

TCCC Guidelines for Medical Personnel

1 August 2018

RED text indicates new text in this year's update to the TCCC Guidelines, which includes the recent changes on extraglottic airways and management of suspected tension pneumothorax.

Basic Management Plan for Care Under Fire

1. Return fire and take cover.
2. Direct or expect casualty to remain engaged as a combatant if appropriate.
3. Direct casualty to move to cover and apply self-aid if able.
4. Try to keep the casualty from sustaining additional wounds.

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5. Casualties should be extricated from burning vehicles or buildings and moved to places of relative safety. Do what is necessary to stop the burning process.

 6. Stop life-threatening external hemorrhage if tactically feasible:
 - a. Direct casualty to control hemorrhage by self-aid if able.

 - b. Use a CoTCCC-recommended limb tourniquet for hemorrhage that is anatomically amenable to tourniquet use.

 - c. Apply the limb tourniquet over the uniform clearly proximal to the bleeding site(s). If the site of the life-threatening bleeding is not readily apparent, place the tourniquet “high and tight” (as proximal as possible) on the injured limb and move the casualty to cover.

 7. Airway management is generally best deferred until the Tactical Field Care phase.

Basic Management Plan for Tactical Field Care

1. Establish a security perimeter in accordance with unit tactical standard operating procedures and/or battle drills. Maintain tactical situational awareness.

2. Triage casualties as required. Casualties with an altered mental status should have weapons and communications equipment taken away immediately.

3. Massive Hemorrhage
 - a. Assess for unrecognized hemorrhage and control all sources of bleeding. If not already done, use a CoTCCC-recommended limb tourniquet to control life-threatening external hemorrhage that is anatomically amenable to tourniquet use or for any traumatic amputation. Apply directly to the skin 2-3 inches above the bleeding site. If bleeding is not controlled with the first tourniquet, apply a second tourniquet side-by-side with the first.

 - b. For compressible (external) hemorrhage not amenable to limb tourniquet use or as an adjunct to tourniquet removal, use Combat Gauze as the CoTCCC hemostatic dressing of choice.
 - Alternative hemostatic adjuncts:
 - Celox Gauze or
 - ChitoGauze or
 - XStat (Best for deep, narrow-tract junctional wounds)

- Hemostatic dressings should be applied with at least 3 minutes of direct pressure (optional for XStat). Each dressing works differently, so if one fails to control bleeding, it may be removed and a fresh dressing of the same type or a different type applied. (Note: XStat is not to be removed in the field, but additional XStat, other hemostatic adjuncts, or trauma dressings may be applied over it.)

- If the bleeding site is amenable to use of a junctional tourniquet, immediately apply a CoTCCC-recommended junctional tourniquet. Do not delay in the application of the junctional tourniquet once it is ready for use. Apply hemostatic dressings with direct pressure if a junctional tourniquet is not available or while the junctional tourniquet is being readied for use.

4. Airway Management

a. Conscious casualty with no airway problem identified:

- No airway intervention required

b. Unconscious casualty without airway obstruction:

- Place casualty in the recovery position

- Chin lift or jaw thrust maneuver or

- Nasopharyngeal airway or

- Extraglottic airway

- c. Casualty with airway obstruction or impending airway obstruction:
- Allow a conscious casualty to assume any position that best protects the airway, to include sitting up
 - Use a chin lift or jaw thrust maneuver
 - Use suction if available and appropriate
 - Nasopharyngeal airway or
 - Extraglottic airway (if the casualty is unconscious)
 - Place an unconscious casualty in the recovery position.
- d. If the previous measures are unsuccessful, perform a surgical cricothyroidotomy using one of the following:
- Cric-Key technique (preferred option)
 - Bougie-aided open surgical technique using a flanged and cuffed airway cannula of less than 10 mm outer diameter, 6-7 mm internal diameter, and 5-8 cm of intratracheal length
 - Standard open surgical technique using a flanged and cuffed airway cannula of less than 10mm outer diameter, 6-7 mm internal diameter, and 5-8 cm of intra-tracheal length (least desirable option)
 - Use lidocaine if the casualty is conscious.

