

PARARESCUE MEDICAL OPERATIONS HANDBOOK



8th Edition, January 2021



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DUNS #070397122 / Cage #6F0Z6

Primary SIC Code: 2721

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Disclaimer: The Pararescue Medical Operations Handbook is a resource for Pararescue (PJ) medical personnel with advanced skills and knowledge, operating in tactical, remote or austere environments. The purpose of the handbook is to provide these medical professionals a resource that outlines the latest techniques and procedures used in the PJ community.

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please contact the Pararescue Medical Program Manager.**

PREFACE – This eighth edition of the Pararescue (PJ) Medical Operations Handbook (HB) is a refinement of the seventh edition which reflected the evolution of PJ Medicine (PJ MED) over the past half century, the Global War on Terror, other Overseas Contingency Operations (GWOT/OCO), and progressive civil search and rescue (SAR) missions. PJs have distinguished themselves in combat, civil SAR, and humanitarian assistance (HA) operations, and proved time and again the vital and unique role served in the Department of Defense.

The guidelines reflect the advanced knowledge and skills required to treat injured or ill patients in all circumstances to include remote, austere and non-permissive environments.

There are several factors that define PJ MED and make it unique. PJ MED is comprised of the following:

- National Registry Paramedic Certification
- Tactical Combat Casualty Care (TCCC)
- United States Special Operations Command (USSOCOM) Advanced Tactical Paramedic (ATP) Guidelines including trauma and medical protocols
- Dive Medicine
- Wilderness and Environmental Medicine (e.g., high altitude, extreme weather, maritime operations, etc.)
- Fixed-Wing (FW) and Rotary-Wing (RW) in-flight medical care
- Expertise in the management of disasters and Mass Casualty Incidents (MCI)
- Prolonged Field Care including basic critical care
- Rescue medicine associated with technical rescues

PJs are the only asset routinely trained to provide care during all three phases of TCCC: care under fire, tactical field care (TFC), and tactical evacuation (TACEVAC).

Since participating in Operation Enduring Freedom as dedicated TACEVAC assets, PJs have developed more expertise than ever before with the RW movement and care of critically injured patients after retrieving them from the point of injury (POI), resulting in increased sophistication of medical protocols and procedures. The robust nature of rotary wing tactical evacuation led to the expansion of helicopter specific medical operations.

Other operations have led to the development of more robust Prolonged Field Care guidelines (PFC) which are now also included in the HB.

Additional sections including the MTPs (Medical and Trauma Protocols) and palliative care for unique situations in prolonged care and recovery operations have also been added.

Finally, PJ expertise in MCI, and observations from domestic mass shootings and bombings, has led to an expansion of the PJ MCI protocol section.

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1. Introduction

Foreword

This handbook is designed to form the basis of medical practice during both Rescue Operations and training mishaps for USAF Pararescuemen (PJs). It can be scaled by selecting pertinent sections to meet mission requirements. Reference cards can be used in place of the handbook to provide greater flexibility.

You should have a full set of reference cards, available on the GA Sharepoint, which can also be used in place of the handbook for quick reference for support of direct action and patrols and should be kept in the diagnostic kit.

This revised handbook includes an updated brief history of Pararescue Medicine (PJ MED). It is followed by an outline of the Principles of PJ MED and the patient assessment checklist. This approach to patients is slightly modified from traditional primary and secondary surveys to reflect both a more efficient and a comprehensive approach to combat trauma based on PJ experience and data from Overseas Contingency Operations.

Selected portions pertinent to Pararescue of the new and edited Tactical Combat Casualty Care (TCCC) guidelines and the ATP Tactical Medical Emergency Protocols (TMEPS) are included and have been modified to suit the PJ mission. The goal remains to have all PJs work to a single standard. The section on prolonged care has been modified and expanded based on PJ experiences in Horn of Africa (HOA) and on civil SAR Guard missions at sea and in Alaska.

The TCCC Guidelines are posted on the GA Sharepoint and the JTS sponsored Deployed Medicine app/website deployedmedicine.com. The ATP-P Handbook USSOCOM tactical and emergency protocols are also available in print and digital form from *the Journal of Special Operations Medicine* website at www.jsomonline.org.

A portion of the blood protocol is included from SOCOM, which covers general principles. The unit flight surgeon has the step-by-step power point to practice field transfusions. The use of blood and blood products at a particular location should conform to local blood bank protocols and be administered with medical control oversight. Details on the use of Warm Fresh Whole Blood are included in the ATP-P Handbook on the GA Sharepoint. The step-by-step process is also on a checklist in each kit. This procedure should be practiced at least three times before deployment to ensure proficiency.

These are followed by the focused PJ medication list with dosages and indications. These drugs are in the ATP Drug Formulary and are listed in more detail there. PJs carry the fewest medications possible to be efficient for tactical and weight purposes.

All of the information is derived from a variety of references including expert consultation from military and civilian medical and surgical specialists, the AF Trauma Service, SOCOM and wilderness medical subject matter experts, the Committee for TCCC, or from the cadre of board certified emergency medicine and anesthesiology Pararescue Flight Surgeons.

It is your duty to read this handbook cover to cover and be aware of all the protocols to use.

Stay safe, be smart, be prepared, and train like you fight. Practice perfect, play perfect.

Always reflect your professionalism and leadership by adhering to a strong work ethic, positive attitude, open mind, and commitment to excellence.

PJ Medical History

1940: Captain Leo P. Martin, MC, USAAF Chief Flight Surgeon at Walla Walla Army Air Base completes parachute training conducted by U.S. Forest Service at Missoula training center and becomes the first “jumping doctor”.

1940–1944: Parachute rescue proven effective by USAAF search and rescue parachute teams (doctor, medical corpsmen and survival specialists) operating in the remote areas of the Rocky Mountain States and Canadian-Alaskan wilderness.

1943, 2 August: Wing flight surgeon Lt Col Don Flickinger and enlisted combat surgical technicians Sergeant Harold Passey and Corporal William MacKenzie rescue jump into Northern Burma proving rescue jumps can be done into remote areas under enemy control and inhabited by potentially dangerous indigenous peoples (head-hunters).

1946, January: USAAF Air Rescue Service proposes and requests that permanently ready and available Pararescue teams be formed.

1947, 18 September: USAAF Air Rescue Service becomes USAF Air Rescue Service (ARS).

1947, November: First permanently constituted Pararescue teams (physician and at least four enlisted medical-survival personnel) are mission-ready.

1947, July–December: USAF Air Rescue Service requests merging medical corpsman and survival specialty into a new rescue survival MOS 3383. P suffix designates parachuting.

1952, June: An International High Altitude Training Exercise in the Italian Alps resulted in the requirement for mountaineering skills and peak physical conditioning.

1953, December: Medical officers and techs removed from Pararescue teams.

1953, 30 June: Ground Rescue Survival Teams discontinued as helicopters prove reliable.

1955: ARRS (Air Rescue/Recovery Service) enlisted Pararescue medical capability is recognized.

1974: Pararescuemen are instructed and trained to provide higher medical care distinguished from an Independent Duty Medical Technician (IDMT).

1981: Pararescue School offered option to obtain EMT-Basic and Paramedic qualification.

1986: Directive for the PJ to function as a physician extender. In the event no physician guidance is immediately available, the PJ will provide treatment as best indicated by training and experience.

1986, 18 September: DOD requires EMT-Basic or higher level of certification be implemented for all personnel (including USAF Pararescue) who provide medical support for the transport of patients other than active duty military members.

1991: First edition of PJ Handbook created by Docs Neace, Bagian, and Allen.

1994, September: USAF Pararescue School began requiring all students to be nationally certified as EMT-Paramedic to graduate. This allowed PJs to do ambulance ride-alongs.

1996: TCCC introduced to Navy SEALs, Army Rangers, Army Special Missions Unit, and USAF Pararescue. Created by CAPT Frank Butler (Naval Special Warfare) and others.

1999: TCCC-based First Responder Course mandated for all in the 75th Ranger Regiment and included documentation through TCCC Cards and AARs to validate, refine, and improve performance. This would prove to be the foundation for modern casualty care.

2001: The Committee on TCCC is established to review and update guidelines. Pararescue has had a continuous presence since its founding.

2002: PJs began in-house training on delivery of blood products to patients/survivors in combat and establish alert protocols with deployed blood banks should blood be needed on a mission.

2007: HH-60s/GA begin flying CASEVAC in lieu of DUSTOFF when weather conditions prohibit the latter from Bagram. TCCC mandated for all deploying SOF Personnel by Commander, USSOCOM.

2009: Fragmentation Order formalizing USAF HH-60s/GA role to fly CASEVAC in OEF in addition to PR role. C-130 “FEVER” missions fly to transport patients including post-op critical patients on ventilators and drips. Humeral head IOs increasingly used over sternal IOs. Ketamine increasingly used by PJs based on the British MERT (Medical Emergency Response Teams) use of this drug.

2010, December: PJs become the first non-physician DoD asset to routinely fly with and administer blood products as far forward as the POI.

2011: Tranexamic acid (TXA) is adopted for use in hemorrhagic shock.

2011: TCCC is validated when COL Russ Kotwal (US Army) shows a significant reduction in potentially preventable deaths amongst the Rangers versus conventional forces after analyzing mortality metrics from TCCC cards and TCCC AARs collected from 2001 to 2010.

2011: Rapid Sequence Induction used more often; video laryngoscopy introduced.

2012: Ketamine approved for traumatic pain relief by the Defense Health Board for all military services based on PJ experience.

2012: Formal Canine casualty care training increasingly provided.

2012: Development of PJ-driven operationally focused Paramedic recertification courses begins.

