control.** – Tourniquets and hemostatic dressings help by stopping hemorrhage from external sites. – TXA helps to reduce blood loss from internal hemorrhage sites that can't be addressed by tourniquets and hemostatic dressings.	**Stop All Bleeding Now!** • **TXA helps with hemorrhage control.** – Tourniquets and hemostatic dressings help by stopping hemorrhage from external sites. – TXA helps to reduce blood loss from internal hemorrhage sites that can't be addressed by tourniquets and hemostatic dressings.	Read the text.
62.		**TXA is now approved for use at the point of injury.**	TXA is now approved for use at the point of injury in combat trauma.
63.	**ASDHA Letter 9 October 2013** **"Traumatic hemorrhage remains the leading cause of death on the battlefield….. Joint Theater Trauma experts recommended adding TXA as an adjunct to severe hemorrhage management. Presently, TXA is not FDA-approved for this indication, and as such is considered an off-label use subject to a provider's clinical judgment in a practitioner-patient relationship."**	**ASDHA Letter 9 October 2013** "Traumatic hemorrhage remains the leading cause of death on the battlefield….. Joint Theater Trauma experts recommended adding TXA as an adjunct to severe hemorrhage management. Presently, TXA is not FDA-approved for this indication, and as such is considered an off-label use subject to a provider's clinical judgment in a practitioner-patient relationship."	Read the text. ASDHA = Assistant Secretary of Defense for Health Affairs – the Senior Health Care Official in the DoD.

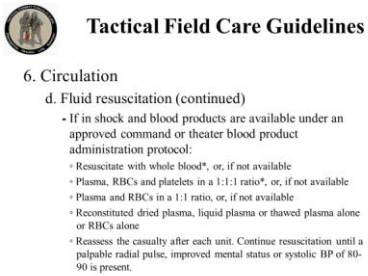
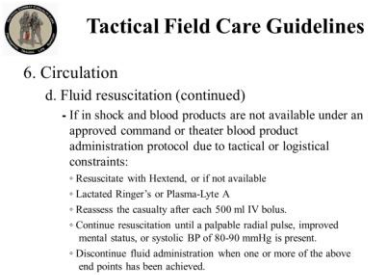
64.	**ASDHA Letter** **9 October 2013** **"The Military Services and the Combatant Commands may authorize such use of TXA in the combat environment, consistent with current clinical practice guidelines and appropriate clinical oversight. The Services will accumulate outcome data and monitor adverse events. The Services will establish Service-specific policies regarding TXA administration, develop training and education plans, and assume all costs for implementation. TXA may be obtained through normal class VIII channels."**	**ASDHA Letter 9 October 2013** "The Military Services and the Combatant Commands may authorize such use of TXA in the combat environment, consistent with current clinical practice guidelines and appropriate clinical oversight. The Services will accumulate outcome data and monitor adverse events. The Services will establish Service-specific policies regarding TXA administration, develop training and education plans, and assume all costs for implementation. TXA may be obtained through normal class VIII channels."	Read the text.
65.	**TXA** • **Non-compressible hemorrhage is the leading cause of preventable death on the battlefield** • **Tourniquets and Combat Gauze do not work for *internal* bleeding** • **TXA does!**	**TXA** • Non-compressible hemorrhage is the leading cause of preventable death on the battlefield • Tourniquets and Combat Gauze do not work for *internal* bleeding • TXA does!	TXA is the medic's best tool for stopping internal bleeding!
66.	**TXA** • TXA does not promote new clot formation. • It prevents forming clots from being broken down by the body. • It helps stop internal bleeding. • It helps prevent death from hemorrhage. • **Two major studies have shown a survival benefit from TXA**, especially in casualties that require a massive transfusion of blood products. 66	**TXA** • TXA does not promote new clot formation. • It prevents forming clots from being broken down by the body. • It helps stop internal bleeding. • It helps prevent death from hemorrhage. • Two major studies have shown a survival benefit from TXA, especially in casualties that require a massive transfusion of blood products.	CRASH-2: a very large (20,000 plus) patients in civilian trauma centers. MATTERS (Military Application of Tranexamic Acid in Traumatic Emergency and Resuscitative Surgery) – 896 casualties treated at the Bastion hospital in Afghanistan. Both studies showed a significant decrease in mortality with TXA use.

67.		***Don't Delay with TXA!*** • Survival benefit is GREATEST when TXA is given within 1 hour of injury. • The greatest decrease in blood loss is seen when TXA is started ASAP! – Give it as soon after wounding as possible! • Survival benefit is still present when given within 3 hours of injury. • DO NOT GIVE TXA if more than 3 hours have passed since the casualty was injured – survival is DECREASED by TXA given after this point.	It is just common sense if you are trying to stop bleeding to do that AS SOON AS POSSIBLE. We do not have a good reason why TXA should cause casualties to do worse after 3 hours, but that's what the data indicate. REINFORCE THAT BLEEDING SHOULD BE STOPPED ASAP – SO GIVE TXA WTHOUT DELAY!
68.		**TXA** • FDA approved • Possible side effects: – Nausea, vomiting, diarrhea – Visual disturbances – Possible increase in risk of post-injury blood clots – Hypotension is possible if given to rapidly as an IV bolus	Do not be deterred by the possible side effects. The important thing is to stop the bleeding and save the life of the casualty.

69.		**TXA Storage and Handling** • Recommended temperature range for storage: 59°-86° F • You must protect this drug from environmental extremes. • Store and transport in air-conditioned spaces. • On missions, carry it in a small insulated container. • In very cold temperatures, carry it next to your body. – Carrying it in an aid bag also insulates it against temperature extremes. • Return to room temperature storage after each mission.	Review each point.
70.		**TXA Administration – 1st Dose** • TXA is supplied in 1-gram (1000 mg) ampules. • It should NOT be given with Hextend or through an IV line with Hextend in it. • Inject 1 gram of TXA into a 100-ml bag of normal saline or Lactated Ringer's. • Infuse this volume slowly over 10 minutes. • Rapid IV push may cause hypotension. • If there is a new-onset drop in BP during the infusion – SLOW IT DOWN! • Administer blood products or Hextend after TXA.	Review each point.