- e. Cervical spine stabilization is not necessary for casualties who have sustained only penetrating trauma.

- f. Monitor the hemoglobin oxygen saturation in casualties to help assess airway patency.

- g. Always remember that the casualty's airway status may change over time and requires frequent reassessment.

Notes:

* The i-gel is the preferred extraglottic airway because its gel-filled cuff makes it simpler to use and avoids the need for cuff inflation and monitoring. If an extraglottic airway with an air-filled cuff is used, the cuff pressure must be monitored to avoid overpressurization, especially during TACEVAC on an aircraft with the accompanying pressure changes.

* Extraglottic airways will not be tolerated by a casualty who is not deeply unconscious. If an unconscious casualty without direct airway trauma needs an airway intervention, but does not tolerate an extraglottic airway, consider the use of a nasopharyngeal airway.

* For casualties with trauma to the face and mouth, or facial burns with suspected inhalation injury, nasopharyngeal airways and extraglottic airways may not suffice and a surgical cricothyroidotomy may be required.

* Surgical cricothyroidotomies should not be performed on unconscious casualties who have no direct airway trauma unless use of a nasopharyngeal airway and/or an extraglottic airway have been unsuccessful in opening the airway.

5. Respiration/Breathing

- a. Assess for tension pneumothorax and treat as necessary.

1. Suspect a tension pneumothorax and treat when a casualty has significant torso trauma or primary blast injury and one or more of the following:

- Severe or progressive respiratory distress

- Severe or progressive tachypnea

- Absent or markedly decreased breath sounds on one side of the chest

- Hemoglobin oxygen saturation < 90% on pulse oximetry

- Shock

- Traumatic cardiac arrest without obviously fatal wounds

Note:

* If not treated promptly, tension pneumothorax may progress from respiratory distress to shock and traumatic cardiac arrest.

2. Initial treatment of suspected tension pneumothorax:

- If the casualty has a chest seal in place, burp or remove the chest seal.

- Establish pulse oximetry monitoring.

- Place the casualty in the supine or recovery position unless he or she is conscious and needs to sit up to help keep the airway clear as a result of maxillofacial trauma.

- Decompress the chest on the side of the injury with a 14-gauge or a 10-gauge, 3.25-inch needle/catheter unit.

- If a casualty has significant torso trauma or primary blast injury and is in traumatic cardiac arrest (no pulse, no respirations, no response to painful stimuli, no other signs of life), decompress both sides of the chest before discontinuing treatment.

Notes:

* Either the 5th intercostal space (ICS) in the anterior axillary line (AAL) or the 2nd ICS in the mid-clavicular line (MCL) may be used for needle decompression (NDC). If the anterior (MCL) site is used, do not insert the needle medial to the nipple line.

* The needle/catheter unit should be inserted at an angle perpendicular to the chest wall and just over the top of the lower rib at the insertion site. Insert the needle/catheter unit all the way to the hub and hold it in place for 5-10 seconds to allow decompression to occur.

* After the NDC has been performed, remove the needle and leave the catheter in place.

3. The NDC should be considered successful if:

- Respiratory distress improves, or
- There is an obvious hissing sound as air escapes from the chest when NDC is performed (this may be difficult to appreciate in high-noise environments), or

- Hemoglobin oxygen saturation increases to 90% or greater (note that this may take several minutes and may not happen at altitude), or
 - A casualty with no vital signs has return of consciousness and/or radial pulse.
4. If the initial NDC fails to improve the casualty's signs/symptoms from the suspected tension pneumothorax:
- Perform a second NDC on the same side of the chest at whichever of the two recommended sites was not previously used. Use a new needle/catheter unit for the second attempt.
 - Consider, based on the mechanism of injury and physical findings, whether decompression of the opposite side of the chest may be needed.
5. If the initial NDC was successful, but symptoms later recur:
- Perform another NDC at the same site that was used previously. Use a new needle/catheter unit for the repeat NDC.
 - Continue to re-assess!
6. If the second NDC is also not successful:
- Continue on to the Circulation section of the TCCC Guidelines.
- b. All open and/or sucking chest wounds should be treated by immediately applying a vented chest seal to cover the defect. If a vented chest seal is not available, use a non-

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.