2013. PJs perform the first field whole blood transfusion during a transload of a security team member in hemorrhagic shock from a GSW in a remote theater of operations.

2017: Freeze-dried plasma (FDP) fielded by PJs under an FDA Investigational New Drug (IND) Protocol; first for the Air Force.

2017: Liquid plasma added to packed red blood cells for downrange Rescue Teams.

2017: Escharotomies and sophisticated critical care with ventilators and continuous sedation carried out on two burn patients on the MV Tamar mission.

2018: Point-of-Care Ultrasound (POCUS) fielded for the first time down-range by specially trained PJs.

2018: Packed red blood cells and liquid plasma successfully used during a civil SAR mission in the Pacific Ocean.

2. Medical Command and Control (MC2)

HAF/A3S is the lead for the PJ Handbook, direction for C2, and scope of practice.

Care by PJs of injured or sick personnel in combat, other missions, training, civil SAR, or humanitarian assistance (HA) operations is always under the auspices (command and control) of a licensed medical provider. This is defined as Medical Control and should not be confused with Tactical Control or Operational Control. PJs providing care in these situations are acting under the license of the delegating authority (licensed provider), where the provider allows the PJ to perform specified diagnostic and therapeutic interventions. All authorized care and interventions include those outlined in the current edition PJ Medical Handbook (PJ HB), ATP book for selected protocols per the Flight Surgeon and mission, ACLS, PALS, TCCC curriculum, or other designated sources. Care outside of this material must be otherwise authorized by the flight surgeon or local medical authority.

All prior editions of the PJ HB are obsolete.

In practical terms, this means providing care IAW the guidance above without deviation. If there is a needed deviation, the medical director is responsible for any directed deviation during on-line Medical Control. If you provide care outside the scope of your practice during off-line Medical Control, you are personally responsible for any adverse outcome and subject to other possible ramifications. ***DO NOT PROVIDE CARE THAT DEVIATES FROM WHAT YOU ARE TRAINED AND ALLOWED TO DO.***



The following list of procedures require specific task initial and annual refresher training in order to perform. Training will be conducted and signed off by the unit flight surgeon. A current 623a will be maintained in the PJ's medical training records.

- The following require initial and refresher **cadaver** training before flight surgeon sign off:
 - Leg Fasciotomy
 - Escharotomy
 - Lateral Canthotomy
- The following require initial and refresher training before flight surgeon sign off:
 - Use of Blood Products
 - Rapid Sequence Induction (RSI)
 - Ventilator Use

On-line Medical Control: A physician is present at the scene or available through communication. Although this is the ideal and preferred method it is uncommon in most Rescue operations. Order of precedence for on-line medical control:

On scene:

Flight Surgeon (either: SOFME or CSARME)
Senior US Military Physician present on scene
Senior Allied Military MD (equivalent to US Military Physician)
Civilian MD who can prove credentials and assumes responsibility
Senior Military Physician Assistant

Off scene: US Military Physician in direct contact via audio/visual communication

Off-line Medical Control: Contact with a Physician is impossible or impractical. Care is based on approved protocols and procedures. This is the most common scenario.

Off-line Control situations: The PJ Team Leader is responsible for all care unless delegated to another PJ.

NOTE: These sources cover the vast majority of care PJs will provide. Instances where deviation may occur more frequently would be in remote situations where certain medications are not available, and the local medical authority has directed the use of locally available meds and has provided the adequate in-service education with proper documentation. Also, certain regions may have diseases and treatments that are endemic and require unique care that should be added to the protocols in that area of operation.

Special Considerations

In instances where the Medical Control Officer is not the assigned Flight Surgeon, it is important to review the PJ HB and other applicable protocols with the Medical Control Officer as soon as possible to ensure authorization to perform to the level of one's training and protocols.

In instances where a non-Air Force Special Warfare (AFSPECWAR) Surgeon is significantly at odds with accepted protocols and wants the PJ to provide care materially different, the PJ should work through his Chain of Command to reach a senior pararescue flight surgeon, the USAF Pararescue Medical Director, or the HAF/A3SG.

- When responding to a civil SAR operation, the PJ will follow local or national (as appropriate) EMS guidelines for care. Therefore, the PJ should become familiar with these protocols in advance. In some instances, things like ketamine or tourniquets are not approved. Most invasive procedures are not appropriate for civil SAR missions.
- If responding to an injured PJ or aircrew for training accidents, etc., practice according to this HB.
- If otherwise responding to an incident in garrison, follow the locally approved protocols, otherwise this HB.

It is the responsibility of the PJ leadership on each base to establish a relationship with the local Medical Treatment Facility to ensure understanding and support of PJ treatment protocols. This will support the supply of appropriate medications and supplies and prevent any confusion of scope of practice during real world responses on base or elsewhere.

Trauma Care for Hostile Combatants

PJs may be called upon to render initial care for enemy combatants. Medically speaking, this presents only a logistical problem because the tenets of trauma care do not change. Tactical, legal and ethical considerations, however, make this a complex issue. The recommendations presented below may help medics and their mission commanders formulate their plans for handling wounded enemy combatants during pre-mission planning.

- **Care for wounded Hostile Combatants**
 - Though wounded, enemy personnel may still act as hostile combatants.
 - They may employ any weapons or detonate any ordnance they are carrying.
- **Care Under Fire**
 - Enemy casualties are hostile combatants until they:
 - Indicate surrender
 - Drop all weapons
 - Are proven to no longer pose a threat – complete body search for weapons and ordnance, trauma naked if able
 - Are removed from reach of weapons
 - Are restrained with flex cuffs or other devices
 - No care rendered until:
 - TFC phase
 - Casualties and scene rendered safe
 - Tactical situation permits
- **Tactical Field Care Phase Management:** Medic should not attempt treatment until sure that the wounded hostile combatant is rendered safe by other members of unit.
 - Restrain rear as medically and tactically feasible
 - Search for weapons and/or ordnance
 - Silence to prevent communication with other hostile combatants
 - Segregate from other captured hostile combatants
 - Safeguard from further injury. Provide care IAW TFC guidelines for US forces after securing the enemy casualty as described above
 - Speed to the rear as medically and tactically feasible

Guidelines for Initiation of Resuscitation

Medical treatment and resuscitation of victims should be initiated under all circumstances, with the following qualifications:

1. **Combat (Direct Fire)**

- Immediately unresponsive patients with no pulse or respirations, regardless of cause, should not have resuscitation initiated.
- Unresponsive patients with a pulse but no respirations should have resuscitation initiated if it can be accomplished in relative safety.

NOTE: Body recovery should be attempted unless the attempt exposes the team to undue danger. If the body cannot be safely recovered, the location should be noted as accurately as possible (GPS coordinates preferred) for later recovery efforts. If the body has a set of ID tags that can be safely recovered, leave one with the body, bring the other out.

2. **Non-Combat:** Decisions to not initiate resuscitation should be discussed with medical control if possible. If contact with medical control is not possible, the following guidelines should be followed:

- **Do not initiate resuscitation if victim is obviously dead, characterized by:**
 - Dependent lividity
 - Rigor mortis

 **WARNING:** In hypothermia victims, severe hypothermia may resemble rigor mortis. Check core body temperature.

- Open head injury with brain matter exposed and no pulse present
- Injury to the trunk with chest contents exposed and no pulse present
- “Frozen” hypothermia victim, e.g., ice formation in the airway, incompressible chest
- Total body burns or body carbonization and no pulse present
- Suffered massive blunt trauma, e.g., fall of over 100 feet, and has no pulse
- **Decisions to not initiate resuscitation will be completely documented to include:**
 - Time/Date of decision
 - Reason for decision as noted above
 - Name, title/rank, and unit/organization of medical control (if able to contact)
 - Location of victim (GPS coordinates if possible)
 - Document “Vital Signs Absent (VSA)” and other findings consistent with death and when possible, have a second PJ or Medic confirm findings and cosign the note.
- **The decision to not initiate resuscitation IS NOT a legal declaration of death, unless a qualified physician declares the patient dead.**

NOTES: Body recovery should only be attempted if it can be accomplished with a minimum of risk to the rescue team. If there is any suspicion of death as a result of foul play, or other forensic circumstances (suicide, homicide, neglect, accident, etc.) the body and the area around it should be left undisturbed until law enforcement authorities have had an opportunity to examine the scene.

In the event of a military aircraft crash, body recovery may be the responsibility of local law enforcement or military authority, depending on the circumstances and location of the mishap. In most circumstances it is best to leave the bodies in position until investigating authorities arrive and survey the site. If the bodies must be moved prior to arrival of the investigative authority, every attempt should be made to record the exact location where the body was found, and the exact position it was in (photographs from multiple angles are helpful).

Refusal of Medical Care and/or Transport

In general, Active Duty military members may not refuse life-saving medical care. Mentally competent adult civilians (including dependents, spouses and retired military members) may refuse medical care, even if refusing medical care endangers their lives. PJs should make every effort to ensure that patients refusing medical care are aware of the possible consequences of their actions. The patient should be urged to seek other medical care as soon as possible.

- If the patient is unconscious, or unable to make a rational decision (secondary to head injury or any other cause of altered mental status), the principle of **Implied Consent** assumes that a normal, rational person would consent to life-saving medical treatment.
- If the patient is a minor or mentally incompetent adult, permission to treat must be obtained from a parent or guardian before treatment can be rendered. If a life-threatening condition exists, and the parent or guardian is unavailable for consent, treatment shall be rendered under the principle of implied consent, as noted above.
- If an alert, oriented patient with normal mental status refuses medical care, then care cannot be rendered. Medical control should be contacted (if possible) if such a situation occurs.
- If a patient refuses medical care the following statement must be written on the medical treatment form and signed by the patient if possible.