71.	**TXA Administration – 2nd Dose** • A second dose of TXA is typically given after the casualty arrives at a Role II/Role III medical facility. • It may be given in the field if evacuation is delayed and fluid resuscitation is completed before arrival at the medical facility. • If you give the second dose during TFC or TACEVAC, give it just as directed for the first dose.	**TXA Administration – 2nd Dose** • A second dose of TXA is typically given after the casualty arrives at a Role II/Role III medical facility • It may be given in field if evacuation is delayed and fluid resuscitation is completed before arrival at the medical facility. • If you give the second dose during TFC or TACEVAC, give it just as directed for the first dose	Review each point.
72.	**Questions?** 	**Questions?**	

73.		**Tactical Field Care Guidelines** 6. Circulation (continued) d. Fluid resuscitation ● Assess for hemorrhagic shock (altered mental status in the absence of brain injury and/or weak or absent radial pulse). ● The resuscitation fluids of choice for casualties in hemorrhagic shock, listed from most to least preferred, are: whole blood*; plasma, red blood cells (RBCs) and platelets in a 1:1:1 ratio*; plasma and RBCs in a 1:1 ratio; plasma or RBCs alone; Hextend; and crystalloid (Lactated Ringer's or Plasma-Lyte A). (NOTE: Hypothermia prevention measures [Section 7] should be initiated while fluid resuscitation is being accomplished.)	Read the guideline. (NOTE: The footnote attached to these asterisks appears in slide #84.)
74.		**Tactical Field Care Guidelines** 6. Circulation d. Fluid resuscitation (continued) - If not in shock: ◦ No IV fluids are immediately necessary. ◦ Fluids by mouth are permissible if the casualty is conscious and can swallow.	Read the guideline.

75.		**Tactical Field Care Guidelines** 6. Circulation d. Fluid resuscitation (continued) **-** If in shock and blood products are available under an approved command or theater blood product administration protocol: ◦ Resuscitate with whole blood*, or, if not available ◦ Plasma, RBCs and platelets in a 1:1:1 ratio*, or, if not available ◦ Plasma and RBCs in a 1:1 ratio, or, if not available ◦ Reconstituted dried plasma, liquid plasma or thawed plasma alone or RBCs alone ◦ Reassess the casualty after each unit. Continue resuscitation until a palpable radial pulse, improved mental status or systolic BP of 80-90 is present.	Read the guideline.
76.		**Tactical Field Care Guidelines** 6. Circulation d. Fluid resuscitation (continued) **-** If in shock and blood products are not available under an approved command or theater blood product administration protocol due to tactical or logistical constraints: ◦ Resuscitate with Hextend, or if not available ◦ Lactated Ringer's or Plasma-Lyte A ◦ Reassess the casualty after each 500 ml IV bolus. ◦ Continue resuscitation until a palpable radial pulse, improved mental status, or systolic BP of 80-90 mmHg is present. ◦ Discontinue fluid administration when one or more of the above end points has been achieved.	Read the guideline.

77.	 **Tactical Field Care Guidelines** 6. Circulation d. Fluid resuscitation (continued) • If a casualty with an altered mental status due to suspected TBI has a weak or absent radial pulse, resuscitate as necessary to restore and maintain a normal radial pulse. If BP monitoring is available, maintain a target systolic BP of at least 90 mmHg.	**Tactical Field Care Guidelines** 6. Circulation d. Fluid resuscitation (continued) ● If a casualty with an altered mental status due to suspected TBI has a weak or absent radial pulse, resuscitate as necessary to restore and maintain a normal radial pulse. If BP monitoring is available, maintain a target systolic BP of at least 90 mmHg.	Read the guideline.
78.	 **Tactical Field Care Guidelines** 6. Circulation d. Fluid resuscitation (continued) • Reassess the casualty frequently to check for recurrence of shock. If shock recurs, re-check all external hemorrhage control measures to ensure that they are still effective and repeat the fluid resuscitation as outlined above.	**Tactical Field Care Guidelines** 6. Circulation d. Fluid resuscitation (continued) ● Reassess the casualty frequently to check for recurrence of shock. If shock recurs, re-check all external hemorrhage control measures to ensure that they are still effective and repeat the fluid resuscitation as outlined above.	Read the guideline.
79.	 **Tactical Field Care Guidelines** 6. Circulation d. Fluid resuscitation (footnote) * Currently, neither whole blood nor apheresis platelets collected in theater are FDA-compliant because of the way they are collected. Consequently, whole blood and 1:1:1 resuscitation using apheresis platelets should be used only if all of the FDA-compliant blood products needed to support 1:1:1 resuscitation are not available, or if 1:1:1 resuscitation is not producing the desired clinical effect.	**Tactical Field Care Guidelines** 6. Circulation d. Fluid resuscitation (footnote) * Currently, neither whole blood nor apheresis platelets collected in theater are FDA-compliant because of the way they are collected. Consequently, whole blood and 1:1:1 resuscitation using apheresis platelets should be used only if all of the FDA-compliant blood products needed to support 1:1:1 resuscitation are not available, or if 1:1:1 resuscitation is not producing the desired clinical effect.	Read the guideline.

80.	**Blood Loss and Shock** What is "Shock?" • Inadequate blood flow to the body tissues • Leads to inadequate oxygen delivery and cellular dysfunction • May cause death • Shock can have many causes, but on the battlefield, it is typically caused by severe blood loss	**Blood Loss and Shock** What is "Shock?" • Shock is caused by insufficient blood flow to the body tissues. • This results in inadequate oxygen delivery and cellular dysfunction. • This state, if not corrected, will likely lead to death. • Shock may have many causes, but on the battlefield, it is typically caused by severe blood loss. • Hemorrhagic shock is the leading cause of preventable death on the battlefield.	A lot of people talk about "shock" without really understanding what it is. Let's clarify….
81.	**Blood Loss and Shock** Question: How does your body react to blood loss? Answer: It depends – on how much blood you lose.	**Blood Loss and Shock** Question: How does your body react to blood loss? Answer: It depends – on how much blood you lose.	Let's talk about blood loss and what happens when that occurs.
82.	**Normal Adult Blood Volume** **5 Liters** 	**Normal Adult Blood Volume** **5 Liters**	For demonstration – this slide shows 5 liters of simulated blood. Shown in five 1-liter bottles to help with the demo.

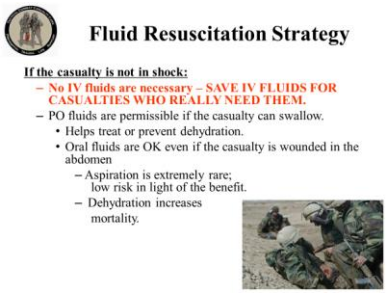
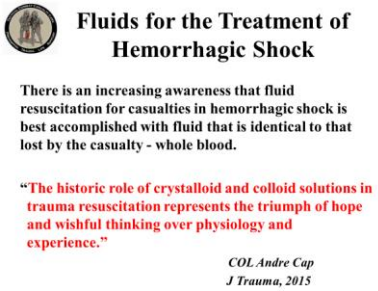
83.	**500 ml Blood Loss** **4.5 Liters Blood Volume** 	**500 ml Blood Loss** **4.5 Liters Blood Volume**	So – here we have lost the first 500 ml of blood. This is what you lose when you donate a "pint" or a unit of blood at the blood bank.
84.	**500 ml Blood Loss** • Mental State: Alert • Radial Pulse: Full • Heart Rate: Normal or slightly increased • Systolic Blood pressure: Normal • Respiratory Rate: Normal • Is the casualty going to die from this? No	**500 ml Blood Loss** • Mental State: Alert • Radial Pulse: Full • Heart Rate: Normal or slightly increased • Systolic Blood pressure: Normal • Respiratory Rate: Normal • Is the casualty going to die from this? **No**	No danger from this level of blood loss. Keep in mind that factors such as exertion, fear, and pain may affect heart rate and breathing rate, and these factors will affect anyone engaged in combat, especially someone who has been wounded. You have to consider these things when treating casualties on the battlefield. For this demonstration, though, we are ignoring these factors, so the physiologic changes you see here are due solely to blood loss.
85.	**1000 ml Blood Loss** **4.0 Liters Blood Volume** 	**1000 ml Blood Loss** **4.0 Liters Blood Volume**	So now we lose another 500 ml of blood. How are we doing now?