- 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.
- 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.

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.

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.

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.)

- If not in shock:
 - No IV fluids are immediately necessary.

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

- 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.

- 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.

- 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.

- 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.

Note:

* 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.

e. Refractory Shock

- If a casualty in shock is not responding to fluid resuscitation, consider untreated tension pneumothorax as a possible cause of refractory shock. Thoracic trauma, persistent respiratory distress, absent breath sounds, and hemoglobin oxygen saturation < 90% support this diagnosis. Treat as indicated with repeated NDC or

finger thoracostomy/chest tube insertion at the 5th ICS in the AAL, according to the skills, experience, and authorizations of the treating medical provider. Note that if finger thoracostomy is used, it may not remain patent and finger decompression through the incision may have to be repeated. Consider decompressing the opposite side of the chest if indicated based on the mechanism of injury and physical findings.

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).
- 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.

8. Penetrating Eye Trauma

a. If a penetrating eye injury is noted or suspected:

- Perform a rapid field test of visual acuity and document findings.

- Cover the eye with a rigid eye shield (NOT a pressure patch.)

- Ensure that the 400 mg moxifloxacin tablet in the Combat Wound Medication Pack (CWMP) is taken if possible and that IV/IM antibiotics are given as outlined below if oral moxifloxacin cannot be taken.

9. Monitoring

a. Initiate advanced electronic monitoring if indicated and if monitoring equipment is available.

10. Analgesia

a. Analgesia on the battlefield should generally be achieved using one of three options:

- 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

- 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 μ g
 - * Place lozenge between the cheek and the gum
 - * Do not chew the lozenge

- 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)

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

- 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 patient'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

- 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.

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- 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.
- 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.
- 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.
- k. Ondansetron, 4 mg Orally Dissolving Tablet (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!

11. Antibiotics: recommended for all open combat wounds

a. If able to take PO meds:

- Moxifloxacin (from the CWMP), 400 mg PO once a day

b. If unable to take PO meds (shock, unconsciousness):

- Ertapenem, 1 gm IV/IM once a day

12. Inspect and dress known wounds.

13. Check for additional wounds.

14. Burns

- a. Facial burns, especially those that occur in closed spaces, may be associated with inhalation injury. Aggressively monitor airway status and oxygen saturation in such patients and consider early surgical airway for respiratory distress or oxygen desaturation.

- b. Estimate total body surface area (TBSA) burned to the nearest 10% using the Rule of Nines.

- c. Cover the burn area with dry, sterile dressings. For extensive burns (>20%), consider placing the casualty in the Heat-Reflective Shell or Blizzard Survival Blanket from the Hypothermia Prevention Kit in order to both cover the burned areas and prevent hypothermia.
- d. Fluid resuscitation (USAISR Rule of Ten)
- If burns are greater than 20% of TBSA, fluid resuscitation should be initiated as soon as IV/IO access is established. Resuscitation should be initiated with Lactated Ringer's, normal saline, or Hextend. If Hextend is used, no more than 1000 ml should be given, followed by Lactated Ringer's or normal saline as needed.
 - Initial IV/IO fluid rate is calculated as %TBSA x 10 ml/hr for adults weighing 40- 80 kg.
 - For every 10 kg ABOVE 80 kg, increase initial rate by 100 ml/hr.
 - If hemorrhagic shock is also present, resuscitation for hemorrhagic shock takes precedence over resuscitation for burn shock. Administer IV/IO fluids per the TCCC Guidelines in Section (6).
- e. Analgesia in accordance with the TCCC Guidelines in Section (10) may be administered to treat burn pain.

- f. Prehospital antibiotic therapy is not indicated solely for burns, but antibiotics should be given per the TCCC guidelines in Section (11) if indicated to prevent infection in penetrating wounds.

- g. All TCCC interventions can be performed on or through burned skin in a burn casualty.

- h. Burn patients are particularly susceptible to hypothermia. Extra emphasis should be placed on barrier heat loss prevention methods.