I, THE UNDERSIGNED HAVE BEEN ADVISED THAT MEDICAL ASSISTANCE ON MY BEHALF IS NECESSARY AND THAT REFUSAL OF SAID ASSISTANCE MAY RESULT IN DEATH, PERMANENT INJURY OR IMPERIL MY HEALTH. I REFUSE TO ACCEPT TREATMENT AND ASSUME ALL RISK AND CONSEQUENCES OF MY DECISION. I RELEASE THE UNITED STATES AIR FORCE AND THE DEPARTMENT OF DEFENSE FROM ANY LIABILITY ARISING FROM MY REFUSAL TO ACCEPT MEDICAL CARE.

NOTE: The statement must be signed and dated by the patient and countersigned by a witness. The medical record should completely document that the patient is awake, alert, oriented and has normal mental status. If the patient refuses to sign the form, and still refuses medical care, the patient's refusal to sign should be documented and signed by the treating PJ and preferably by at least one other witness.

3. PJ Patient Assessment and Treatment

Establish Situational Awareness

- Scene safety – enemy threat/smoke/fire/avalanche/ocean conditions, etc.
- Establish security – near/far perimeter set, ground element coordination, ropes, etc.
- BSI PPE
- Determine the Mechanism of Injury (MOI)
- Determine the # of patients (in case triage is necessary)
- Request additional help if necessary, determine availability of resources
- In general, time and tactics take precedence over medicine in combat or dangerous non-combat rescues
- These decisions are based on experience and judgment as well as direction from the Team Commander or Leader

Primary Assessment and Treatments

MARCH PAWS: A mnemonic device used to cover the vast majority of care required during tactical field care and tactical evacuation. It covers the care for any trauma patient. Other than the M, it also covers the care for most medical patients since it is just a variation on the ABCs.

MARCH is the primary survey.

SAMPLE history, vital signs and head to toe exam with PAWS treatments comprise the secondary assessment/treatment.

Establish patient is conscious and say out loud: **“I am a PJ; I’m here to help you. What is your name?”** (Determines LOC, basic orientation, security of airway, absence of profound shock or TBI)

Massive Hemorrhage – Visualize and feel (sweep) for life-threatening hemorrhage:

- All 4 extremities
- Then junctional sites (neck, axillae, groins)
- Then torso including back
- Treatments: Apply tourniquet, hemostatic gauze, pressure dressing, suture/staple, clamp, direct pressure, junctional hemorrhage device, elevate limb

Airway – Look: mouth and neck

- Treatments: clear airway, chin lift/jaw thrust, recovery position, sit up and lean forward position, NPA, supraglottic device, ET tube, cricothyroidotomy

Respirations – Place pulse oximeter

- *Look:* chest rise and fall, paradoxical motion, chest wall injuries
- *Listen:* if possible with stethoscope, each side at anterior axillary line
- *Feel:* chest wall: ribs and sternum for fractures or tenderness, subcutaneous air, holes or defects
- Treatments: apply vented chest seal to actively SUCKING chest wounds, needle decompression, BVM, O₂, finger or tube thoracostomy

NOTE: 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.

Circulation – Reassess hemorrhage control, diagnose shock, initiate resuscitation

- Reassess bleeding control interventions.
- Assess pelvis once for stability by applying compression along iliac crests bilaterally, DO NOT ROCK.
- Diagnose Shock (declining AVPU, radial/carotid pulse, assess skin, cap refill).
- Treatments: pelvic binder, IV/IO access, treat per shock protocol. *See Shock section in MTPs.*
- Hemorrhagic shock: Tranexamic Acid (TXA), calcium, blood/blood product resuscitation
- Non-hemorrhagic shock/burns: Use LR for resuscitation.
- In patients requiring shock or burn resuscitation, record urine output and report this information as part of circulation.

Head – Rule out severe intracranial pressure (TBI) by identifying mental status, pupils, posturing or snoring respirations (Document Glasgow Coma Scale Score on TBI patient)

- Treatment:
 - Keep systolic BP >100
 - Keep O2 sat >90%
 - 23.4% hypertonic saline through an IO or excellent peripheral IV
 - Elevate head 30° if not in shock

Hypothermia – Dry patient, insulate from ground, place hat, utilize hypothermia blankets

NOTE: While performing the primary assessment, the MARCH interventions are performed when an indication is found.

Secondary Assessment

Vital Signs – Record set of vitals: (AVPU, HR, RR, BP, SpO2, Temperature, pain score)

Obtain an SAMPLE history

Head-to-Toe Examination

- Head: inspect/palpate skull/scalp, face jaw, ears, eyes, nose, mouth
- Neck: inspect/palpate, assess JVD, subcutaneous air, hematoma, C-spine deformity/tenderness
- Chest: look, listen, feel again
- Abdomen: normal = soft, flat, non-tender
- Pelvis: Assess pelvis, if not already done, document status of genitals if lower limb amputations (intact, absent, or mangled) or if blood at urethral meatus. Perform DRE for blood if GSW from knees to groin and no exit.
- Extremities: look and feel; DCAPBTLS, color, cap refill, PMS, strength and ROM
- Spine: inspect, palpate, and percuss

- **Neurologic:** If no TBI, confirm speech and comprehension intact, moves all four extremities, and walking ok; perform a detailed neuro exam (PJ neuro exam) for TBI, stroke, dive medicine, etc.

NOTE: While performing the secondary assessment, the PAWS interventions are performed when an indication is found.

Pain – Pain meds: trauma-pill pack, fentanyl, ketamine; Toradol for significant musculoskeletal injury; Dilaudid for PFC

Antibiotics (medications) – Antibiotics for open combat wounds, administer other medications as indicated. PO if patient is awake and can swallow without serious abdominal injury, otherwise IV/IO/IM, for all open combat wounds.

Wounds – Clean and Cover: Remove debris, irrigate, and cover with sterile or clean dressings.

Splint – Perform orthopedic related care, use rigid eye shield for penetrating eye trauma.

Tourniquet Conversion

Indications: Limb and junctional tourniquets should be converted to hemostatic or pressure dressings as soon as possible (or tactically appropriate) unless the patient is in shock, the wound can't be monitored for re-bleeding, or the tourniquet is placed for an amputation.

Timing for TQ Conversion:

- Less than 2 hours after application is considered safe (attempt conversion)
- 2–6 hours is likely safe, but the upper safe limit has not been scientifically determined (attempt conversion)
- More than 6 hours requires caution (field conversion not advised due to reperfusion injuries/kidney failure risk) and management with the *Crush Syndrome Protocol*

Procedure:

- Add one loose TQ above the original TQ in case the original breaks during conversion.
- Slowly release pressure from the TQ windlass, unwinding a half turn every 10 seconds. Continually monitor for wound bleeding throughout and after conversion. Dress wound with a pressure bandage.
- If conversion fails and the wound bleeds, move the original TQ as close to the wound as possible and retighten. If bleeding continues, additionally tighten the extra TQ that is still in place.
- Attempt the conversion every 10 or 15 minutes if able. Document the number of attempted conversions.

Documentation and Verbal Report

Documentation – use the PJ patient care card for all missions. If deployed fill out a DD Form 1380 and hand it in to the MTF if applicable. Writing must be legible and card must be thorough.

Verbal Report: Age, Time of Event, MOI, Injuries, Signs and Symptoms, Treatments Performed

Signs and symptoms should include the most recent set of vital signs. Additional information may be requested by medical provider.

When reporting the treatments, report them in the MARCH PAWS algorithm format. Indicate both negatives and positives in MARCH PAWS by line to ensure all items are covered.

Verbal report format covers the patient handoff as well as Telemedicine consultation.

Phase of Care Notes

Care Under Fire (CUF)

- Direct casualty
- “Return fire”
- “Move to cover” or “move to me”
- Self-apply tourniquet if extremity hemorrhage
- If casualty cannot move, devise and execute rescue plan with attention to the tactical piece and details on how to move the patient and to where

Tactical Field Care (TFC)

- Perform MARCH PAWS
- Prep for exfil
- Tactical Evacuation (TACEVAC)
- Reassess patient and interventions
- Monitor patient and treat as needed
- Package on approach

Prolonged Field Care (PFC)

- See Chapter 5
- Nursing type skills – patient hygiene and comfort, monitoring and documentation
- Critical care skills
- Prolonged analgesia and sedation

PJ PEARLS regarding Phases of Care:

- For care under fire limit actions to
SHOOT-MOVE-TOURNIQUET-RESCUE
- For tactical field care if time and tactics are limited,
STOP THE BLEEDING, MAKE ‘EM BREATHE, GET READY TO LEAVE

4. PJ Medical and Trauma Protocols (MTPs)

The PJ MTPs form the basic foundations for the most common medical and trauma emergencies that Paramedics encounter. These injuries have been frequently identified in training mishaps and are mandatory knowledge for training point of injury care. They are mission critical and **MUST KNOW**.

Dx= Diagnosis Rx= Treatment

Combat Shock Protocol (Hemorrhagic Shock)

Dx:

1. MOI and blood loss
2. Declining level of consciousness in the absence of head trauma, or weak/absent radial pulse

Rx:

1. Establish IV/IO access
2. Flush with TXA – 2g (1 minute slow IV push)
3. Administer blood (cold stored type 'O' whole blood>fresh low titer-'O' whole blood>PRBCs and plasma>plasma alone>PRBCs alone>non-titered type 'O' fresh whole blood>non-titered type specific fresh whole blood)
4. Administer Calcium (10mL of 10% calcium gluconate) via slow IV/IO push (establish secondary IV/IO access, if required). Repeat dosing (every 4 units of blood product) is considered safe in the setting of on-going resuscitation with blood products; however, cardiac monitoring is recommended.

