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|  |  | **Tactical Combat Casualty Care for Medical Personnel**  **03 June 2016**  **Tactical Field Care #2** |  |
|  |  | **Tactical Field Care Guidelines**  5. Intravenous (IV) access   * Start an 18-gauge IV or saline lock if indicated. * If resuscitation is required and IV access is not obtainable, use the intraosseous (IO) route. | Read text |
|  |  | **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    – Distract from other care required    – 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  That concept is outdated on the modern battlefield.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. |
|  |  | **IV Access**  **Indications for IV access**  • Fluid resuscitation for hemorrhagic shock or    – Significant risk of shock – GSW to torso  • Casualty needs medications, but cannot take them PO:    – 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. |
|  |  | **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. |
|  |  | **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.   + Much easier to move casualty without the IV line and bag attached   + Less chance of traumatic disinsertion of IV   + Provides rapid subsequent access if needed   + Conserve 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. |
|  |  | **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.  . |
|  |  | **Questions?** |  |
|  |  | **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. |
|  |  | **FAST1® IO Device** | Go through the various components of the FAST1® as shown. |
|  |  | **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** | A few things to be aware of about the FAST1®. |
|  |  | **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. |
|  |  | **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. |
|  |  | **FAST1® Insertion (2)**  • Remove backing labeled #1  • Put index finger in sternal notch | The Target Patch has a two-piece peel-off backing. |
|  |  | **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. |
|  |  | **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. |
|  |  | **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…. |
|  |  | **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. |
|  |  | **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. |
|  |  | **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. |
|  |  | **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®? |
|  |  | **FAST1® Insertion Video**  **Key Point Not Shown in Video**  • Remember to run IV fluids through the IV line before connecting. | Click on the photo to play the video.  Read the additional key point. |
|  |  | **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!  (NOTE TO INSTRUCTORS): Slides showing the procedure for placement of the EZ-IO sternal device are appended to the end of this presentation.) |
|  |  | **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. |
|  |  | **Tactical Field Care Guidelines**  6. 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 gram of tranexamic acid (TXA) in 100 cc Normal Saline or Lactated Ringer’s as soon as possible but NOT later than 3 hours after injury.  - Begin second infusion of 1 gm TXA after Hextend or other fluid treatment. | Read Text |
|  |  | **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 text |
|  |  | **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. |
|  |  | **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 = Assistant Secretary of Defense for Health Affairs – the Senior Health Care Official in the DoD. |
|  |  | **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 text |
|  |  | **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! |
|  |  | **TXA**   * TXA does not promote new clot formation * Prevents forming clots from being broken down by the body * Helps stop the bleeding * 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. |
|  |  | **TXA**   * Survival benefit GREATEST when given within 1 hour of injury * **Greatest decrease in blood loss seen when TXA is started ASAP!**   + **Give it as soon after wounding as possible!** * Survival benefit 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 * *DON’T DELAY WITH TXA!* | 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.  REINFORCE THAT BLEEDING SHOULD BE STOPPED ASAP – GIVE TXA WTHOUT DELAY! |
|  |  | **TXA**   * FDA approved * Possible side effects:   + Nausea, vomiting, diarrhea   + Visual disturbances   + Possible increase in risk of post-injury blood clots   + Hypotension if given as IV bolus | Do not be deterred by possible side effects.  The important thing is to stop the bleeding and save the life of the casualty. |
|  |  | **TXA Storage and Handling**   * Recommended temperature range for storage: 59°-86° F * Must protect this drug from environmental extremes * Store and transport in air conditioned spaces * On missions, carry in small insulated container * In very cold temperatures, carrying TXA next to the body on missions will protect from cold * Carriage in aid bag also acts as insulator against temperature extremes * Return to room temperature storage after each mission | Review each point |
|  |  | **TXA Administration – 1st Dose**   * Supplied in 1 gram (1000 mg) ampoules * Should NOT be given with Hextend or through an IV line with Hextend in it * Inject 1 gram of TXA into a 100-cc bag of normal saline or lactated ringer’s * Infuse slowly over 10 minutes * Rapid IV push may cause hypotension * If there is a new-onset drop in BP during the infusion – SLOW DOWN the TXA infusion * Then administer blood products or Hextend | Review each point |