15. Splint fractures and re-check pulses.

16. Communication

- a. Communicate with the casualty if possible. Encourage, reassure and explain care.

- b. Communicate with tactical leadership as soon as possible and throughout casualty treatment as needed. Provide leadership with casualty status and evacuation requirements to assist with coordination of evacuation assets.

- c. Communicate with the evacuation system (the Patient Evacuation Coordination Cell) to arrange for TACEVAC. Communicate with medical providers on the evacuation asset if possible and relay mechanism of injury, injuries sustained, signs/symptoms, and treatments rendered. Provide additional information as appropriate.

17. Cardiopulmonary resuscitation (CPR)

- a. Resuscitation on the battlefield for victims of blast or penetrating trauma who have no pulse, no ventilations, and no other signs of life will not be successful and should not be attempted. However, casualties with torso trauma or polytrauma who have no pulse or respirations during TFC should have bilateral needle decompression performed to ensure they do not have a tension pneumothorax prior to discontinuation of care. The procedure is the same as described in section 5.a. above.

18. Documentation of Care

- a. Document clinical assessments, treatments rendered, and changes in the casualty's status on a TCCC Card (DD Form 1380). Forward this information with the casualty to the next level of care.

19. Prepare for Evacuation.

- a. Complete and secure the TCCC Card (DD 1380) to the casualty.
- b. Secure all loose ends of bandages and wraps.
- c. Secure hypothermia prevention wraps/blankets/straps.

- d. Secure litter straps as required. Consider additional padding for long evacuations.

- e. Provide instructions to ambulatory patients as needed.

- f. Stage casualties for evacuation in accordance with unit standard operating procedures.

- g. Maintain security at the evacuation point in accordance with unit standard operating procedures.

Basic Management Plan for Tactical Evacuation Care

* The term “Tactical Evacuation” includes both Casualty Evacuation (CASEVAC) and Medical Evacuation (MEDEVAC) as defined in Joint Publication 4-02.

1. Transition of Care

- a. Tactical force personnel should establish evacuation point security and stage casualties for evacuation.

- b. Tactical force personnel or the medic should communicate patient information and status to TACEVAC personnel as clearly as possible. The minimum information communicated should include stable or unstable, injuries identified, and treatments rendered.

- c. TACEVAC personnel should stage casualties on evacuation platforms as required.

- d. Secure casualties in the evacuation platform in accordance with unit policies, platform configurations and safety requirements.

- e. TACEVAC medical personnel should re-assess casualties and re-evaluate all injuries and previous interventions.

2. Massive Hemorrhage

- a. Assess for unrecognized hemorrhage and control all sources of bleeding. If not already done, use a CoTCCC-recommended limb tourniquet to control life-threatening external hemorrhage that is anatomically amenable to tourniquet use or for any traumatic amputation. Apply directly to the skin 2-3 inches above the bleeding site. If bleeding is

not controlled with the first tourniquet, apply a second tourniquet side-by-side with the first.

b. For compressible (external) hemorrhage not amenable to limb tourniquet use or as an adjunct to tourniquet removal, use Combat Gauze as the CoTCCC hemostatic dressing of choice.

- Alternative hemostatic adjuncts:

- Celox Gauze or
- ChitoGauze or
- XStat (Best for deep, narrow-tract junctional wounds)

- Hemostatic dressings should be applied with at least 3 minutes of direct pressure (optional for XStat). Each dressing works differently, so if one fails to control bleeding, it may be removed and a fresh dressing of the same type or a different type applied. (Note: XStat is not to be removed in the field, but additional XStat, other hemostatic adjuncts, or trauma dressings may be applied over it.)

- If the bleeding site is amenable to use of a junctional tourniquet, immediately apply a CoTCCC-recommended junctional tourniquet. Do not delay in the application of the junctional tourniquet once it is ready for use. Apply hemostatic dressings with direct pressure if a junctional tourniquet is not available or while the junctional tourniquet is being readied for use.