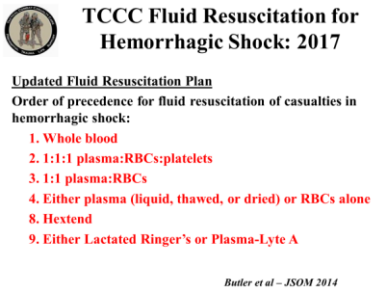
86.	**1000 ml Blood Loss** • Mental State: Alert • Radial Pulse: Full • Heart Rate: 100 + • Systolic Blood pressure: Normal lying down • Respiratory Rate: May be normal • Is the casualty going to die from this? No	**1000 ml Blood Loss** • Mental State: Alert • Radial Pulse: Full • Heart Rate: 100 + • Systolic Blood pressure: Normal lying down • Respiratory Rate: May be normal • Is the casualty going to die from this? **No**	Still basically OK. Heart rate may be up a little.
87.	**1500 ml Blood Loss** 	**1500 ml Blood Loss**	Lose another 500 ml of blood. How are we doing now?

88.	**1500 ml Blood Loss** • Mental State: Alert but anxious • Radial Pulse: May be weak • Heart Rate: 100+ • Systolic Blood pressure: May be decreased • Respiratory Rate: 30 • Is the casualty going to die from this? Probably not	**1500 ml Blood Loss** • Mental State: Alert but anxious • Radial Pulse: May be weak • Heart Rate: 100+ • Systolic Blood pressure: May be decreased • Respiratory Rate: 30 • Is the casualty going to die from this? Probably not	At this point, the casualty is showing some symptoms from his blood loss. He would probably not die from this.
89.	**2000 ml Blood Loss** 	**2000 ml Blood Loss** **3.0 Liters Blood Volume**	Lose another 500 ml of blood. On the battlefield, this would represent ongoing uncontrolled hemorrhage. How is the casualty doing now?

90.	**2000 ml Blood Loss** • Mental State: Confused/lethargic • Radial Pulse: Weak • Heart Rate: 120 + • Systolic Blood pressure: Decreased • Respiratory Rate: >35 • Is the casualty going to die from this? Maybe	**2000 ml Blood Loss** • Mental State: Confused/lethargic • Radial Pulse: Weak • Heart Rate: 120 + • Systolic Blood pressure: Decreased • Respiratory Rate: >35 • Is the casualty going to die from this? **Maybe**	Not so good. At this point, it is quite possible that he or she could die from the blood loss. This is "hemorrhagic" or "hypovolemic" (meaning "not enough blood volume") shock.
91.	**2500 ml Blood Loss** 	**2500 ml Blood Loss** **2.5 Liters Blood Volume**	So let's take away another 500 m l of blood from our simulated casualty. Casualty is now in big trouble.
92.	**2500 ml Blood Loss** • Mental State: Unconscious • Radial Pulse: Absent • Heart Rate: 140+ • Systolic Blood pressure: Markedly decreased • Respiratory Rate: Over 35 • Is he going to die from this? Probably	**2500 ml Blood Loss** • Mental State: Unconscious • Radial Pulse: Absent • Heart Rate: 140+ • Systolic Blood pressure: Markedly decreased • Respiratory Rate: Over 35 • Is he going to die from this? **Probably**	At this point – the casualty has lost HALF of the blood in his/her body. This level of hemorrhage is likely to be fatal. YOUR JOB IS NOT TO LET THEM LOSE THIS MUCH BLOOD! Treating the blood loss after the fact is not as good an option.

93.	**Recognition of Shock on the Battlefield** • Combat medical personnel need a fast, reliable, low-tech way to recognize shock on the battlefield. • **The best TACTICAL indicators of shock are:** – **Decreased state of consciousness (if casualty has not suffered TBI)** **and/or** – **Abnormal character of the radial pulse (weak or absent)**	**Recognition of Shock on the Battlefield** • Combat medical personnel need a fast, reliable, low-tech way to recognize shock on the battlefield. • **The best TACTICAL indicators of shock are:** –**Decreased state of consciousness (if casualty has not suffered TBI) and/or** –**Abnormal character of the radial pulse (weak or absent)**	These are the signs you can reliably identify on the battlefield or in a noisy CASEVAC environment. Note that identification of these signs requires neither stethoscope nor sphygmomanometer. Medications can also cause an altered state of consciousness (e.g. - if you give too much narcotics).
94.	**Fluid Resuscitation Strategy** • If signs of shock are present, ***CONTROL THE BLEEDING FIRST***, if at all possible. • Hemorrhage control takes precedence over infusion of fluids.	**Fluid Resuscitation Strategy** • If signs of shock are present, *CONTROL THE BLEEDING FIRST*, if at all possible. • Hemorrhage control takes precedence over infusion of fluids.	It is better to prevent shock with hemorrhage control than to treat it. Even if shock is already present, though, the first step in treating it is to control the bleeding.
95.	**What Does Effective Fluid Resuscitation Accomplish?** There are four objectives of prehospital fluid resuscitation for casualties in hemorrhagic shock: 1) Enhance the body's ability to form clots at sites of active bleeding 2) Minimize adverse effects (edema and dilution of clotting factors) resulting from iatrogenic resuscitation injury 3) Restore adequate intravascular volume and organ perfusion prior to definitive surgical control of hemorrhage 4) Optimize oxygen carrying capacity	**What Does Effective Fluid Resuscitation Accomplish?** There are four objectives of prehospital fluid resuscitation for casualties in hemorrhagic shock: 1) Enhance the body's ability to form clots at sites of active bleeding 2) Minimize adverse effects (edema and dilution of clotting factors) resulting from iatrogenic resuscitation injury 3) Restore adequate intravascular volume and organ perfusion prior to definitive surgical control of hemorrhage 4) Optimize oxygen carrying capacity	Read the text.