NOTE:

- The priorities in hemorrhagic shock are to maintain perfusion and prevent coagulopathy.
- If using PRBCs and plasma, give in a 1:1 ratio. If both PRBCs and plasma are not available, plasma is preferred over PRBCs due to its ability to provide volume replacement AND coagulation factors.
- When using calcium, ensure to flush line before and after administration to avoid compatibility issues with blood and other potential medications. Additionally, flushing confirms line patency and reduces risk of calcium extravasation and resultant tissue necrosis.

Severe TBI

Dx:

1. Increased intracranial pressure with mechanism or injury present
2. Declining mental status in the absence of shock
3. Significant pupillary asymmetry
4. Unilateral or bilateral fixed and dilated pupils
5. Sustained decorticate or decerebrate posturing
6. Respiratory depression
7. Cushing triad: hypertension, bradycardia, irregular respiration

Tactical field care and tactical evacuation

Rx:

1. Prevent hypoxemia
 - a. provide supplemental oxygen to maintain SpO₂>92%
 - b. If unable to maintain SpO₂>92%, perform endotracheal intubation
 - c. use a ventilator for GCS<9 (goal: EtCO₂ 30–35mmHg)
2. Prevent hypotension – keep sys BP 100–110mmHg
3. Decrease metabolic demand
 - a. maintain normothermia (95–99.5°F or 35–37.5°C)
 - b. Treat seizures with midazolam 5mg IV/IO/IM q15min
 - c. Treat agitation/combatative behavior
 - i) Midazolam 2mg IV/IO/IM q15min and/or
 - ii) Ketamine 20mg IV/IO/IM q15min
4. Give TXA 2g IV/IO if within 3 hours of injury
5. Give antibiotics for penetrating brain injury – ertapenem 1g IV/IO q24hr
6. Identify and treat herniation (Dx lines 3–7)
 - a. Elevate the head 30° in the absence of shock if tactically feasible
 - b. Remove constricting/tight braces around the neck/loosen cervical collar, if applicable
 - c. Give 30mL of 23.4% hypertonic saline over 10 minutes through excellent IV or IO (cannot allow extravasation)
 - d. If time needed to perform above interventions, may hyperventilate at 1 breath every 3 seconds to an EtCO₂ of 25mmHg for no more than 20 minutes.
7. Spinal motion restriction for blunt or blast trauma

Prolonged field care

1. Continue to prevent hypoxemia and hypotension and decrease metabolic demands as described above
 - a. avoid fever using acetaminophen 1g q6–8hr and surface cooling measures
2. Treat seizures, agitation/combatative behavior as above, additionally:
 - a. Give Levetiracetam 1,000mg IV/IO over 20 minutes for seizures, GCS ≤8, or depressed skull fracture (repeat 1,000mg q12hr)
3. Monitor blood glucose and treat hypoglycemia: goal 140–180
4. If not already done, Give TXA 2g IV/IO if within 3 hours of injury
5. Continue antibiotic therapy for penetrating brain injury
 - a. ertapenem 1g IV/IO q24hr
 - b. or, if available, give ceftriaxone 2g q8hr; add metronidazole 500mg IV/IO q8hr for heavily contaminated wounds
6. If signs of herniation present, continue giving 30mL of 23.4% Saline over 10 minutes q3hr
7. Feeding not necessary

NOTE: Document GCS and neuro exam.

Mild TBI

Dx:

1. “Bell rung”, “saw stars”, “stunned”, loss of consciousness <30 minutes, memory loss around event

Rx:

1. Perform GCS, neuro exam and MACE
2. Rest for 72 hours

Basilar Skull Fracture (Skull Base Fracture)

Dx:

1. Raccoon eyes
2. Battle’s sign
3. CSF rhinorrhea or otorrhea (clear fluid from the nose or ears)

Rx:

1. None
2. Document GCS
3. Transport to neurosurgeon

NOTE: If PFC setting observe for cranial nerve injury and meningitis.

Oro-pharyngeal Hemorrhage

Dx:

1. Massive, uncontrolled bleeding coming from the mouth or throat in a casualty with neck or facial trauma

Rx:

1. Procedural IV sedation (ketamine 100mg) and local lidocaine if responding to pain and time, tactics and clinical condition permit
2. Cricothyroidotomy
3. Pack the oropharynx with combat gauze – leave a tail for each roll outside the mouth

Indications for intubation

1. Unable to maintain airway – altered consciousness, gurgling, etc.
2. Desaturation despite simple efforts and clinical deterioration – requires judgment in tactical and austere settings
3. Respiratory rates >30 and <10
4. GCS <8 (unconscious TBI patients)

NOTE: Use RSI if the gag reflex is still intact and the patient requires intubation
In the uncontrolled environment if you can use means not requiring intubation, ventilator or ambu-bag and maintain adequate O2 saturation, then monitor the patient closely but be ready to intervene.

Thoracic Trauma

Dx:

1. Chest trauma
2. Respiratory distress
3. Other physical findings if time and tactics permit

Rx:

Perform these in order until patient experiences relief and improved VS:

1. Needle Decompression (ND) × 2 attempts at 4th or 5th intercostal space (ICS) in the anterior axillary line
2. Finger thoracostomy and/or chest tube in the 5th ICS in the mid-axillary line
3. Positive pressure ventilation (BVM, nu-mask and blow, ventilator)
4. O2 if available

Acute Abdomen

Dx: can be from trauma or medical problem

1. Rigidity
2. Rebound tenderness or severe focal tenderness
3. Distension

Rx:

1. NPO
2. IV access. NS (normal saline) if medical; or blood and TXA hemorrhagic shock
3. Ertapenem
4. NG tube for PFC
5. Fentanyl for pain
6. Zofran for nausea
7. Acetaminophen PO with sips of water for fever

Burns – 9, 10, 20, 30 Principle

Dx:

1. TBSA (total body surface area) – there are 11 “9”s: 2 front torso, 2 back torso, 1 each upper extremity, 2 each lower extremity, 1 head

Rx:

1. Use Rule of **10** to start fluid resuscitation (10mL/hr × % TBSA, add 100mL/hr for each 10 kg above 80 kg)
2. Start fluid resuscitation with LR if **>20%** TBSA burned with second degree or greater burns
3. Adjust IV fluids to maintain urine output **30–50mL/hr**
4. Treat per pain management protocol
5. No antibiotics unless other indication is present (i.e. penetrating wounds, fever, etc.)
6. Perform surgical airway for stridor or respiratory distress (this is generally gradual)
7. Use dry sterile dressings to cover burns. If exfil is >12 hours, debride dead skin once
8. Put dry gauze between burned digits
9. Escharotomy PRN for circumferential burns with progressive pain and tension to palpation

NOTE: If LR not available, begin fluid resuscitation with NS up to 2–4L.

Penetrating Eye Trauma

Rx:

1. Vision test: document highest level of function – read print, count fingers, hand motion, light perception, no light perception

Rx:

1. Rigid eye shield
2. Antibiotics (PO if able)

Abdominal Evisceration

Rx:

1. Stop the bleeding and clean the bowel
2. Gently put back in if able, otherwise moist dressing over bowels, occlusive over that
3. Suture staple tape abdomen closed if bowels replaced
4. Ertapenem

Flail Chest

Rx:

1. Analgesics
2. Monitor patient for desaturation or respiratory distress
3. Positive pressure ventilation: assisted ventilations or RSI and bag/vent

Extremity Trauma

Rx:

1. Splint/immobilize
2. Use traction device for isolated mid – femur fractures
3. Document PMS
4. Reduce fractures and dislocations when possible
5. R/O compartment syndrome: pain out of proportion to appearance and pain with passive motion
6. Consider fasciotomy for leg compartment syndrome and >6 hours to definitive care



Do not use traction device if the pelvis is unstable.

Shock: Non-hemorrhagic

Rx:

1. 1–2 L of LR, except 250mL boluses for cardiogenic shock
2. Anaphylactic: Epi, Benadryl, Decadron, Pepcid (Dx – allergic stimulus, red skin, facial swelling, respiratory distress, hypotension)
3. Septic: Ertapenem, Epi if no response to LR (Dx – source of infection, fever)
4. Neurogenic: Epi if no response to LR (Dx – spine trauma, back pain, deformity of spine, weakness/paralysis/decreased sensation of extremities, etc.)
5. Cardiogenic: FONA (fentanyl, oxygen, Nitro, aspirin) for chest pain, hold nitro and fentanyl for systolic BP <90

High Altitude Pulmonary Edema

Dx:

1. Shortness of breath at rest
2. Rales
3. Pink, frothy sputum

Rx:

1. Descent
2. O₂
3. Nifedipine
4. Albuterol

High Altitude Cerebral Edema

Dx:

1. Ataxia
2. Confusion

Rx:

1. Descent
2. Decadron

Acute Mountain Sickness

Dx:

1. Headache, listless, loss of appetite, nausea, vomiting, etc.

Rx:

1. Hydration
2. Ibuprofen
3. Diamox 250mg BID until 2 days after resolved and still at altitude
4. Hold any ascent until asymptomatic for 24 hours

Frostbite

Dx:

1. Hard, white tissue – frozen

Rx:

1. Keep warm
2. Only rewarm in 102° water if no risk of refreezing
3. Gauze/cotton between digits
4. Do not rub
5. Analgesics when rewarming

Hypothermia

Dx:

1. Mild: shivering, alert
2. Moderate: stop shivering, confused/obtunded
3. Severe: coma

Rx:

1. Insulate from ground
2. Remove wet clothes
3. Cover
4. Actively warm if able
5. For Severe Hypothermia, use care to be gentle due to risk of ventricular fibrillation

Hyperthermia

Dx:

1. Cramps
2. Exhaustion
3. Stroke/CNS findings (emergency)

Rx:

1. Shade/cool the casualty
2. Hydrate
3. If stroke/CNS deficiencies present – actively cool

5. Prolonged Field Care

1. The dynamic nature of Pararescue missions, and remote/austere environments in which they occur, may require medical care lasting hours to days before evacuation can be achieved. Identify the potential for prolonged care during mission planning in order to prepare increased amounts of medical and Operator's personal supplies (e.g., carried on vehicles, bundled, etc.) and/or re-supply bundles.
2. Prolonged Field Care (PFC) is presumed to exist when evacuation cannot be performed within the 4-hour time frame doctrinally dictated for urgent and priority patients, but also is a concept requiring medications and equipment beyond initial care. It may occur in place or during TACEVAC.
3. Prolonged care is characterized by:
 - a. Preparing and packing specific types and amounts of gear, medication, food, water source, and personal care items
 - b. Establishing work-rest cycles
 - c. Cleaning the patient and the environment
 - d. Setting up the room or work space
 - e. Incorporating lifesaving interventions and ICU-like care with routine supportive care
 - f. Regular reassessment and monitoring
 - g. Focused interventions
 - h. Patient comfort, hygiene and nursing care skills
 - i. Meticulous documentation
 - j. Telecon
 - k. Plan and prep for exfil
4. General concepts with use of acronyms:
 - a. Use **MARCH** for patients who are **unstable** and for **initial tactical field care**.
 - b. Use **MARCH PAWS** to maintain **acute care** and **tactical field care**. Complete it fully at least once prior to transitioning to HITMAN (see below).
 - c. Transition to **HITMAN (prolonged care)** after roughly 4 hours, integrate MARCH as needed for unstable patients.
5. Maintaining a clean room and keeping the patient clean and comfortable are a priority. These actions reduce risk of infection and pain med requirements, while improving morale.
6. NATO and the US SOF community have adopted the term Prolonged Field Care (PFC). Prolonged care, or extended care, has a connotation for Pararescue to include the environments and flight other than the "field".

General considerations after patient is stable, or unstable patient and >4 hours extraction/exfiltration. Use **HITMAN**:

Hydration – PO/IV/IO/Rectal (PR)/NG tube

- Starting maintenance IVF – rate should be approx 125mL/hr
- Urine output should be approximately 30–50mL/hr at a minimum. Place a Foley in all patients who are unable to void including all unresponsive patients as well as critical care patients with burns or in shock

Hygiene –

- Prevent pressure sores, roll and pad patient q1–2hr, clean patient q12–24hr, keep the patient dry, keep the room clean

Hypothermia –

- Take preventative measures; cover casualty to protect from elements and further loss of heat. If patient is hypothermic, treat per *Hypothermia Protocol*

Infection –

- Take temps, change dressings q12–24hr
- Confirm antibiotics given on schedule
- Check IV/IO sites and sites of invasive procedures for signs of infection

Tubes and lines –

- Make sure all lines are “neat and tidy” and functioning and draining properly
- Intermittent or continuous suction applied if indicated (chest tube, NG tube)
- Intermittent lavage PRN (cric, ET tube)

Medications –

- 6 RIGHTS – patient, med, dose, time, route, documentation
- Monitoring – as needed
 - If unstable q1–2hr, record VS including AVPU/temp/O2 sat
 - VS no less than q12hr

Analgesia –

- Document with pain scale before and after giving pain meds
- For long term pain control in a hemodynamically stable casualty, dilaudid is preferred. If casualty is unstable, ketamine is preferred.
- Add other long-acting meds per Med Direction
- If meds are limited, give pain meds as needed and not continuous
- Remember: analgesia is different than sedation

Nutrition –

- Critical for the Operator – maintain your own hydration and blood sugar
- Probably not critical for trauma patients for 24–48 hours
- Very important for conscious patients – morale and sense of well-being
- Sports gel and high calorie protein bars – (>300 calories, or unsalted nuts instead of protein bars) are densely caloric and supply all 3 macronutrients – carbohydrates, protein and fat. Also, protein or muscle building powders are useful to pack.
- Goal is >1500 calories per day if patient can take PO
- Can bring electrolyte powder, and protein/recovery powders and give orally, by NG tube, or rectally (least effective)
- In general, you can give a gel every 3 hours and 1/3 to 1/2 a protein bar on the 90 minutes in between, or space the intervals longer depending on patient, movements, and supplies

Detailed Aspects of Reassessments and Treatment

1. Airway Management

- a. Re-verify airway patency and security in a consistent manner.
- b. Suction: Consider periodic low pressure suctioning of the oropharynx and endotracheal tube.
- c. Pulmonary toilet: Consider periodic gentle saline flushes (2mL) to clear mucus/blood from ET tube. Can also drag a Foley with partial inflation from the end of the ET tube to drag out mucus or clots.
- d. Local wound care at cricothyroidotomy site if applicable.

2. Respiratory Management

- a. Place a chest tube if patient required more than one needle decompression, or has chest trauma with decreased breath sounds and signs of hypotension.
- b. Apply low pressure suction to chest tube if available. Alternatively, you may attach a one-way valve and gravity feed into a collection bag.
- c. Administer oxygen to maintain O₂ saturation >90%.
- d. If patient is being ventilated by BVM, maintain strict bagging cycles (1 breath every 6 seconds) and a tidal volume of approximately 500mL (bag one handed, not a full bag of volume) to allow for complete exhalation and avoid stacking breaths. Use the EMMA to guide you further.
- e. Use pulse oximetry and capnography to guide ventilator management.
- f. Use the **DOPE** acronym to trouble shoot tube, vent or capnography problems:
 - i) **D**isplacement: verify tube placement
 - ii) **O**bstuction: use suction and flushes, replace tube if necessary
 - ii) **P**neumothorax: use stethoscope, if prior needle decompressions, place chest tube
 - iv) **E**quipment: check all equipment, lines, connections, power sources, etc.
- g. Use sedation in casualties requiring prolonged intubation/ventilation. If you use sedation adequately, you should not have to use paralytics.

3. Fail Chest Management

- a. Monitor for developing hypoxia secondary to pulmonary contusions.
- b. Casualty may require positive pressure ventilation. RR >30, O₂ sat <90%.
- c. Ensure adequate analgesia.
- d. These casualties frequently fatigue and require intubation/definitive airway/ventilation.

4. Fluid Management

- a. Conscious: Instruct casualty to drink clear liquids up to 200mL/hr; consider oral electrolyte supplementation if available (or add a little salt and sugar).
- b. Unconscious: Insert Foley catheter and titrate IV/IO/NG crystalloid fluids to maintain minimum urine output of 30–50mL/hr.
 - i) Clean water ± electrolyte solution may be utilized in lieu of crystalloid for NG infusion. Bolus 125mL over 5–15 minutes every hour.
 - ii) If no NG tube, administer fluids by rectum (PR). Maximum PR fluid infusion rate for stable patients is 200mL/hr.
 - iii) Maximum PR fluid infusion rate for volume-depleted patients is 500mL/hr.
 - iv) Notes courtesy of CAN-SOF: **NG/OG:**
 - 1) *Be sure to re-check tube placement (auscultate over epigastrium and aspirate NG for gastric contents) prior to starting feeds.*
 - 2) *Keep head of bed elevated >30° during feeds.*
 - 3) *Tube feed electrolyte solution: (25mL/hr via OG/NG OR 50–100mL q4hr)*

- 4) If IV fluids are scarce, also begin slow administration of water at 25mL/hr then increase by 25mL/hr q4hr to meet goal rate of 100–150mL/hr.
 - 5) If patient becomes nauseated/vomits: D/C feeds, suction NG, and keep NPO.
 - 6) **RECALL:** Blood is shunted from the GI system to compensate for shock. Do not give PO fluid for severely injured/unstable patients for the 1st 24 hours.
- c. Critical burn (>20% TBSA of 2nd degree or greater burns):
- i) Insert Foley catheter.
 - ii) Continue fluid resuscitation according to “The Rule of Ten”.
 - 1) Initial rate is 10mL per % TBSA per hour for a max casualty weight of 80 kg.
 - 2) Add 100mL per hour to the rate for each 10 kg above 80 kg.
 Example: A 90 kg casualty with 50% TBSA burn would receive an initial rate of (10mL × 50)/hr + 100mL/hr or 600mL/hr.
 - 3) Adjust fluid rate every 1–2 hours to maintain urine output of 30–50mL/hr. Adjustments should not exceed a 20% change from the current rate.
 - 4) Oral fluid administration may be acceptable in burns up to 40% TBSA if crystalloid supplies are limited. Larger burns are associated with ileus and significantly decreased bowel absorption. Use WHO oral rehydration packets if available.

PJ PEARLS:

- Bring a collapsible 500mL canteen to be used for collection/measurement of urine output or chest tube output hourly.
- Empty a Foley collection bag hourly to facilitate measurement.

5. Wound Care Management

- a. See *Wound Care* under *Surgical and Medical Procedures* for irrigation, debridement, suturing and delayed closure protocols.
- b. Dress wounds using dry sterile dressings, if not available, use clean cloth or other material. For missions expected to last greater than 24 hours, use silver impregnated dressings to reduce frequency of dressing changes. Silver nylon dressings must be changed every 5 days. In the absence of silver nylon dressings follow *Burn Management, Infection* under *Surgical and Medical Procedures*.

