1. Tactical Combat Casualty Care for Medical Personnel August 2018
   (Based on TCCC-MP Guidelines 180801)
   Direct from the Battlefield:
   Tactical Combat Casualty Care
   Performance Improvement Items

   In its pursuit of performance improvement and quality assurance, the CoTCCC actively gathers and analyzes information on TCCC training, implementation, and efficacy. In this presentation we will examine several situations that presented important lessons learned.

2. Disclaimer
   “The opinions or assertions contained herein are the private views of the authors and are not to be construed as official or as reflecting the views of the Departments of the Army, Air Force, Navy or the Department of Defense.”
   - There are no conflict of interest disclosures.
   Read the disclaimer.

3. Learning Objective
   IDENTIFY the Lessons Learned and Opportunities to Improve in TCCC identified during the conflicts in Iraq and Afghanistan

   LEARNING OBJECTIVE
   IDENTIFY the Lessons Learned and Opportunities to Improve in TCCC identified during the conflicts in Iraq and Afghanistan
   Read the text.
### Sources for TCCC Opportunities to Improve:

- Reports from Joint Trauma System (JTS) weekly Trauma Telecons – every Thursday morning
  - Worldwide telecon to discuss every serious casualty admitted to a Role 3 hospital from that week
- Published medical reports
- Armed Forces Medical Examiner’s System
- Theater AARs
- Feedback from doctors, PAs, corpsmen, medics, and PJs

Opportunities to improve TCCC come to the CoTCCC from a number of sources.

### The Forgotten Tourniquet

- There was an adverse outcome from a tourniquet that was left in place for approximately 8 hours.
- Be aggressive about putting tourniquets on in Care Under Fire for any life-threatening extremity hemorrhage BUT
- Reassess the casualty in Tactical Field Care – remove a tourniquet if it is not needed - unless the casualty is in shock.
- Always re-evaluate tourniquets at two hours and remove if possible.

Read the text.
## Tourniquet Mistakes to Avoid!

<table>
<thead>
<tr>
<th>7.</th>
<th>Tourniquet Mistakes to Avoid!</th>
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</thead>
<tbody>
<tr>
<td>• Not using a tourniquet when you should</td>
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<tr>
<td>• Using a tourniquet for minimal bleeding</td>
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<tr>
<td>• Leaving the tourniquet too high— if placed &quot;high and tight&quot; during Care Under Fire (move to just above the wound during TFC)</td>
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<tr>
<td>• Not taking it off when indicated during TFC</td>
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<tr>
<td>• Taking the tourniquet off when the casualty is in shock or has only a short transport time to the hospital</td>
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<tr>
<td>• Not making it tight enough – the tourniquet should both stop the bleeding and eliminate the distal pulse if the distal extremity is intact</td>
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## Tourniquet Mistakes to Avoid!

<table>
<thead>
<tr>
<th>8.</th>
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<tbody>
<tr>
<td>• Not using a second tourniquet if needed</td>
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<tr>
<td>• Waiting too long to put a tourniquet on</td>
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<tr>
<td>• Periodically loosening the tourniquet to allow blood flow to the injured extremity</td>
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<tr>
<td>• Failing to reassess to make sure the bleeding is still stopped</td>
<td></td>
</tr>
<tr>
<td>• Not attempting to convert a tourniquet if it has been on for two hours</td>
<td></td>
</tr>
</tbody>
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Read the text.
<table>
<thead>
<tr>
<th>No.</th>
<th>Opioid Analgesics for Casualties in Shock</th>
<th>NO Opioid Analgesia for Casualties in Shock</th>
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<tbody>
<tr>
<td>9</td>
<td></td>
<td>NO Opioid Analgesia for Casualties in Shock</td>
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<td></td>
<td><strong>Opioid Analgesics for Casualties in Shock</strong></td>
<td><strong>NO Opioid Analgesia for Casualties in Shock</strong></td>
</tr>
</tbody>
</table>
| 10  | | • Narcotics (morphine and fentanyl) are CONTRAINDICATED for casualties who are in shock or who are likely to go into shock; these agents may worsen their shock and increase the risk of death  
  • Four casualties in two successive weekly telecons were noted to have received narcotics and were in shock during transport or on admission to the MTFs  
  • Use ketamine for casualties who are in shock or at risk of going into shock but are still having significant pain |
| 11  | | JTS Case Report 2017 |
|     | JTS Case Report 2017 | JTS Case Report 2017 |
|     | • Casualty injured in a dIED attack  
  • CPR in progress on arrival at forward surgical capability  
  • Multiple abdominal and pelvic injuries  
    – Severe liver laceration (requiring packing)  
    – Splenic laceration  
    – Significant mesenteric bleeding  
    – Left iliac vein injury  
    – Pelvic fracture  
    – Zone 1 REBOA placed with return of VS | • Casualty injured in a dIED attack  
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Read the text.
12. **JTS Case Report 2017**