96.		**Fluid Resuscitation Strategy** **<u>If the casualty is not in shock:</u>** **– No IV fluids are necessary – SAVE IV FLUIDS FOR CASUALTIES WHO REALLY NEED THEM.** – PO fluids are permissible if the casualty can swallow. • Helps treat or prevent dehydration. • Oral fluids are OK, even if the casualty is wounded in the abdomen. – Aspiration is extremely rare; low risk in light of benefit – Dehydration increases mortality	Don't ever use your IV fluids unless the casualty needs them. The next person to get shot may die if he or she doesn't get fluids. CONSERVE precious medical supplies on the battlefield.
97.		**Fluids for the Treatment of Hemorrhagic Shock** There is an increasing awareness that fluid resuscitation for casualties in hemorrhagic shock is best accomplished with fluid that is identical to that lost by the casualty - whole blood. "The historic role of crystalloid and colloid solutions in trauma resuscitation represents the triumph of hope and wishful thinking over physiology and experience." ***COL Andre Cap*** ***J Trauma, 2015***	Read the text. COL Andre Cap was Chief of Coagulation and Blood Research at the U.S. Army Institute of Surgical Research when he published this assessment.

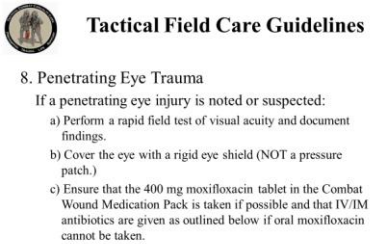
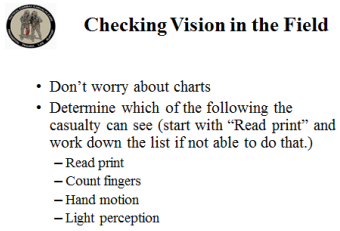
98.		**TCCC Fluid Resuscitation for Hemorrhagic Shock: 2017** <u>Updated Fluid Resuscitation Plan</u> Order of precedence for fluid resuscitation of casualties in hemorrhagic shock: 1. Whole blood 2. 1:1:1 plasma:RBCs:platelets 3. 1:1 plasma:RBCs 4. Either plasma (liquid, thawed, or dried) or RBCs alone 8. Hextend 9. Either Lactated Ringer's or Plasma-Lyte A	When resuscitating a casualty in hemorrhagic shock, whole blood is best, followed by blood products, Hextend, and then colloids.
99.		**Tactical Damage Control Resuscitation** Fisher et al 2015 • FWB is the best prehospital resuscitation fluid. • 75th Ranger Regiment program: – Type O, Low-Titer Anti-A, Anti-B antibodies – Donors pre-screened for type, titers, and infectious diseases – The donor pool is used to transfuse casualties in shock.	The 75th Rangers have provided whole blood transfusion far forward by identifying type O, low-titer donors ahead of time, and collecting blood from then when needed on the battlefield.

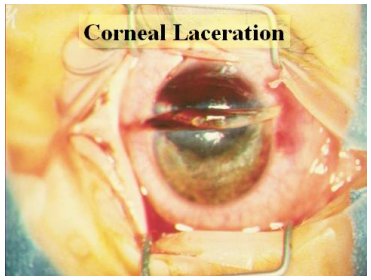
100.	**Type O, Low-Titer Whole Blood with a Prolonged Shelf Life** • Identify Type O, Low-titer donors. • Collect the blood in CONUS or closer to theater. • Screen for pathogens (FDA compliant). • New technology for cryopreservation enables prolonged storage without loss of efficacy. • Blood can be moved far-forward in a new long-duration blood cooler.  	**Type O, Low-Titer Whole Blood with a Prolonged Shelf Life** • Identify Type O, Low-titer donors. • Collect the blood in CONUS or closer to theater. • Screen for pathogens (FDA compliant). • New technology for cryopreservation enables prolonged storage without loss of efficacy. • Blood can be moved far-forward in a new long-duration blood cooler.	This is the latest development in providing FDA-compliant whole blood far forward in theater. Donated blood is preserved in electrically powered blood coolers and moved far forward in a new non-powered, 50-hour container.
101.	**Fluid Resuscitation from Hemorrhagic Shock** **Why not use these fluids?** • Albumin – not recommended for casualties with TBI • Voluven – More expensive than Hextend – Also reported to cause kidney injury • Normal saline – causes a hyperchloremic acidosis • Hypertonic saline – Volume expansion is larger than NS, but short-lived – Found to be not superior to NS in a large study – Most-studied concentration (7.5%) is not FDA-approved	**Fluid Resuscitation from Hemorrhagic Shock** **Why not use these fluids?** • Albumin – not recommended for casualties with TBI • Voluven – More expensive than Hextend – Also reported to cause kidney injury • Normal saline – causes a hyperchloremic acidosis • Hypertonic saline – Volume expansion is larger than NS, but short-lived – Found to be not superior to NS in a large study – Most-studied concentration (7.5%) is not FDA-approved	Albumin is a colloid derived from human plasma that has been used to resuscitate individuals in hemorrhagic and other types of shock, but patients resuscitated with albumin have a higher mortality rate than those resuscitated with saline. Voluven is a synthetic colloid.
102.	**Hypotensive Resuscitation** **Goals of Fluid Resuscitation Therapy** • Improved state of consciousness (if no TBI) • Palpable radial pulse corresponds roughly to systolic blood pressure of 80 mm Hg • Avoid over-resuscitation of shock from torso wounds. • **Too much fluid volume may make internal hemorrhage worse by "Popping the Clot."**	**Hypotensive Resuscitation** **Goals of Fluid Resuscitation Therapy** • Improved state of consciousness (if no TBI) • Palpable radial pulse corresponds roughly to systolic blood pressure of 80 mm Hg • Avoid over-resuscitation of shock from torso wounds. • Too much fluid volume may make internal hemorrhage worse by "Popping the Clot."	DO NOT try to restore a normal blood pressure. As you infuse fluids, the blood pressure goes up. If it goes up too much, this may interfere with your body's attempt to clot off an internal bleeding site both by diluting clotting factors and by increasing the pressure to the point where the clot is disrupted by the hydrostatic force exerted by the IV fluid. Bickell study in New England Journal of Medicine 1994: Patients with shock from uncontrolled hemorrhage did WORSE with aggressive prehospital fluids