|  |  | **TXA Administration – 2nd Dose**   * Typically given after the casualty arrives at a Role II/Role III medical facility * May be given in field if evacuation is delayed and fluid resuscitation has been completed before arrival at the medical facility * If still in field or in TACEVAC when fluid resuscitation is complete, give second dose of TXA as directed for the first dose | Review each point |
|  |  | **Questions?**  **IV/IO/IV Meds Practical** | IV Skill Sheet  IO Skill Sheet  TXA Skill Sheet  Ketamine Skill Sheet |
|  |  | **Questions?** |  |
|  |  | **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 | A lot of people talk about “shock” without really understanding what it is. |
|  |  | **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. |
|  |  | **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. |
|  |  | **500cc Blood Loss**  **4.5 Liters Blood Volume** | So – here we have lost the first 500cc of blood.  This is what you lose when you donate a “pint” or a unit of blood at the blood bank. |
|  |  | **500cc 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. |
|  |  | **1000cc Blood Loss**  **4.0 Liters Blood Volume** | So now we lose another 500cc of blood.  How are we doing now? |
|  |  | **1000cc 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. |
|  |  | **1500cc Blood Loss** | Lose another 500cc of blood.  How are we doing now? |
|  |  | **1500cc 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.  Would probably not die from this. |
|  |  | **2000cc Blood Loss**  **3.0 Liters Blood Volume** | Lose another 500cc of blood.  On the battlefield, this would represent ongoing uncontrolled hemorrhage.  How is the casualty doing now? |
|  |  | **2000cc 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. |
|  |  | **2500cc Blood Loss**  **2.5 Liters Blood Volume** | So let’s take away another 500cc of blood from our simulated casualty.  Casualty is now in big trouble. |
|  |  | **2500cc 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. |
|  |  | **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). |
|  |  | **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. |
|  |  | **Goals for Fluid Resuscitation**  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 text |
|  |  | **Tactical Field Care Guidelines**  7. Fluid resuscitation  a. The resuscitation fluids of choice for casualties in hemorrhagic shock, listed from most to least preferred, are: whole blood\*; plasma, RBCs and platelets in 1:1:1 ratio\*; plasma and RBCs in 1:1 ratio; plasma or RBCs alone; Hextend; and crystalloid (Lactated Ringers or Plasma-Lyte A). | This is the order of preference for resuscitation fluids in TCCC. Recently published studies have described an increased use of blood products by coalition forces in Afghanistan during Tactical Evacuation (TACEVAC) Care and even in Tactical Field Care (TFC). Resuscitation with RBCs and plasma has been associated with improved survival on the platforms that use them, even in the relatively short evacuation times seen in Afghanistan in recent years. Prehospital blood products may have an increasingly important impact on survival if evacuation times lengthen as the drawdown in Afghanistan continues and if the U.S. military is called upon to conduct operations in less mature theaters of conflict. For resuscitation of traumatic hemorrhagic shock on the battlefield, whole blood is preferable to blood components which in turn are preferable to colloids and then crystalloids. |
|  |  | **Tactical Field Care Guidelines**  7. Fluid resuscitation  b. Assess for hemorrhagic shock (altered mental status in the absence of brain injury and/or weak or absent radial pulse).   * 1. If not in shock:   - No IV fluids are immediately necessary.  - Fluids by mouth are permissible if the casualty is conscious and can swallow. | Read text |
|  |  | **Tactical Field Care Guidelines**  7. Fluid resuscitation  b2. 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 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 mmHg is present. | The maintenance, transport, and administration of blood products is a complex practice. It should be carried out only in strict compliance with formal command or theater protocol. Compliance with such a protocol requires a great deal of training and careful preparation.  Casualties who have absent radial pulse and/or decreased mental status due to hemorrhagic shock in the prehospital setting have a very high mortality rate and are in need of blood products as soon as possible. Blood product administration should be initiated for any casualty who meets protocol criteria. There is no minimum transport time below which blood product therapy should not be initiated if protocol criteria are met – give blood products as soon as it is apparent they are needed, no matter how close the MTF is. Remember, though, to give TXA first.  Do not pause between units of resuscitation fluids. Continue in the sequence you are equipped and trained to administer, assessing the casualty’s clinical status after each unit given, until a desired outcome is attained. |
|  |  | **Tactical Field Care Guidelines**  7. Fluid resuscitation  b3. 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 Ringers 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. | If whole blood and blood component therapy are not available, then resuscitation with Hextend, Ringer’s Lactate or Plasma-Lyte A can be used for casualties in hemorrhagic shock.  The colloid solution Hextend is preferred over the crystalloids because the volume needed to attain a given amount of intravascular volume expansion is less, and the effect lasts longer. This helps minimize weight and volume in the combat medic’s pack. Here, too, resuscitation should continue without pause until a desired clinical outcome is attained, assessing the casualty’s clinical status after each bolus. |