- Re-operated at Role 3 hospital several times
- Stormy course but stabilized and was off pressor medications at time of transport
- Private transport to a NATO partner hospital
- On Precedex & ketamine at the Role 3, but changed to fentanyl and midazolam by the flight team
- Casualty became hypotensive and was treated with escalating dose Levophed drip
- Arrived at coalition partner hospital unstable
- Died shortly thereafter of multi-organ failure

13. **Untreated Pain on the Battlefield**

14. **JTS Case Report 2017**

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**Read the text.**

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**Untreated Pain on the Battlefield**

- Jul 2103 – Feb 2014
- N = 191 casualties
- Prior to MEDEVAC

Amputations: 57% had no pain meds
GSW: 59% had no pain meds

Almost 2/3 of these seriously wounded casualties got no pre-hospital treatment for pain.

Furthermore, several of them received IM morphine which is clearly not the contemporary standard of care.

### Case Report

- Male casualty with GSW to thigh
- Bleeding controlled by tourniquet
- In shock – alert but hypotensive
- Severe pain from tourniquet
- Repeated pleas to PA to remove the tourniquet
- PA did not want to use opioids because of the shock
- Perfect candidate for ketamine analgesia
- Ketamine not fielded at the time with this unit
- 50 mg ketamine autoinjectors would help - but approval from the FDA is needed to use ketamine in that mode

### Opioid Analgesics Given in Combination with Benzodiazepines

**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

**Read the text.**

There is a black box warning from the FDA about midazolam causing respiratory depression and arrest even when used as a single agent. This effect is potentiated when midazolam is used in conjunction with opioids.
<table>
<thead>
<tr>
<th>18.</th>
<th>Penetrating Eye Injuries</th>
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<tbody>
<tr>
<td>19.</td>
<td>Penetrating Eye Trauma</td>
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<tr>
<td></td>
<td>• Rigid eye shield for obvious or suspected eye wounds - often not being done – SHIELD AND SHIP!</td>
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</tr>
<tr>
<td></td>
<td>• Not doing this may cause permanent loss of vision – use a shield for any injury in or around the eye.</td>
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</tr>
<tr>
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<td>• Eye shields are not always in IFAKs. You can use eye protection instead (i.e., tactical eyewear).</td>
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</tr>
<tr>
<td></td>
<td>• IED + no eye pro + facial wounds = Suspected Eye Injury!</td>
<td></td>
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</tbody>
</table>

* The eye on the left has a good chance of recovering vision. The eye on the right will have to be surgically removed.

| 20. | Patched Open Globe        |
|     | • Shrapnel in right eye from IED |
|     | • Had rigid eye shield placed |
|     | • Reported as both pressure patched and as having a gauze pad placed under the eye shield without pressure |
|     | • Extruded uveal tissue (intraocular contents) noted at time of operative repair of globe |
|     | • Do not place gauze on injured eyes! COL Robb Mazzoli: Gauze can adhere to iris tissue and cause further extrusion when removed even if no pressure is applied to eye. |
|     | • At least two other known occurrences of patching open globe injuries |

* COL Robb Mazzoli was formerly the Army Surgeon General’s Consultant for Ophthalmology. Reminder: Rigid eye shields are GOOD, and pressure patches are BAD for eye trauma. You should put no gauze underneath the shield at all – may cause problems as noted here.
### Antibiotics after Eye Injuries

- 2010 casualty with endophthalmitis (blinding infection inside the eye)
- Reminder – shield and moxifloxacin in the field for penetrating eye injuries – use combat pill pack!
- Also – moxi, both topically and systemically, should be continued in MTFs
- Many antibiotics do not penetrate well into the eye

Eye infections can cause permanent loss of vision after eye injury. Give antibiotics in the Combat Pill Pack to help prevent them!