3. Airway Management

a. Conscious casualty with no airway problem identified:

- No airway intervention required

b. Unconscious casualty without airway obstruction:

- Place casualty in the recovery position
- Chin lift or jaw thrust maneuver **or**
- Nasopharyngeal airway **or**
- Extraglottic airway

c. Casualty with airway obstruction or impending airway obstruction:

- Allow a conscious casualty to assume any position that best protects the airway, to include sitting up.
- Use a chin lift or jaw thrust maneuver
- Use suction if available and appropriate
- Nasopharyngeal airway **or**
- Extraglottic airway (if the casualty is unconscious)
- Place an unconscious casualty in the recovery position

- d. If the previous measures are unsuccessful, assess the tactical and clinical situations, the equipment at hand, and the skills and experience of the person providing care, and then select one of the following airway interventions:
- Endotracheal intubation or

 - Perform a surgical cricothyroidotomy using one of the following:
 - Cric-Key technique (Preferred option)

 - Bougie-aided open surgical technique using a flanged and cuffed airway cannula of less than 10 mm outer diameter, 6-7 mm internal diameter, and 5-8 cm of intra-tracheal length

 - Standard open surgical technique using a flanged and cuffed airway cannula of less than 10 mm outer diameter, 6-7 mm internal diameter and 5-8 cm of intra-tracheal length (Least desirable option)

 - Use lidocaine if the casualty is conscious.
- e. Cervical spine stabilization is not necessary for casualties who have sustained only penetrating trauma.
- f. Monitor the hemoglobin oxygen saturation in casualties to help assess airway patency. Use capnography monitoring in this phase of care if available.
- g. Always remember that the casualty's airway status may change over time and requires frequent reassessment.

Notes:

* The i-gel is the preferred extraglottic airway because its gel-filled cuff makes it simpler to use and avoids the need for cuff inflation and monitoring. If an extraglottic airway with an air-filled cuff is used, the cuff pressure must be monitored to avoid overpressurization, especially during TACEVAC on an aircraft with the accompanying pressure changes.

* Extraglottic airways will not be tolerated by a casualty who is not deeply unconscious. If an unconscious casualty without direct airway trauma needs an airway intervention, but does not tolerate an extraglottic airway, consider the use of a nasopharyngeal airway.

* For casualties with trauma to the face and mouth, or facial burns with suspected inhalation injury, nasopharyngeal airways and extraglottic airways may not suffice and a surgical cricothyroidotomy may be required.

* Surgical cricothyroidotomies should not be performed on unconscious casualties who have no direct airway trauma unless use of a nasopharyngeal airway and/or an extraglottic airway have been unsuccessful in opening the airway.

4. Respiration/Breathing

- a. Assess for tension pneumothorax and treat as necessary.
 1. Suspect a tension pneumothorax and treat when a casualty has significant torso trauma or primary blast injury and one or more of the following:
 - Severe or progressive respiratory distress
 - Severe or progressive tachypnea
 - Absent or markedly decreased breath sounds on one side of the chest
 - Hemoglobin oxygen saturation < 90% on pulse oximetry
 - Shock
 - Traumatic cardiac arrest without obviously fatal wounds

Note:

* If not treated promptly, tension pneumothorax may progress from respiratory distress to shock and traumatic cardiac arrest.

2. Initial treatment of suspected tension pneumothorax:

- If the casualty has a chest seal in place, burp or remove the chest seal.

- Establish pulse oximetry monitoring.

- Place the casualty in the supine or recovery position unless he or she is conscious and needs to sit up to help keep the airway clear as a result of maxillofacial trauma.

- Decompress the chest on the side of the injury with a 14-gauge or a 10-gauge, 3.25-inch needle/catheter unit.

- If a casualty has significant torso trauma or primary blast injury and is in traumatic cardiac arrest (no pulse, no respirations, no response to painful stimuli, no other signs of life), decompress both sides of the chest before discontinuing treatment.

Notes:

* Either the 5th intercostal space (ICS) in the anterior axillary line (AAL) or the 2nd ICS in the mid-clavicular line (MCL) may be used for needle decompression (NDC.) If the anterior (MCL) site is used, do not insert the needle medial to the nipple line.

* The needle/catheter unit should be inserted at an angle perpendicular to the chest wall and just over the top of the lower rib at the insertion site. Insert the needle/catheter unit all the way to the hub and hold it in place for 5-10 seconds to allow decompression to occur.