103.	**TCCC Fluid Resuscitation for Hemorrhagic Shock: 2017** How much fluid should you give? • Reassess the casualty after each unit of blood product or 500 ml of fluid. • Continue resuscitation until a palpable radial pulse, improved mental status, or systolic BP of 80-90 is present. • Do not over-resuscitate. Too much fluid or blood may raise blood pressure higher than needed and increase any ongoing non-compressible hemorrhage. *Butler et al – JSOM 2014*	**TCCC Fluid Resuscitation for Hemorrhagic Shock: 2017** • **How much fluid should you give?** • Reassess the casualty after each unit of blood product or 500 ml of fluid. • Continue resuscitation until a palpable radial pulse, improved mental status, or systolic BP of 80-90 is present. • Do not over-resuscitate. Too much fluid or blood may raise blood pressure higher than needed and increase any ongoing non-compressible hemorrhage.	Read the text.
104.	 **Questions?**	**Questions?**	
105.	**Tactical Field Care Guidelines** 7. Hypothermia Prevention a. Minimize casualty's exposure to the elements. Keep protective gear on or with the casualty if feasible. b. Replace wet clothing with dry if possible. Get the casualty onto an insulated surface as soon as possible. c. Apply the Ready-Heat Blanket from the Hypothermia Prevention and Management Kit (HPMK) to the casualty's torso (not directly on the skin) and cover the casualty with the Heat-Reflective Shell (HRS).	**Tactical Field Care Guidelines** 7. Hypothermia Prevention a. Minimize casualty's exposure to the elements. Keep protective gear on or with the casualty if feasible. b. Replace wet clothing with dry if possible. Get the casualty onto an insulated surface as soon as possible. c. Apply the Ready-Heat Blanket from the Hypothermia Prevention and Management Kit (HPMK) to the casualty's torso (not directly on the skin) and cover the casualty with the Heat-Reflective Shell (HRS).	Read the guideline.

106.	**Tactical Field Care Guidelines** 7. Hypothermia Prevention d. If an HPMK is not available, the previously recommended combination of the Blizzard Survival Blanket and the Ready Heat blanket may also be used. e. If the items mentioned above are not available, use dry blankets, poncho liners, sleeping bags, or anything that will retain heat and keep the casualty dry. f. Warm fluids are preferred if IV fluids are required.	**Tactical Field Care Guidelines** 7. Hypothermia Prevention d. If an HRS is not available, the previously recommended combination of the Blizzard Survival Blanket and the Ready Heat blanket may also be used. e. If the items mentioned above are not available, use dry blankets, poncho liners, sleeping bags, or anything that will retain heat and keep the casualty dry. f. Warm fluids are preferred if IV fluids are required.	Read the guideline.
107.	**Hypothermia Prevention** • **Key Point: Even a small decrease in body temperature can interfere with blood clotting and increase the risk of bleeding to death.** • Casualties in shock are unable to generate body heat effectively. • Wet clothes and helicopter evacuations increase body heat loss. • Remove wet clothes and cover casualty with hypothermia prevention gear. • **Hypothermia is much easier to prevent than to treat!**	**Hypothermia Prevention** • **Key Point: Even a small decrease in body temperature can interfere with blood clotting and increase the risk of bleeding to death.** • Casualties in shock are unable to generate body heat effectively. • Wet clothes and helicopter evacuations increase body heat loss. • Remove wet clothes and cover casualty with hypothermia prevention gear. • **Hypothermia is much easier to prevent than to treat!**	Here we're not talking about hypothermia in the usual sense, which is dying from cold exposure. **Here we are talking about keeping your blood clotting system working!** Hypothermia is a problem for casualties with hemorrhagic shock even with warm ambient temperatures. Prevention of hypothermia is the key; once established it is difficult to reverse.
108.	 HPMK	**HPMK**	This is the Hypothermia Prevention and Management Kit with a Ready-Heat Blanket and a Heat Reflective Shell. The HRS will help to retain the heat produced by the Ready-Heat blanket. It has an incorporated hood and Velcro closures down each side to allow exposure of an arm or a leg. Such exposure allows the medic to attend to IVs and tourniquets.

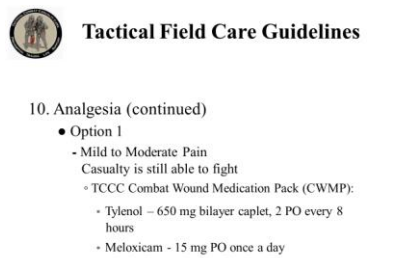
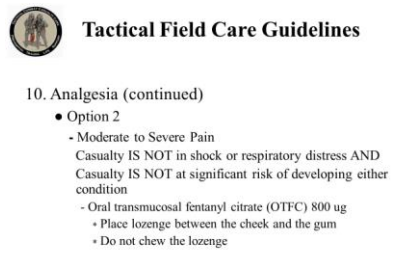
109.	 Apply the Ready Heat blanket to the casualty's torso OVER the casualty's shirt.	**6 – Cell *"Ready-Heat"* Blanket** **4- Cell *"Ready-Heat"* Blanket** Apply the Ready Heat blanket to the casualty's torso OVER the casualty's shirt.	The Ready-Heat blanket generates heat when exposed to air. It can produce temperatures reaching 104°F for up to 8 hours. Works for up to 8 hours. Avoid direct contact with bare skin since thermal burns are possible. Ready-Heat blankets may not work as well at high altitudes. The lower partial pressure of oxygen at high altitudes may not be enough to sustain the chemical reaction required to generate heat.
110.	**Repeat** • Do **NOT** place the ready-Heat Blanket directly on the skin. • There have been multiple reports of skin burns from this being done. • Keep the casualty's cammie top or T-shirt on. • Place the Ready-Heat Blanket over the shirt.	**Repeat** • Do **NOT** place the ready-Heat Blanket directly on the skin. • There have been multiple reports of skin burns from this being done. • Keep the casualty's cammie top or T-shirt on. • Place the Ready-Heat Blanket over the shirt.	Read the text.
111.	**THE PREVIOUS HPMK** 	**THE PREVIOUS HPMK**	The previous HPMK contains a Thermo-Lite Hypothermia Prevention Cap, a Ready-Heat Blanket, and a Blizzard Survival Blanket. The cap can be blown off by rotor wash when loading a casualty in a helicopter, and the Blizzard Rescue Blanket does not provide convenient exposure for tending IVs and tourniquets. Nevertheless, this is still an effective combination.

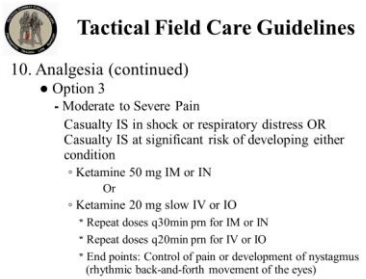
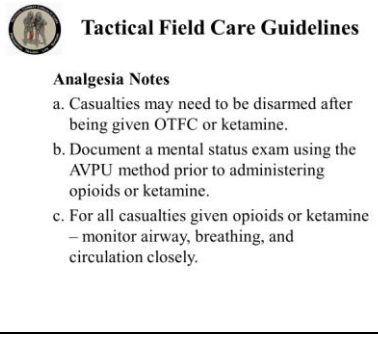
112.		**Tactical Field Care Guidelines** 8. Penetrating Eye Trauma If a penetrating eye injury is noted or suspected: a) Perform a rapid field test of visual acuity and document findings. b) Cover the eye with a rigid eye shield (NOT a pressure patch.) c) Ensure that the 400-mg moxifloxacin tablet in the Combat Wound Medication Pack is taken if possible, and that IV/IM antibiotics are given as outlined below if oral moxifloxacin cannot be taken.	Read the guideline.
113.		**Checking Vision in the Field** •Don't worry about charts •Determine which of the following the casualty can see (start with "Read print" and work down the list if not able to do that.) –Read print –Count fingers –Hand motion –Light perception	Here's how you quantify vision in the field. Like everything else, vision measurement has to be simplified for battlefield use. NOTE: If vision is going down and the eye area is swelling rapidly, there may be a hemorrhage behind the eye and the casualty should be evacuated ASAP. Can happen with fragments that miss the eye but injure the orbit. He or she may permanently lose vision due to increased pressure in the eye if they don't get to a hospital ASAP.