### Tension Pneumothorax

- One U.S. combat fatality in 2014 was found to have died with a tension pneumothorax
- No evidence of attempted needle decompression
- Monitor anyone with torso trauma or polytrauma for respiratory distress – perform needle decompression when indicated
- ALWAYS do bilateral NDC for a casualty with torso trauma who loses vital signs on the battlefield – this may be lifesaving

Read the text.
### 24. Combat Gauze

**Combat Gauze**

### 25. External Hemorrhage – No Combat Gauze

- Casualty with gunshot wound in the left infraclavicular area with external hemorrhage
- “Progressive deterioration”
- External hemorrhage noted to increase as casualty resuscitated in ED
- *No* record of Combat Gauze use
- All injuries noted to be extrapleural
- Lesson learned: see following slide

**External Hemorrhage – No Combat Gauze**

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**Read the text.**

### 26. Combat Gauze

*It doesn’t work if you don’t use it.*

**Combat Gauze**

*It doesn’t work if you don’t use it.*

**Read the text.**

### 27. Junctional Hemorrhage

**Junctional Hemorrhage**
<table>
<thead>
<tr>
<th>28.</th>
<th>Junctional Hemorrhage</th>
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<tbody>
<tr>
<td></td>
<td>A U.S. casualty in 2013 sustained a GSW to the inguinal area.</td>
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</tr>
<tr>
<td></td>
<td>The CASEVAC platform did not have junctional tourniquets aboard.</td>
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<tr>
<td></td>
<td>The subsequent junctional hemorrhage was only partially controlled with Combat Gauze.</td>
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<tr>
<td></td>
<td>Casualty went into hemorrhagic shock and had to be transfused.</td>
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<tr>
<td>29.</td>
<td>Junctional Hemorrhage: IED Blast Injury</td>
<td>IED Blast Injury</td>
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<td>In one IED attack, 3 of 5 casualties had complex blast injuries.</td>
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<td></td>
<td>All 3 had high LE amputations and reported difficulty with hemorrhage control despite tourniquet use.</td>
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<tr>
<td></td>
<td>Combat Gauze was reportedly not used.</td>
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<td></td>
<td>All 3 would have been excellent candidates for a junctional tourniquet – none were fielded with this unit.</td>
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<td>All 3 casualties required massive transfusions upon arrival at the Role 2 MTF.</td>
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<th>Junctional Tourniquets</th>
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<tbody>
<tr>
<td></td>
<td>Combat Ready Clamp, JETT, Sam Junctional Tourniquet</td>
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<td></td>
<td>Junctional tourniquets: They don’t work if your unit doesn’t have them.</td>
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<td>31.</td>
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<thead>
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<th></th>
<th>Issues with Current TCCC Training</th>
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<tbody>
<tr>
<td>32.</td>
<td>- There is significant variation among TCCC courses, both military and commercial.</td>
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<td></td>
<td>- Some segments of the DoD have had no TCCC training.</td>
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<td></td>
<td>- Some TCCC courses contain inappropriate training.</td>
<td>Read the text.</td>
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<thead>
<tr>
<th></th>
<th>Problems with Non-Standard TCCC Courses</th>
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<tbody>
<tr>
<td>33.</td>
<td>- Incorrect messaging</td>
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<td>- Instructor drift</td>
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<td></td>
<td>- &quot;Never take off a tourniquet in the field&quot;</td>
<td>- &quot;Never take off a tourniquet in the field&quot;</td>
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<tr>
<td></td>
<td>- Inappropriate training</td>
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<tr>
<td></td>
<td>- Vendor-supplied training is expensive</td>
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</table>

The recommended curriculum in TCCC is the one developed and continually updated by the Committee on Tactical Combat Casualty Care and approved by the Joint Trauma System. Any deviation from this curriculum cannot claim to be TCCC. Problems like these occur when training vendors and independent military training centers are not held to the standard curriculum.
Instructor Drift in a “TCCC” course, 2015

- TBI does not contraindicate ketamine.
- Shock does not contra-indicate ketamine.
- No one is likely to be allergic to both ketamine and opioids.

This algorithm is from a TCCC course put on by a service trauma training center. It departs from TCCC Guidelines at a number of points:

- It ignores the analgesic option that can be used even if the tactical scenario is likely to revert to Care Under Fire (meloxicam and acetaminophen).
- It appears to discourage indicated analgesics even in Tactical Field Care.
- Neither TBI nor hemorrhagic shock is a contraindication to the use of ketamine.
- It is unlikely that any individual would be allergic to both ketamine and opioids.
- This is not the triple-option analgesia recommended in TCCC guidelines. It is an excellent example of instructor drift.