|  |  | **Tactical Field Care Guidelines**  7. Fluid resuscitation  b4. If a casualty with an altered mental status due to suspected TBI has a weak or absent peripheral 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. | TBI (traumatic brain injury) – can be due to either a closed head injury or penetrating head trauma. In a casualty with a suspected TBI, altered mental status cannot be used as an indicator of hemorrhagic shock nor used to monitor response to resuscitation. In this situation, resuscitation for shock must be guided by pulse character or blood pressure.  Shock increases mortality in casualties with head injuries, so in these cases, the need to ensure that there is enough blood pressure to pump blood to the brain means that you have to be more aggressive with your fluid resuscitation. You should resuscitate the casualty until he has a NORMAL, not just palpable, radial pulse, or if you can monitor blood pressure, resuscitate to maintain a systolic BP of at least 90. |
|  |  | **Tactical Field Care Guidelines**  7. Fluid resuscitation  b5. Reassess the casualty frequently to check for recurrence of shock. If shock recurs, recheck all external hemorrhage control measures to ensure that they are still effective and repeat the fluid resuscitation as outlined above. | Any time you have to take measures to prevent or treat hemorrhagic shock, you must frequently reassess the casualty’s status. In the event you have to resuscitate the casualty again, control of bleeding still takes precedence over giving fluids, and all measures you have previously taken to control hemorrhage must be rechecked. You should also seek sources of bleeding that have not been previously identified and control them. |
|  |  | **Tactical Field Care Guidelines**  7. Fluid resuscitation  \* Neither whole blood nor apheresis platelets as these products are currently collected in theater are FDA-compliant. 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. | It is extremely unusual to have platelets in the prehospital setting. The best two practical choices at this point in the continuum of care are 1:1 plasma and RBCs or whole blood. |
|  |  | **Fluid Resuscitation Strategy**  **If the casualty is not in shock:**   * + **No IV fluids necessary – SAVE IV FLUIDS FOR CASUALTIES WHO REALLY NEED THEM.**   + PO fluids permissible if casualty can swallow     - Helps treat or prevent dehydration     - OK, even if wounded in 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. |
|  |  | **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 |
|  |  | **Fluid Resuscitation from Hemorrhagic Shock**  **Hypotensive Resuscitation Saves Lives in Non-Compressible Hemorrhage!**   * Giving more fluid than necessary to reach the end points previously noted may increase bleeding from internal bleeding sites * **DO NOT start your fluid resuscitation by giving two liters of LR or NS wide open before re-assessing your casualty!** | Read text |
|  |  | **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. |
|  |  | **Questions?** |  |
|  |  | **Tactical Field Care Guidelines**  8. Prevention of hypothermia  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 text |
|  |  | **Tactical Field Care Guidelines**  8. Prevention of hypothermia (cont)  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 text |
|  |  | **THE OLD HPMK** | The old 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. |
|  |  | **6 – Cell *“Ready-Heat”* Blanket**  **4- Cell *“Ready-Heat”* Blanket**  Apply Ready Heat blanket to torso OVER shirt. | The Ready-Heat blanket generates heat when exposed to the air. It can produce temperatures reaching 104°F for several hours. Works for up to 8 hours.  Avoid direct contact with bare skin, as 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. |
|  |  | **Repeat**   * Do **NOT** place the ready-Heat Blanket directly on the skin * Multiple reports of skin burns from this being done * Keep cammie top or T-shirt on * Place Ready-Heat over the fabric | Read text |
|  |  | **NEW HPMK** | This is the new 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. |
|  |  | **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. |
|  |  | **Tactical Field Care Guidelines**  9. Penetrating Eye Trauma  If a penetrating eye injury is noted or suspected:  a) Perform a rapid field test of visual acuity.  b) Cover the eye with a rigid eye shield (NOT a pressure patch.)  c) Ensure that the 400 mg moxifloxacin tablet in the combat pill pack is taken if possible, or that IV/IM antibiotics are given as outlined below if oral moxifloxacin cannot be taken. | Read text |
|  |  | **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. |
|  |  | **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. |
|  |  | **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. |
|  |  | 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. |
|  |  | **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. |
|  |  | **The Value of Eye Shields** | Click on the photo to play the video. |
|  |  | **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. |
|  |  | **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 eyeware can be used to protect the eye if no eye shield is available.  Use of tactical eyeware is an excellent way to prevent this type of injury from happening in the first place. |