NOTE: Dressing changes can be extremely painful. Consider providing analgesia; for extensive dressing changes, procedural sedation may be indicated.

- c. Continue antibiotics. Repeat moxifloxacin 400mg PO or ertapenem 1g IV/IO/IM q24hr for open wounds or invasive procedures, or suspicion of infection.
- d. Monitor for signs of infection (fever, redness, swelling, warm to touch, tenderness, pain, discharge).

PJ PEARL:

- Rubber dish washing gloves may be used, washed and re-used multiple times with minimal risk of tearing in instances where you have limited gloves and need to be selective about using them (i.e. procedures requiring high levels of dexterity).

6. Analgesia

- See *Pain Management* under *Tactical Medical Emergency Protocols*.
- Frequently reassess casualty's mental status, vital signs and analgesic response. Re-dose as necessary.
- When applicable, use local anesthetics or regional nerve blocks, if trained and supplied.
- Use immobilization and soft cushioning when able to increase comfort and reduce medication requirements.

7. Orthopedic/Compartment Syndrome Management

- Beware for injured extremities with pain out of proportion to physical findings and pain with passive motion.
- See *Fasciotomy Protocol*.
- Only leg (below the knee) fasciotomy is approved.

8. Special Blast Injury Considerations

- Tympanic membranes:
 - Inspect for perforation if possible.
 - Presume perforation in the setting of post-blast hearing loss.
- Lungs:
 - Pulmonary overpressure may result in delayed lung injury.
 - Monitor patients closely for respiratory deterioration for at least 6 hours post-blast.
- Abdomen:
 - Blast overpressure may result in bowel injury and delayed perforation.
 - Acute abdominal pain, especially with evidence of peritoneal irritation, within 72 hours of blast exposure should be presumed to be a bowel perforation. If patient develops severe pain, rigidity, or rebound tenderness perform the *Acute Abdomen Protocol*.
- Spine:
 - Patients involved in vehicular blasts or thrown by explosions are at high risk for spinal injury.
 - Perform spinal motion restriction as indicated.
 - Document Pararescue Neurologic Exam and clear C-spine if appropriate.
 - Beware of undetected TBI with a blunt spine injury from a fall or crash.
 - Pad back boards and collars on bony prominences.
 - Maintain a high index of suspicion for spinal injury: unconscious patients, blast, rollovers, falls >10 feet, any midline neck or back pain.
- Soft tissue defects/amputations:
 - Remove gross debris, irrigate, and debride. Debride **ONLY** obviously dead tissue.
 - Cover and secure all soft tissue defects and amputations, even if not sterile: e.g., cravats, chucks, T-shirts, space blanket, etc. and duct tape.

9. Communications

- Routinely rehearse telemedicine consultations with your unit medical director. Give report using AT MIST format.
- Pre-plan for multiple telemedicine/communication options (audio only; audio/visual; A/V/medical telemetry; email; text; etc.).
- Obtain medical C2 and consultation.
- Communicate *urgency* of evacuation.

PFC Sedation Loadout

The following guide is an estimation of medications required to sustain a sedated patient each day in a PFC environment:

FOR ONE SEDATED PATIENT PER DAY:

- 5,000mg ketamine
- 200mg rocuronium
- 1,000mcg fentanyl
- 20mg Versed

of patients x # of anticipated days x above dosages = recommended packout amount

PFC Teleconsultation

Medical Teleconsultation can be performed in acute care situations by voice.

Medical Teleconsultation can be performed by email/text with your flight surgeon or via the VC3 below.

It is imperative to build medical teleconsultation into training scenarios!

Refer to Chapter 2, Medical Command and Control for additional information on medical direction and scope of practice information.

OFF SCENE MEDICAL DIRECTION CONTACT INFORMATION

Pre-plan and Ops check communication plans with your local or unit flight surgeon prior to operations.

(P) Local Medical Director: _____

(A) Garrison Medical Director: _____

(C) PJ Medical Director: _____

(E) SOF Virtual Crit Care Consult (VC3) Line (24/7): **210-916-8222**
(if using VC3 for training purposes, call program office (210) 916-8764 to pre-coordinate)

VC3 Backup MAMC ED: **253-968-1396**

Army Surgical Research Burn Center (24/7): **DSN 312-429-2876, COMM 210-916-2876**

Other: _____

Sample Telemedicine Format

Telemedicine Script v1.0 17 July 2017

1. Before calling, E-mail image of the casualty (wounds, environment, etc.), “capabilities” (back), and vital trends dod.VC3@mail.mil (for VC3) or appropriate.
2. If call not answered, call next number on PACE or call back in 5–10 minutes.
3. If unable to provide information due to operational security, state so.

P: Local Medical Director

A: Garrison Medical Director

C: Pararescue Medical Director

E: VC3 – Critical Care: Commercial: +1 (210) 916-8222, DSN: (312) 429-8222

VC3 – Critical Care backup: MAMC ED 253-968-1396

This is _____ I am a (job/position) _____

My best contact info is: _____

YOUR best contact info is (Intensivist’s number): _____ Alternate e-mail: _____

PAUSE POINT to CONFIRM CONTACT INFO

Age: I have a ____ year–old ____ (sex) _____ (active duty/foreign natl/agency, etc), who has:

Mechanism of Injury or known diagnosis (for illness) _____

The injury/start of care occurred _____ hours ago. Anticipated evacuation time is (range) _____

Injuries/illness/problems: _____

Symptoms/Vital signs _____

Treatments (Report in MARCH PAWS format): _____

He/she is currently (circle) stable/unstable, getting better/getting worse/getting worse rapidly

Known Medication Allergies: _____

Past surgical and medical history: _____

I need help with (be specific, i.e. “I need help reading this ECG,” or “I need help stabilizing this pt,” etc.) _____

Other Consultants have recommended: _____

PAUSE POINT for Remote Consultant to ask clarification questions

VITALS (current and trend as of _____): HR _____ BP _____ RR _____

SpO2 _____ EtCO2 _____ Temp _____

UOP (mL/hr) _____ over _____ (# hours) Mental Status (GCS/AVPU) _____

EXAM: Head/Neuro _____ Ext/MSK _____

Lungs _____ Abd _____ Skin/Wounds _____

PAUSE POINT for Remote Consultant to ask clarification questions

TO-DO/FOLLOW-UP/TO-STOP NOTES

1. _____

2. _____

PAUSE POINT, for Medic/to ask clarification questions/READBACK

6. Surgical and Medical Procedures

Procedural Sedation

Guidelines and Considerations:

- Casualties may require sedation in the setting of severe injuries to ensure safety (casualty/team members), to facilitate overall mission success, or to perform an invasive procedure, secure an airway (RSI), or manage the casualty on a ventilator.
- Ketamine is used in the field to induce dissociation (dissociative sedation), a distinct trance-like state, that confers sedation, analgesia, and amnesia, while maintaining the patient's hemodynamic status, spontaneous respirations, and protective airway reflexes. It is common to see transient elevations in HR and BP.
- Ketamine should be administered via slow IV/IO push (1 minute). Transient apnea can occur if high concentrations (100mg/mL) are given too quickly.
- Patients should be disarmed prior to receiving ketamine.
- Document mental status exam (AVPU) prior to administering ketamine.
- SpO₂ and EtCO₂ should be monitored if tactically feasible. Must be prepared to manage the airway if not already secured.
- Vascular access (IV/IO) should be established as soon as possible following IM/IN dosing.

Dosing Options:

- Ketamine 150mg IV/IO slow IV push (1–2mg/kg) – repeat as needed to maintain dissociation (q15–30min)
- Ketamine 300mg IM (2–3mg/kg) – repeat q30min PRN
- Continuous Sedation (1–2mg/kg/hr)
 - Ketamine 1,000mg/250mL LR (4mg/mL infused at 25–50mL/hr – titrated to adequate response
 - Drip concentrations can be varied to meet overall fluid requirement

Adverse Reactions:

- Apnea – support breathing; typically transient and not clinically significant
- Incomplete dissociation – administer additional ketamine (50% of previous dose)
- Emergence reaction – administer midazolam (Versed®) 1–2mg IV/IO/IN
- Nausea/vomiting – ondansetron 4mg ODT/IV/IM – repeat q4hr PRN

WARNING Benzodiazepines (midazolam) should not be used prophylactically and are not routinely needed when the appropriate dose of ketamine is administered slowly (IV/IO). Midazolam can be used to manage emergence reaction.

Airway

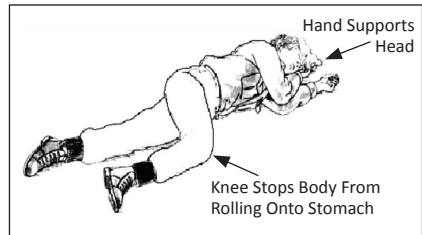
Guidelines and Considerations:

- Indicated when airway is (or a significant potential exists to become) partially or completely obstructed or compromised.
- Cervical spine injury is assumed with deceleration trauma, blast injury and unconscious patients. Spinal immobilization is not required for penetrating trauma alone in the absence of other spinal precaution indications.
- Airway management options are often driven by the tactical situation and phase of patient care. In general, airway options during each phase of patient care/evacuation will be limited to the following:
 - Chin-lift or jaw-thrust
 - Nasopharyngeal airway (NPA) – Indicated for unresponsive casualties without evidence of basilar skull fracture or significant mid-face trauma
 - Recovery position – Utilize in mass casualty incident if NPA not available or working
 - Sit up and lean forward for conscious patients
 - Supraglottic Airway Device (e.g., Laryngeal Mask Airway, I-gel)
 - Endotracheal intubation –direct/video assisted laryngoscopy
 - Cricothyroidotomy

Recovery position

For use in unconscious patients in dynamic situations and mass casualty scenarios where time, tactics and resources do not allow other treatments.