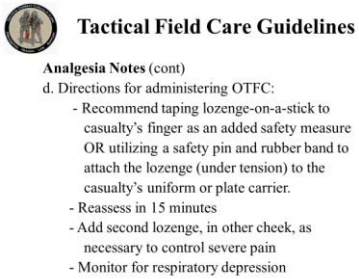
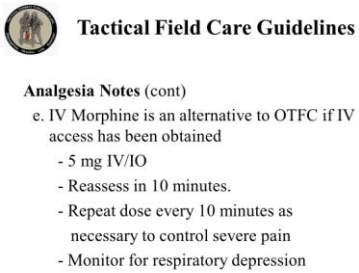
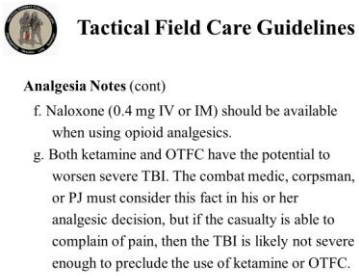
114.		**Corneal Laceration**	This is a laceration to the cornea of the eye – the clear part in front. Eye contents can leak out if you have an injury like this and bacteria can get into the eye and cause an infection. EITHER of these two things is very bad.
115.		**Small Penetrating Eye Injury**	Note the dark spot at 10 o'clock in the circle where the clear part of the eye and the white part of the eye come together. The dark spot is a bit of iris, one of the pigmented parts from inside the eye, which is trapped in the penetrating wound. Attempts to "wipe" this spot away can cause more of the iris to be pulled out of the eye.
116.		Both injuries can result in eye infections that cause permanent blindness – GIVE ANTIBIOTICS!	Infection inside the eye is also a BAD THING! Do you want your buddy's eye to look like this? If not, make sure he gets his antibiotics.

117.		**Protect the eye with a SHIELD, not a patch!**	A rigid shield will protect the eye from any pressure. Pressure could force the interior contents of the eye to come out – this is a BAD THING! Rigid shield should be in first aid kits and medical sets.
118.	**The Value of Eye Shields** 	**The Value of Eye Shields**	Click on the photo to play the video.
119.	**Eye Shields** • When only one eye has been injured, ***do not*** place a shield over the uninjured eye to prevent eye movement. – Movement has not been shown to worsen the outcome for the injured eye. – Blindness makes an otherwise ambulatory casualty a litter patient. – Blindness is psychologically stressful. 	**Eye Shields** • When only one eye has been injured, ***do not*** place a shield over the uninjured eye to prevent eye movement. – Movement has not been shown to worsen the outcome for the injured eye. – Blindness makes an otherwise ambulatory casualty a litter patient. – Blindness is psychologically stressful.	Read the text. Rigid eye shields should be placed over both eyes only when you are sure or at least strongly suspect that both eyes have been injured.

120.	**Eye Protection**  • Use your tactical eyewear to cover the injured eye if you don't have a shield. • Using tactical eyewear in the field will generally prevent the eye injury from happening in the first place!	**Eye Protection** • Use your tactical eyewear to cover the injured eye if you don't have a shield. • Using tactical eyewear in the field will generally prevent the eye injury from happening in the first place!	Tactical eyewear can be used to protect the eye if no eye shield is available. Use of tactical eyecare is an excellent way to ***prevent*** this type of injury from happening in the first place.
121.	**Tactical Field Care Guidelines** 9. Monitoring a. Initiate advanced electronic monitoring if indicated and if monitoring equipment is available.	**Tactical Field Care Guidelines** 9. Monitoring a. Initiate advanced electronic monitoring if indicated and if monitoring equipment is available.	Read the guideline. Advanced monitoring units are available and sometimes carried forward by mounted units into Tactical Field Care scenarios. Propaq LT, Tempus Pro, and LifePak are examples.
122.	**Tactical Field Care Guidelines** 10. Analgesia a. Analgesia on the battlefield should generally be achieved using one of three options:	**Tactical Field Care Guidelines** 10. Analgesia a. Analgesia on the battlefield should generally be achieved using one of three options:	Read the guideline.

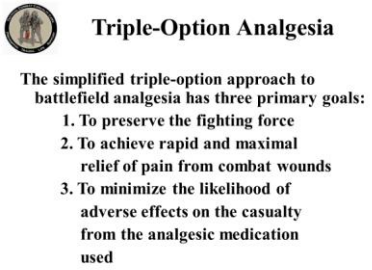
123.		**Tactical Field Care Guidelines** 10. Analgesia (continued) ● Option 1 **-** Mild to Moderate Pain Casualty is still able to fight ◦ TCCC Combat Wound Medication Pack (CWMP): * Tylenol – 650 mg bilayer caplet, 2 PO every 8 hours * Meloxicam - 15 mg PO once a day	Read the guideline.
124.		**Tactical Field Care Guidelines** 10. Analgesia (continued) ● Option 2 **-** Moderate to Severe Pain Casualty IS NOT in shock or respiratory distress AND Casualty IS NOT at significant risk of developing either condition - Oral transmucosal fentanyl citrate (OTFC) 800 ug * Place lozenge between the cheek and the gum * Do not chew the lozenge	Read the guideline.

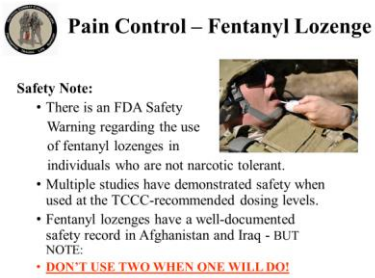
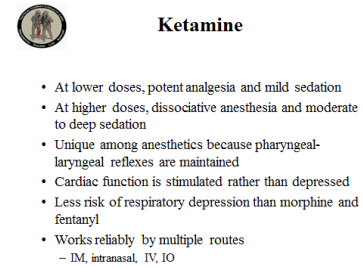
125.		**Tactical Field Care Guidelines** 10. Analgesia (continued) ● Option 3 - Moderate to Severe Pain Casualty IS in shock or respiratory distress OR Casualty IS at significant risk of developing either condition ◦ Ketamine 50 mg IM or IN Or ◦ Ketamine 20 mg slow IV or IO * Repeat doses q30min prn for IM or IN * Repeat doses q20min prn for IV or IO * End points: Control of pain or development of nystagmus (rhythmic back-and-forth movement of the eyes)	Read the guideline.
126.		**Tactical Field Care Guidelines** **Analgesia Notes** a. Casualties may need to be disarmed after being given OTFC or ketamine. b. Document a mental status exam using the AVPU method prior to administering opioids or ketamine. **c.** For all casualties given opioids or ketamine – monitor airway, breathing, and circulation closely.	Read the text.