|  |  | **Tactical Field Care Guidelines**  10. Monitoring  Pulse oximetry should be available as an adjunct to clinical monitoring. **All individuals with moderate/severe TBI should be monitored with pulse oximetry.** Readings may be misleading in the settings of shock or marked hypothermia. | Read text  Hypoxia is associated with worse clinical outcomes in casualties with moderate/severe TBI. Monitoring the O2 saturation in these casualties with a pulse oximeter will help identify hypoxia so that it can be prevented or treated. |
|  |  | **Pulse Oximetry Monitoring**   * Pulse oximetry – tells you how much oxygen is present in the blood * Shows the heart rate and the percent of oxygenated blood (“O2 sat”) in the numbers displayed * 98% or higher is normal O2 sat at sea level. * 86% is normal at 12,000 feet – lower oxygen pressure at altitude | Here is what a pulse oximeter looks like and what it tells you.  The device actually tells you the percentage of oxygenated hemoglobin in the blood. |
|  |  | **Pulse Oximetry Monitoring**  Consider using a pulse ox for these types of casualties:   * TBI – good O2 sat very important for a good outcome * Unconscious * Penetrating chest trauma * Chest contusion * Severe blast trauma | TBI casualties who become hypoxic have a worse outcome. You must watch them very closely for hypoxia.  Unconscious casualties may experience an airway obstruction.  Chest trauma and blast trauma casualties may not exchange oxygen well in their lungs. |
|  |  | **Pulse Oximetry Monitoring**  Oxygen saturation values may be inaccurate in the presence of:   * Hypothermia * Shock * Carbon monoxide poisoning * Very high ambient light levels | A normal reading on a pulse oximeter is NOT a good indicator for absence of shock.  Even after significant blood loss, the blood remaining in the intravascular compartment may be normally oxygenated.  Readings on a cold limb may be artificially low.  The pulse ox can mistake carbon monoxide for oxygen in burn patients and give a falsely high reading.  To repeat – a decrease in O2 sat is normal at altitude. This drop in O2 sat is REAL. |
|  |  | **Tactical Field Care Guidelines**  11. Inspect and dress known wounds.  12. Check for additional wounds. | Read text  Expose wounded areas using trauma shears – knives may cut the casualty as clothing is being removed. |
|  |  | **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 text |
|  |  | Tactical Field Care Guidelines  13. Analgesia on the battlefield should generally be achieved using one of three options depending on the level of the casualty’s pain and the nature of his or her injuries. | Read text |
|  |  | **Tactical Field Care Guidelines**  13. Option 1  Mild to Moderate Pain  Casualty is still able to fight  TCCC Combat pill pack:  Tylenol - 650-mg bilayer caplet, 2 PO every 8 hour  Meloxicam - 15 mg PO once a day | Read text |
|  |  | **Tactical Field Care Guidelines**  13. 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 text |
|  |  | **Tactical Field Care Guidelines**  13. Option 3  Moderate to Severe Pain  Casualty IS in hemorrhagic 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 text |
|  |  | **Tactical Field Care Guidelines**  **Analgesia Notes**   1. Casualties may need to be disarmed after being given OTFC or ketamine. 2. Document a mental status exam using the AVPU method prior to administering opioids or ketamine. 3. For all casualties given opiods or ketamine – monitor airway, breathing, and circulation closely. | Read text |
|  |  | **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 text |
|  |  | **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 text |
|  |  | **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 text |
|  |  | **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 text |
|  |  | **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 text |
|  |  | **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! | Read text.  Ondansetron is now the drug of choice for treating nausea and vomiting, replacing promethazine. |
|  |  | **Additional Points on Battlefield Analgesia** |  |
|  |  | **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 | 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. |
|  |  | **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. |
|  |  | **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. |
|  |  | **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   + Single agent surgical anesthesia in austere settings and developing countries | Special operations communities have experience using ketamine in pre-hospital settings. |
|  |  | **Ketamine – Safety**   * 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 text |
|  |  | **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 reliably reverse the effects of ketamine. Mechanical ventilatory assistance is preferred over respiratory stimulants. |
|  |  | **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. |
|  |  | **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. |
|  |  | **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. |
|  |  | **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 effect profile that make it a much better choice than promethazine for use on the battlefield. |
|  |  | **Ondansetron**   * Much more favorable side effect 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. |
|  |  | **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. |
|  |  | **Questions?** |  |