1. Lay patient prone.
2. If on left side, extend left arm overhead, right arm bent at elbow in front on ground, left leg extended, right leg flexed at hip and knee.



Sit up and lean forward position

For all patients who are conscious and bleeding from the mouth or throat and can maintain their own airway. If they can do this, never force them to lie down. Monitor clinical status and O2 sat closely and be prepared to perform surgical airway if they deteriorate (refer to *Oro-pharyngeal Hemorrhage Protocol* in the PJ MTPs). Patient will determine best position of comfort. It is important to treat and transport the patient in this position if able and avoid surgical airway.

Nasopharyngeal Airway (NPA)

For use on unresponsive casualties without evidence of basilar skull fracture or significant mid-face trauma. NPA is the preferred initial airway adjunct. Never force the airway. If the patient does not allow it to remain in place leave it out. This means their gag reflex is intact.

1. Lubricate with water soluble lubricant or the patient's saliva.
2. Insert the airway through the right nostril, direct it straight back, not up, advance into the posterior pharynx.
3. If unable to insert through the right nostril, attempt to place through the left nostril.

PJ PEARL:

- Keep a 6 inch piece of bougie with the NPAs to ream out the airway in blast patients PRN. There have been cases of patients in blasts who have had dirt and debris impacted in their nasal passages, as well as the trachea while attempting surgical airways. Keep full length bougie with intubation gear.

Supraglottic airway (SGA) devices

1. *I-gel* – no cuffs to inflate. Preferred in aeromedical evacuation
2. *LMA Supreme* – one cuff to inflate

CAUTION: SGA's are not definitive airways and thus require constant monitoring for displacement including visual check of device, O2 saturation, capnography and chest rise and fall and breath sounds. They should be adequately stabilized, and carefully managed during patient movement.

Endotracheal Tube (ETT) intubation

For Protection of the Airway and/or Means of Ventilation In The Apneic Patient

Equipment:

1. Endotracheal tube with stylet, cuff checked for leaks (size 7.0–7.5–8.0 for adult)
2. Laryngoscope (check operation of blade, bulb and batteries)
3. BVM
4. Suction
5. Capnometer and Pulse oximeter
6. Syringe to inflate cuff and tape or other means of securing the ETT once placed
7. Elastic gum bougie
8. Rescue devices – SGA and cric kit readily available and prepared for use

Procedure:

1. Pre-oxygenate patient with 100% oxygen for several minutes prior to intubation, if available.
2. Assemble and test equipment while patient is being pre-oxygenated:
 - a. Inflate cuff of ETT with 5–10cc of air and check for leaks. Remove air from cuff leaving syringe attached to tube. Insert stylet into ETT ensuring it does not protrude past the distal end of the ETT. Ensure that the stylet slides out the top of the ETT easily.

- b. Check light on laryngoscope.
- c. Ensure availability of suction.
- 3. Lubricate distal end of tube with water soluble lubricant (viscous lidocaine can be used).
- 4. Stop pre-oxygenation.
 - a. Make an attempt less than 30 seconds, if failed, remove laryngoscope and ventilate the patient for 1 minute. Repeat attempt to visualize cords unless there is obvious severe edema, or excess blood or secretions that cannot be suctioned.
 - b. Make no more than 2 attempts before reverting to maintain BVM, placing SGA or performing surgical airway. Avoid prolonged attempts. If you cannot visualize the vocal cords immediately, come back out of the airway, bag the patient to re-oxygenate and attempt again.
 - c. When cords are visualized, advance the ETT cuffed balloon beyond cords. Inflate cuff and ventilate. If using bougie, place bougie first with visual confirmation of passing the vocal cords, and tactile feedback of feeling the tracheal rings.
- 5. Confirm proper tube placement:
 - a. Auscultate over stomach and both lung fields.
 - b. Attach capnometer and document CO2 reading.
 - c. If proper tube placement can't be confirmed, reposition or remove tube as necessary.
 - d. Secure tube once proper placement confirmed.
 - e. Reconfirm position of tube by auscultation and capnometry every time the patient is moved. Also monitor pulse oximetry. If patient begins to desaturate, check tube for DOPE: Displacement; Obstruction (blood, mucus); Pneumothorax; Equipment (disconnection, power failure, etc.).

PJ PEARLS:

When performing intubation use the following 4 steps:

1. Scissor the mouth open by applying pressure to the molars via the thumb and middle finger.
2. Put the laryngoscope blade on the right side of the patient's mouth and sweep the tongue to the left as you go.
3. Progressive visualization of structures: Insert just the tip of the blade first and incrementally place it forward until you see the tip of the epiglottis. Then place the blade in front of the epiglottis (in the vallecula) so it stays on the tongue. Continue to slowly advance (and lift up) it so you next see the arytenoid cartilages, the "knuckles" in back of the airway, and then the entire airway (the upside down "V", the V being the pale vocal cords).
4. Pass the tube under direct visualization of it going through the vocal cords.

NOTE: If you only see a portion of the airway, insert the bougie, feel the tracheal cartilages, pass an ET tube over the bougie to the appropriate depth and withdraw the bougie.

Rapid Sequence Induction (RSI)

When intubation is indicated and the patient has a gag reflex. This eases intubation and reduces the risk of vomiting and aspiration.

WARNING: Do not attempt these procedures if not trained or qualified. NOT ALL PJs are taught, or qualified, to perform this procedure. Pararescue Medical Directors will authorize properly trained Pararescuemen to perform this procedure.

The 7 Ps of RSI

1. Preparation

- Check all equipment (BVM, O₂, ETT, suction, SGA Devices, Cric supplies)
- Draw up induction (sedation) and paralytic meds

2. Pre-oxygenation

- 3 minutes with tight fitting non-rebreather mask if patient is spontaneously breathing
- 8 vital capacity breaths if assisted with BVM with 100% O₂

3. Pre-medication

- You *may* pre-medicate with Versed 2mg IV if using ketamine for induction
- ONLY if patient is not hypotensive

4. Sedate and Paralyze

- Sedation agent renders the patient unconscious/unresponsive
 - Ketamine 150mg (2.0mg/kg) IV/may use 100mg in smaller adults
 - Do not use ketamine in the severely hypertensive patient, use Versed 10mg
- Paralytic eliminates muscle tone and optimizes laryngoscopy and prevents vomiting
 - Options: rocuronium: 100mg (1mg/kg) IV (150mg if >100kg)
 - NEVER PARALYZE WITHOUT GIVING AN APPROPRIATE DOSE OF AN INDUCTION AGENT!**

5. Pass the tube

- If successful: remove stylet, ventilate patient.
- If unable to pass the tube after 2 attempts, or the patient's O₂ sat falls below 90%, bag the patient with 100% oxygen.
- Place an SGA Device (e.g., LMA, I-gel or King LT). If this is not successful, use O₂ saturation and EtCO₂, resume BVM if working. If not, or resources do not allow BVM, perform a cricothyroidotomy if unable to intubate or oxygenate the patient.

6. Proof of placement

- End tidal CO₂, auscultation of each lung and epigastrium, fogging of tube, bilateral chest rise, absence of epigastric distension.

7. Post intubation care: maintenance of sedation

- Bolusing of sedation:** Alternate 5mg Versed/100mg ketamine/100mcg fentanyl q30–60min
- Continuous sedation:** ketamine infusion (500mg/250mL NS – 2mg/mL) – administer at 75–100mL/hr
- If the patient continues to move or otherwise not tolerate the ventilator then sedation and analgesia are likely inadequate and need improved titration. Paralytics (rocuronium 20mg IV q1hr) should be administered sparingly to address patient–ventilator dyssynchrony or to facilitate mechanical ventilation in low lung compliance states (ARDS).

Video Laryngoscopy

- The use of a VL increases first pass success for all intubations including difficult intubations.
- VL is important during Rotary Wing operations to facilitate intubation from nonstandard positions (the patient's side or straddling the patient).
- Practice this skill, understand the equipment, and use the correct stylet.

Cricothyroidotomy

The primary indications for a cricothyroidotomy (CRIC, surgical airway) are:

1. Maxillofacial trauma with excessive bleeding from the mouth and throat when the patient does not tolerate the sit up and lean forward position
2. Burns, and anaphylaxis not responding to Epinephrine with associated laryngeal edema seen on laryngoscopy, and unable to visualize the vocal cords in patients who require a definitive airway

CAUTION:

- Severe bleeding is possible with this procedure. Be prepared to suction and provide direct pressure to control bleeding at the incision site.
- Most missed CRICs are due to incorrect anatomic localization.

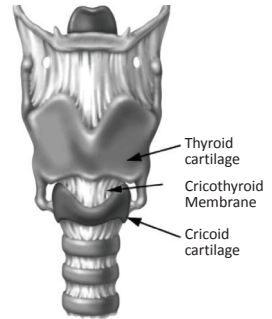
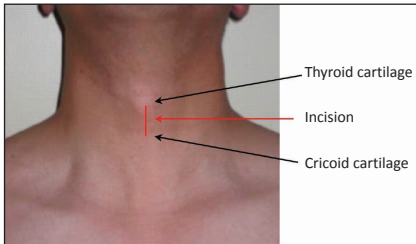
PJ PEARLS:

- Find the membrane by starting at the sternal notch, going up with your finger you will go over the first large ridge (the cricoid cartilage), the membrane lies above this.
- In lean patients, the structures can often be visualized.
- Stay in the midline. Keep 2 fingers on either side of the cartilages.
- Do not force in the airway as it will increase the likelihood of misplacement/soft tissue tracking. If there is resistance, use a tracheal hook to further open the incision and/or utilize a bougie and pass the tube over it. Feel for the tracheal rings with the bougie to facilitate confirmatory placement.