Inappropriate Training

- “Shock labs”
- “Cognition labs”
- Insertion of intraosseous devices on course attendee volunteers
- Regional nerve blocks by non-medical personnel
- Central venous catheter placement by prehospital providers
- Arterial blood draws

These are examples of inappropriate training that have been identified in some vendor-supplied “TCCC” courses.

- In “shock labs”, volunteers are given hypotensive medications so that they can experience the signs and symptoms of hypovolemic shock.
- In “cognition labs”, volunteers are given mind-altering substances like ketamine and tested on tasks like manual dexterity.
NAEMT TCCC Courses: Advantages

- JTS recommends that TCCC should be a credential-producing training program for the MHS.
- NAEMT TCCC courses and instructor courses follow the CoTCCC-developed/JTS-approved curriculum without deviation.
- NAEMT TCCC instructors undergo Quality Assurance evaluation.
- The recommended TCCC training provided through the NAEMT educational system costs much less than equivalent training purchased from for-profit TCCC vendors.

The TCCC curriculum as taught by NAEMT adheres to the CoTCCC guidelines and is updated as the CoTCCC curriculum is updated. This course is internationally recognized and provides a TCCC card with the logos of the groups that have endorsed the concepts that the course contains: the American College of Surgeons Committee on Trauma, the JTS, the CoTCCC and the NAEMT. This course is currently the best option available to ensure consistent and high-quality training in TCCC across the DoD.

NAEMT TCCC Courses: Advantages

- The NAEMT system issues and tracks certification for instructors and students.
- Cards and registries
- The NAEMT system for establishing training sites is working very well for military commands using it.
- NAEMT TCCC courses do not include live tissue training with its associated expense and logistic burden.
- NAEMT TCCC courses are endorsed by the ACS-COT.
- Additional training such as trauma lanes, field exercises, and live tissue training could be added to supplement the basic TCCC curriculum as unit time and resources allow.

TCCC Training for ALL combatants:

Self and buddy aid should be part of the Warrior Culture in all combat units.

Now mandated by DoD Instruction 1322.24

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Read the text.
### Eliminating Preventable Death on the Battlefield

1. Kotwal et al – Archives of Surgery 2011
2. All Rangers and docs trained in TCCC
3. U.S. military preventable deaths: 24%
4. Ranger preventable death incidence: 3%
5. Almost a 90% difference in preventable deaths

The 75th Ranger Regiment achieved the lowest preventable death rate ever recorded. They did this by training all their soldiers in TCCC, not just their medics.

### TCCC in Canadian Forces

- Canadian Forces use TCCC, and credit it with helping achieve the highest casualty survival rate in their history. They also train both medics and soldiers in TCCC.

### Train ALL Combatants in TCCC

- Service medical departments are responsible for training combat medical personnel only.
- Line commanders must take the lead to have an effective TCCC training program for all combatants.
- The Ranger First Responder Course is the best model.

The JTS also recommends the TCCC for All Combatants curriculum as the minimum standard for TCCC training for non-medical personnel. This training could also be provided via an NAEMT/MHS/JTS program like TCCC for Medical Personnel. All the services should train medics and soldiers, sailors, airmen, and marines in TCCC like the 75th Rangers do.

### TCCC: The Combat Leader's Responsibility

- "…medical care is commander's business—scratch that, leaders' business. I, and all of my subordinate commanders, and any leader at any level in the military are all responsible for our fellow service members' well-being. We can delegate authority to the medical community, but not the responsibility for ensuring it is taken care of."
- General Joseph Votel, Commander US Central Command 3 May 2018

This is a remark made by the CENTCOM Commander.
<table>
<thead>
<tr>
<th></th>
<th>Documentation of TCCC Care</th>
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<tbody>
<tr>
<td>43.</td>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
</tr>
</tbody>
</table>
| 44. | **TCCC Card – Fill It Out!**  
  • You haven’t finished taking care of your casualty until this is done  
  • Mission Commanders – this is a *leadership* issue! | TCCC Card – Fill It Out!  
  ![Image](image3.png)  
  Read the text. |
| 45. | ![Image](image4.png) | **TCCC Card (DD Form 1380)**  
  ![Image](image5.png)  
  This shows both sides of the TCCC Card.  
| 46. | ![Image](image6.png) | **TCCC AAR**  
  ![Image](image7.png)  
  The AAR can be downloaded from the Joint Trauma System website.  
| 47. | Questions? | Questions? |