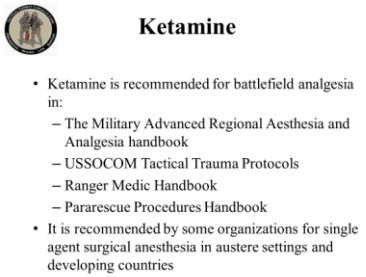
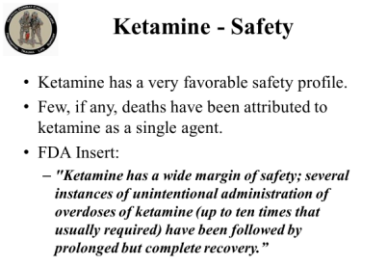
127.		**Tactical Field Care Guidelines** **Analgesia Notes (cont)** d. Directions for administering OTFC: - Recommend taping lozenge-on-a-stick to casualty's finger as an added safety measure OR utilizing a safety pin and rubber band to attach the lozenge (under tension) to the casualty's uniform or plate carrier. - Reassess in 15 minutes - Add second lozenge, in other cheek, as necessary to control severe pain - Monitor for respiratory depression	Read the text.
128.		**Tactical Field Care Guidelines** **Analgesia Notes (cont)** e. IV Morphine is an alternative to OTFC if IV access has been obtained - 5 mg IV/IO - Reassess in 10 minutes. - Repeat dose every 10 minutes as necessary to control severe pain - Monitor for respiratory depression	Read the text.
129.		**Tactical Field Care Guidelines** **Analgesia Notes (cont)** f. Naloxone (0.4 mg IV or IM) should be available when using opioid analgesics. g. Both ketamine and OTFC have the potential to worsen severe TBI. The combat medic, corpsman, or PJ must consider this fact in his or her analgesic decision, but if the casualty is able to complain of pain, then the TBI is likely not severe enough to preclude the use of ketamine or OTFC	Read the text.

130.	**Tactical Field Care Guidelines** **Analgesia Notes** (cont) h. Eye injury does not preclude the use of ketamine. The risk of additional damage to the eye from using ketamine is low and maximizing the casualty's chance for survival takes precedence if the casualty is in shock or respiratory distress or at significant risk for either.	**Tactical Field Care Guidelines** **Analgesia Notes** (cont) h. Eye injury does not preclude the use of ketamine. The risk of additional damage to the eye from using ketamine is low and maximizing the casualty's chance for survival takes precedence if the casualty is in shock or respiratory distress or at significant risk for either.	Read the text.
131.	**Tactical Field Care Guidelines** **Analgesia Notes** (cont) i. Ketamine may be a useful adjunct to reduce the amount of opioids required to provide effective pain relief. It is safe to give ketamine to a casualty who has previously received morphine or OTFC. IV Ketamine should be given over 1 minute. j. If respirations are noted to be reduced after using opioids or ketamine, provide ventilatory support with a bag-valve-mask or mouth-to-mask ventilations.	**Tactical Field Care Guidelines** **Analgesia Notes (cont)** i. Ketamine may be a useful adjunct to reduce the amount of opioids required to provide effective pain relief. It is safe to give ketamine to a casualty who has previously received morphine or OTFC. IV Ketamine should be given over 1 minute. j. If respirations are noted to be reduced after using opioids or ketamine, provide ventilatory support with a bag-valve-mask or mouth-to-mask ventilations.	Read the text.

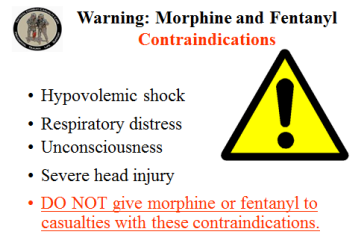
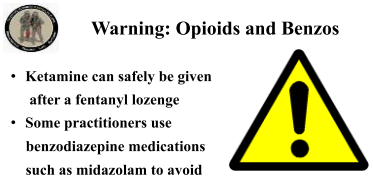
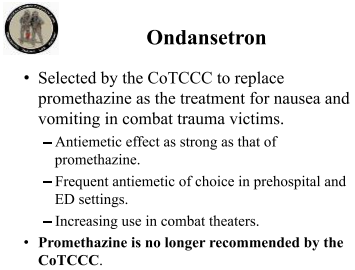
132.	 **Tactical Field Care Guidelines** **Analgesia Notes** (cont) k. Ondansetron, 4 mg ODT/IV/IO/IM, every 8 hours as needed for nausea or vomiting. Each 8hour dose can be repeated once at 15 minutes if nausea and vomiting are not improved. Do not give more than 8 mg in any 8hour interval. Oral ondansetron is NOT an acceptable alternative to the ODT formulation. l. Reassess – reassess – reassess!	**Tactical Field Care Guidelines** **Analgesia Notes (cont)** k. Ondansetron, 4 mg ODT/IV/IO/IM, every 8 hours as needed for nausea or vomiting. Each 8-hour dose can be repeated once at 15 minutes if nausea and vomiting are not improved. Do not give more than 8 mg in any 8-hour interval. Oral ondansetron is NOT an acceptable alternative to the ODT formulation. l. Reassess – reassess – reassess!	Read the text. Ondansetron is now the drug of choice for treating nausea and vomiting, replacing promethazine.
133.	 **Additional Points on Battlefield Analgesia**	**Additional Points on Battlefield Analgesia**	

134.		**Triple-Option Analgesia** The simplified triple-option approach to battlefield analgesia has three primary goals: 1. To preserve the fighting force 2. To achieve rapid and maximal relief of pain from combat wounds 3. To minimize the likelihood of adverse effects on the casualty from the analgesic medication used	Read the text.
135.		**Pain Control – Fentanyl Lozenge** • Does not require IV/IO access • Can be administered quickly – Oral transmucosal fentanyl citrate, 800 µg (between cheek and gum) – VERY FAST-ACTING; WORKS ALMOST AS FAST AS IV MORPHINE – VERY POTENT PAIN RELIEF – **DO NOT CHEW THE FENTANYL LOZENGE – let it dissolve!**	This medication has been used extensively in Special Operations forces in the GWOT with great success. Saves the time of starting an IV and works as well as IV morphine.