* After the NDC has been performed, remove the needle and leave the catheter in place.

3. The NDC should be considered successful if:

- Respiratory distress improves, or

- There is an obvious hissing sound as air escapes from the chest when NDC is performed (this may be difficult to appreciate in high-noise environments), or

- Hemoglobin oxygen saturation increases to 90% or greater (note that this may take several minutes and may not happen at altitude), or

- A casualty with no vital signs has return of consciousness and/or radial pulse.

4. If the initial NDC fails to improve the casualty's signs/symptoms from the suspected tension pneumothorax:

- Perform a second NDC on the same side of the chest at whichever of the two recommended sites was not previously used. Use a new needle/catheter unit for the second attempt.

- Consider, based on the mechanism of injury and physical findings, whether decompression of the opposite side of the chest may be needed.

5. If the initial NDC was successful, but symptoms later recur:

- Perform another NDC at the same site that was used previously. Use a new needle/catheter unit for the repeat NDC.

- Continue to re-assess!

6. If the second NDC is also not successful:

- Continue on to the Circulation section of the TCCC Guidelines.

b. Initiate pulse oximetry if not previously done. All individuals with moderate/severe TBI should be monitored with pulse oximetry. Readings may be misleading in the settings of shock or marked hypothermia.

c. Most combat casualties do not require supplemental oxygen, but administration of oxygen may be of benefit for the following types of casualties:

- Low oxygen saturation by pulse oximetry
- Injuries associated with impaired oxygenation
- Unconscious casualty
- Casualty with TBI (maintain oxygen saturation > 90%)
- Casualty in shock
- Casualty at altitude

- Known or suspected smoke inhalation

d. All open and/or sucking chest wounds should be treated by immediately applying a vented chest seal to cover the defect. If a vented chest seal is not available, use a non-vented chest seal. Monitor the casualty for the potential development of a subsequent tension pneumothorax. If the casualty develops increasing hypoxia, respiratory distress, or hypotension and a tension pneumothorax is suspected, treat by burping or removing the dressing or by needle decompression.

5. 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
- 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.

- 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.

- 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.

b. IV Access

- Reassess need for IV access.

- IV or 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.

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 Ringers 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 second infusion of 1 gm TXA after initial fluid resuscitation has been completed.

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, 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.)
 - If not in shock:
 - No IV fluids are immediately necessary.

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

- 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.

- 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.

- 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.
- 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.

Note:

* 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 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.

e. Refractory Shock

- If a casualty in shock is not responding to fluid resuscitation, consider untreated tension pneumothorax as a possible cause of refractory shock. Thoracic trauma, persistent respiratory distress, absent breath sounds, and hemoglobin oxygen saturation < 90% support this diagnosis. Treat as indicated with repeated NDC or finger thoracostomy/chest tube insertion at the 5th ICS in the AAL, according to the skills, experience, and authorizations of the treating medical provider. Note that if finger thoracostomy is used, it may not remain patent and finger decompression through the incision may have to be repeated. Consider decompressing the opposite side of the chest if indicated based on the mechanism of injury and physical findings.

6. Traumatic Brain Injury

a. Casualties with moderate/severe TBI should be monitored for:

- Decreases in level of consciousness

- Pupillary dilation

- SBP should be >90 mmHg

- O2 sat > 90

- Hypothermia

- End-tidal CO2 (If capnography is available, maintain between 35-40 mmHg)

- Penetrating head trauma (if present, administer antibiotics)

- Assume a spinal (neck) injury until cleared.

b. Unilateral pupillary dilation accompanied by a decreased level of consciousness may signify impending cerebral herniation; if these signs occur, take the following actions to decrease intracranial pressure:

- Administer 250 ml of 3 or 5% hypertonic saline bolus.

- Elevate the casualty's head 30 degrees.

- Hyperventilate the casualty.
 - Respiratory rate 20

- Capnography should be used to maintain the end-tidal CO₂ between 30-35 mmHg

- The highest oxygen concentration (FIO₂) possible should be used for hyperventilation.

*Note:

Do not hyperventilate the casualty unless signs of impending herniation are present. Casualties may be hyperventilated with oxygen using the bag-valve-mask technique.

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).

- 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 poncho liners, sleeping bags, or anything that will retain heat and keep the casualty dry.

- f. Use a portable fluid warmer capable of warming all IV fluids including blood products.

g. Protect the casualty from wind if doors must be kept open.

8. Penetrating Eye Trauma

a. If a penetrating eye injury is noted or suspected:

- Perform a rapid field test of visual acuity and document findings.

- Cover the eye with a rigid eye shield (NOT a pressure patch.)

- Ensure that the 400 mg moxifloxacin tablet in the Combat Wound Medication Pack (CWMP) is taken if possible and that IV/IM antibiotics are given as outlined below if oral moxifloxacin cannot be taken.

9. Monitoring

a. Initiate advanced electronic monitoring if indicated and if monitoring equipment is available.

10. Analgesia

a. Analgesia on the battlefield should generally be achieved using one of three options:

- Option 1
 - Mild to Moderate Pain
 - Casualty is still able to fight
 - TCCC CWMP
 - * Tylenol – 650 mg bilayer caplet, 2 PO every 8 hours
 - * Meloxicam - 15 mg PO once a day

- 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 µg
 - * Place lozenge between the cheek and the gum
 - * Do not chew the lozenge

- 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)

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
- 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 patient'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
- 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.
- 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 can complain of pain, then the TBI is likely not severe enough to preclude the use of ketamine or OTFC.

- 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.
- 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.
- 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!

11. Antibiotics: recommended for all open combat wounds

a. If able to take PO meds:

- Moxifloxacin, (from CWMP) 400 mg PO once a day

b. If unable to take PO meds (shock, unconsciousness):

- Ertapenem, 1 gm IV/IM once a day

12. Inspect and dress known wounds.

13. Check for additional wounds.

14. Burns

- a. Facial burns, especially those that occur in closed spaces, may be associated with inhalation injury. Aggressively monitor airway status and oxygen saturation in such patients and consider early surgical airway for respiratory distress or oxygen desaturation.

- b. Estimate total body surface area (TBSA) burned to the nearest 10% using the Rule of Nines.

- c. Cover the burn area with dry, sterile dressings. For extensive burns (>20%), consider placing the casualty in the Heat-Reflective Shell or Blizzard Survival Blanket from the Hypothermia Prevention Kit to both cover the burned areas and prevent hypothermia.

- d. Fluid resuscitation (USAISR Rule of Ten)
 - If burns are greater than 20% of TBSA, fluid resuscitation should be initiated as soon as IV/IO access is established. Resuscitation should be initiated with Lactated Ringer's, normal saline, or Hextend. If Hextend is used, no more than 1000 ml should be given, followed by Lactated Ringer's or normal saline as needed.

 - Initial IV/IO fluid rate is calculated as %TBSA x 10 ml/hr for adults weighing 40- 80 kg.

 - For every 10 kg ABOVE 80 kg, increase initial rate by 100 ml/hr.

- If hemorrhagic shock is also present, resuscitation for hemorrhagic shock takes precedence over resuscitation for burn shock. Administer IV/IO fluids per the TCCC Guidelines in Section (6).

- e. Analgesia in accordance with the TCCC Guidelines in Section (10) may be administered to treat burn pain.

- f. Prehospital antibiotic therapy is not indicated solely for burns, but antibiotics should be given per the TCCC guidelines in Section (11) if indicated to prevent infection in penetrating wounds.

- g. All TCCC interventions can be performed on or through burned skin in a burn casualty.

- h. Burn patients are particularly susceptible to hypothermia. Extra emphasis should be placed on barrier heat loss prevention methods and IV fluid warming in this phase.

15. Reassess fractures and recheck pulses.

16. Communication

- a. Communicate with the casualty if possible. Encourage, reassure and explain care.

- b. Communicate with medical providers at the next level of care as feasible and relay mechanism of injury, injuries sustained, signs/symptoms, and treatments rendered. Provide additional information as appropriate.