136.		**Pain Control – Fentanyl Lozenge** **Safety Note:** • There is an FDA Safety Warning regarding the use of fentanyl lozenges in individuals who are not narcotic tolerant. • Multiple studies have demonstrated safety when used at the recommended dosing levels. • Fentanyl lozenges have a well-documented safety record in Afghanistan and Iraq. BUT NOTE: • DON'T USE TWO WHEN ONE WILL DO!	Important note regarding fentanyl use: Respiratory depression at the 800-microgram dose level has not been noted in 10 years of combat experience. If it does occur, start an IV and give Narcan. Assist respiration as necessary.
137.		**Ketamine** • At lower doses, potent analgesia and mild sedation • At higher doses, dissociative anesthesia and moderate to deep sedation • Unique among anesthetics because pharyngeal-laryngeal reflexes are maintained • Cardiac function is stimulated rather than depressed • Less risk of respiratory depression than morphine and fentanyl • Works reliably by multiple routes – IM, intranasal, IV, IO	"Dissociative" anesthetics distort perceptions of sight and sound and produce feelings of detachment – or dissociation – from environment and self.

138.		**Ketamine** • Ketamine is recommended for battlefield analgesia in: – The Military Advanced Regional Aesthesia and Analgesia handbook – USSOCOM Tactical Trauma Protocols – Ranger Medic Handbook – Pararescue Procedures Handbook – It is recommended by some organizations for single agent surgical anesthesia in austere settings and developing countries.	Special operations communities have experience using ketamine in pre-hospital settings.
139.		**Ketamine – Safety** • Ketamine has a very favorable safety profile. • Few, if any, deaths attributed to ketamine as a single agent. • FDA Insert: – *"Ketamine has a wide margin of safety; several instances of unintentional administration of overdoses of ketamine (up to ten times that usually required) have been followed by prolonged but complete recovery."*	Read the text.

140.	 **Ketamine - Side Effects** • Respiratory depression and apnea can occur if IV ketamine is administered too rapidly. • Providing several breaths via bag-valve-mask ventilation is typically successful in restoring normal breathing.	**Ketamine - Side Effects** • Respiratory depression and apnea can occur if ketamine is administered too rapidly. • Providing several breaths via bag-valve-mask ventilation is typically successful in restoring normal breathing.	Naloxone does not reverse the effects of ketamine. Mechanical ventilatory assistance may be required in rare instances if apnea occurs.
141.	 **Pain Medications – Key Points!** • **Aspirin, Motrin, Toradol, and other nonsteroidal anti-inflammatory medicines (NSAIDS) other than Mobic should be avoided while in a combat zone because they interfere with blood clotting.** • Aspirin, Motrin, and similar drugs inhibit platelet function for approximately 7-10 days after the last dose. • **You definitely want to have your platelets working normally if you get shot.** • Mobic and Tylenol DO NOT interfere with platelet function – this is the primary feature that makes them the non-narcotic pain medications of choice.	**Pain Medications – Key Points!** • **Aspirin, Motrin, Toradol, and other nonsteroidal anti-inflammatory medicines (NSAIDS) other than Mobic should be avoided while in a combat zone because they interfere with blood clotting.** • Aspirin, Motrin, and similar drugs inhibit platelet function for approximately 7-10 days after the last dose. • **You definitely want to have your platelets working normally if you get shot.** • Mobic and Tylenol DO NOT interfere with platelet function – this is the primary feature that makes them the non-narcotic pain medications of choice.	Anybody who might be going into combat in a week or less should NEVER get aspirin, Motrin, or similar drugs. Mobic is the only NSAID that does not interfere with blood clotting. Applies to sick call at base as well as in the field.

142.		**Warning: Morphine and Fentanyl Contraindications** • Hypovolemic shock • Respiratory distress • Unconsciousness • Severe head injury • DO NOT give morphine or fentanyl to casualties with these contraindications.	You can kill your casualty if you forget this slide.
143.		**Warning: Opioids and Benzos** • Ketamine can safely be given after a fentanyl lozenge • Some practitioners use benzodiazepine medications such as midazolam to avoid ketamine side effects BUT • Midazolam may cause respiratory depression, especially when used with opioids. • Avoid giving midazolam to casualties who have previously gotten fentanyl lozenges or morphine.	You can kill your casualty if you forget this slide.
144.		**Ondansetron** • Selected by the CoTCCC to replace promethazine as the treatment for nausea and vomiting in combat trauma victims. – Antiemetic effect as strong as that of promethazine. – Frequent antiemetic of choice in prehospital and ED settings. – Increasing use in combat theaters. • **Promethazine is no longer recommended by the CoTCCC.**	Ondansetron is an antiemetic that is increasingly being used in the treatment of nausea and vomiting in emergency rooms and the pre-hospital environment, as well as in inpatient, obstetrical, and surgical settings. Although ondansetron is FDA-approved for the treatment of nausea associated with chemotherapy and ionizing radiation for cancer treatment and post-operative nausea, there is an extensive body of literature describing the safe and effective use of ondansetron in many other scenarios, including undifferentiated nausea in the ED. It has a well-established record of both efficacy and safety and a mild side effects profile that make it a much better choice than promethazine for use on the battlefield.

145.	**Ondansetron** • Much more favorable side effects profile than previously recommended promethazine – Sedation unlikely – Does not cause hypotension – QT interval prolongation is the only significant concern – *Unlikely to occur when used as prescribed in TCCC guidelines.* • Neutral or synergistic analgesic effect with opioids. • No Black Box warnings.	**Ondansetron** • Much more favorable side effects profile than previously recommended promethazine – Sedation unlikely – Does not cause hypotension – QT interval prolongation is the only significant concern – ***Unlikely to occur when used as prescribed in TCCC guidelines.*** • Neutral or synergistic analgesic effect with opioids. • No Black Box warnings.	Common side effects of ondansetron include diarrhea, headache, fever, lightheadedness, dizziness, drowsiness, constipation, rash, blurred vision and muscle spasm. When used as prescribed, though, these occur rarely – far less often than the undesirable effects associated with promethazine.
146.	**Ondansetron** • Very expensive previously when sold under patent as Zofran. – Generic version now much more affordable. • Oral Disintegrating Tablet (ODT) – Not the same as the oral (PO) form. – Works much faster! – **Not chewed or swallowed!** • Can also be given IV, IO, or IM.	**Ondansetron** • Very expensive previously when sold under patent as Zofran. – Generic version now much more affordable. • Oral Disintegrating Tablet (ODT) – Not the same as the oral (PO) form. – Works much faster! – **Not chewed or swallowed!** • Can also be given IV, IO, or IM	Ondansetron is available in oral form, but it is also available as an orally disintegrating tablet (ODT) that is absorbed through the buccal and sublingual mucosa and does not require swallowing or gastrointestinal absorption. Ondansetron ODT has been shown to be just as effective as IV ondansetron in the management of chemotherapy-related nausea and postoperative nausea and vomiting.
147.		**Questions?**	