Equipment:

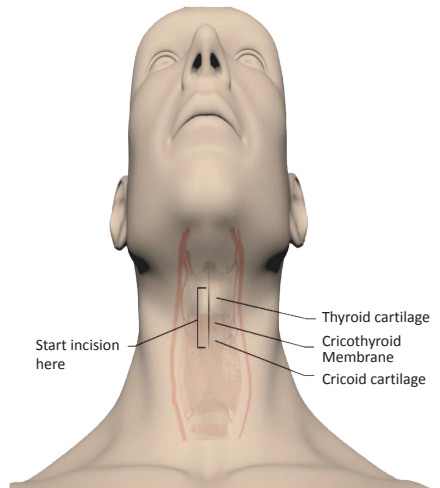
1. Cuffed tracheostomy tube (may use 6.0–7.0 cuffed endotracheal tube if no tracheostomy tube is available)
2. Trachea hook (if available)
3. Syringe to inflate cuff
4. Scalpel (or small knife, razor blade, or sharp surgical scissors if scalpel not available)

5. Umbilical tape or other means of securing tracheostomy or ETT
6. 4 × 4 gauze to control bleeding
7. 1–2% lidocaine, syringe and needle for local anesthesia, if patient is awake. Also can use 100mg ketamine (1mg/kg) IV to achieve dissociation
8. 8 inch piece of elastic gum bougie



Procedure:

1. Expose anterior neck and prepare equipment.
2. Identify cricothyroid membrane, swab with betadine or alcohol if time permits.
3. If patient is conscious, infiltrate area with lidocaine after performing procedural sedation.
4. Make 1-inch vertical incision in the skin overlying the cricothyroid membrane.
5. Holding the larynx between the thumb and middle finger with the index finger in the incision over the cricothyroid membrane, push scissors/blade over index finger into membrane.
6. After entering trachea, spread opening.
7. Insert bougie through the incision into trachea, directing it caudally (towards the lungs) to confirm placement and maintain patency of the incision. Bougie should advance freely in trachea, any resistance could indicate improper placement within the subcutaneous tissue.
8. Place tube over bougie and insert into trachea.
9. Inflate the balloon, remove bougie, check breath sounds, EtCO₂, secure tube and dress incision site.



PJ PEARLS:

- Use non-dominant hand to stabilize trachea between thumb and last 3 fingers and your index finger to locate/track the cricoid cartilage prior to making the incision.
- If the patient has a large neck use a syringe and needle to aspirate air and confirm placement within the airway. Leave the needle in place as a marker to make your incision and then stab into the airway.

Breathing

Methods of Delivery:

- **Nasal Cannula (NC):** Flow rates from 1–6 LPM delivering between 24–44 percent oxygen
- **Simple Face Mask (NRB without reservoir):** Flow rates from 8–12 LPM delivering between 40–60 percent oxygen

NOTE: To avoid the accumulation of expired CO₂, no fewer than 6 LPM should be delivered through the SFM. A flow rate of 6–8 LPM is generally acceptable for pediatrics.

- **Non-Rebreather (NRB) mask with reservoir:** Flow rates from 10–15 LPM delivering between 80–100% oxygen

NOTE: To avoid the accumulation of expired CO₂, no fewer than 8 LPM should be delivered through the NRB.

- **Bag valve mask (BVM) with reservoir:** Flow rates from 10–15 LPM delivering between 60–100 percent oxygen

PJ PEARLS:

- A pediatric BVM may be used on an adult, if available, as it provides acceptable tidal volumes.
- The technique of BVM is one of the most basic and important skills to have.
- Ensure proper seal is made by using the “EC-clamp” technique.
- Deliver one breath every 6 seconds. This is best achieved by counting in your head “one one-thousand, two one-thousand,” etc. and executing the next bag on the six one thousand count.
- Only squeeze the bag partially with one hand enough to see chest rise and fall.
- Utilize the capnometer and pulse oximeter to further guide rate and volume, especially if used for prolonged periods.

Needle Decompression (ND, or needle thoracentesis)

Indications:

- Symptomatic pneumothorax (MOI + respiratory distress)
- Tension pneumothorax (MOI + respiratory distress + shock)
- Bilateral needle decompression for patient with absent vital signs prior to declaring VSA

Signs/Symptoms in a patient with chest trauma:

- Respiratory distress
- Unexplained hypotension in trauma patient
- Unilateral absence of breath sounds
- Hypertympanic percussion over affected side
- Vital signs absent and pending cessation of care/CPR

Equipment:

- 10 or 14 gauge, 3.25-inch angiocath
- Supplemental Oxygen (if available)

NOTE: 10 gauge catheter may allow decompression to be maintained longer than 14 gauge, which may clot more easily

Procedure:

1. Administer oxygen 12L/min per NRB or positive pressure with BVM.
2. Locate the 4th or 5th intercostal space (about nipple level) on the anterior axillary line on the side of the pneumothorax.
3. Clean area with betadine or alcohol swabs.
4. Local anesthetic if time and tactics permit. Leave needle in place as marker.
5. Insert 10–14-gauge, 3-inch catheter over the **top of the rib** into the pleural space. Once through chest wall, advance catheter, and remove needle.
6. Listen for a decompression air rush from the catheter and observe for clinical improvement.
7. It is acceptable to either remove the catheter and re-sheath for repeat decompression (same casualty) or leave in place.
8. Observe/monitor the patient (and catheter for kinking/obstruction).
9. If casualty responds positively to treatment, repeat as necessary. If no relief after 2 attempts, proceed to finger or tube thoracostomy.

Thoracostomy (finger or tube, aka chest tube)**Indications:**

- Chest trauma with respiratory distress after the following: unsuccessful ND \times 2, need for multiple ND, signs of hemothorax (decreased breath sounds, dullness to percussion).

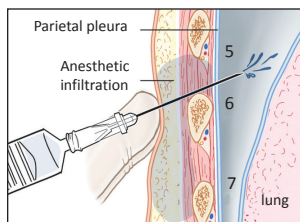
NOTE: Tension or symptomatic pneumothorax should initially be treated with ND (repeated as necessary.) A stable patient with a pneumothorax should be observed closely and a chest tube should be placed **ONLY** if the patient becomes significantly short of breath or has other signs of decompensation which cannot be corrected with repeat ND. Formal chest tube placement is **RARELY** required in the pre-hospital environment. Finger thoracostomy to ensure the chest is fully decompressed is appropriate if time and tactics do not permit tube placement.

Equipment:

- Sterile gloves, chest tube (ETT may be substituted) and one-way valve (Heimlich valve)
- Scalpel, needle, 0-silk suture, material for occlusive dressing
- Lidocaine
- Syringe with needle
- Curved Kelly clamp

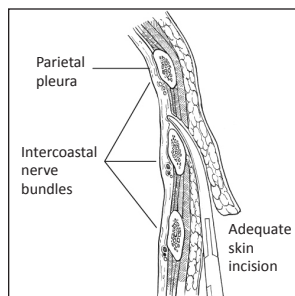
Procedure:

1. Locate 4th or 5th intercostal space (approximately at the nipple level in males) just anterior to the mid-axillary line on the affected side. Prep incision site with chlorhexidine (ChloroPrep) or equivalent and don sterile gloves.
2. **If the patient is conscious:**
 - a. Perform procedural sedation and/or local anesthetic at incision site with 1% or 2% lidocaine.
 - b. Holding the needle at a 90° angle to the skin, insert the needle down to the rib infiltrating the periosteum of the rib.
 - c. Walk the needle up and **over the top of the rib**, injecting gently into the area of the pleura.
 - d. Disconnect needle from syringe and leave needle in place to mark injection site. Make incision over it.
3. Make a 1-inch incision into the skin and subcutaneous tissue over the rib. Insert a sterile gloved finger down to the intercostal muscle **over the top of the rib** bluntly dissecting down to the pleura.
4. Puncture the pleura with a closed clamp. Make an opening big enough to fit your finger into the chest cavity.



Source: Reichman EF: *Emergency Medicine Procedures, Second Edition*:
www.accessemergencymedicine.com

Source: Minter, RM, Doherty GM:
Current Procedures: Surgery:
www.accessemergencymedicine.com
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CAUTION: Even with local anesthetic this part of the procedure may be painful for the conscious patient.

5. Sweep your finger inside the rib cage around the incision feeling the chest wall for any adhesions (scars) and breaking them up.
6. If only performing finger thoracostomy, allow blood to evacuate, if present. Once tension-pneumo signs/symptoms are relieved, place occlusive dressing over incision site (vented chest seal preferred). Monitor for recurrent tension pneumothorax and burp dressing if required.
7. Proceed here if inserting a chest tube. Do not use an ET tube.
8. Insert tip of chest tube with clamp into the pleural space, directing the tip of the tube towards the upper/posterior area of the pleural space. (Superior and posterior to lung; do not go too far; should have 3–4cm of tube in the pleural cavity).
9. Fasten a one-way valve to tube and reinforce with tape. Close incision and secure tube to the skin with a box stitch and sandal wrap using 0-silk suture. Use of a straight needle is preferred due to ease and efficiency of use.
10. Apply an occlusive dressing around the tube and incision.

11. Option for securing chest tube: wrap base of tube on chest wall with occlusive dressing (can use chest seal), or gauze if no occlusive material is available. Wrap duct or surgical tape around tube low against chest wall. Leave tail of duct tape and fold back on itself so there is a 2–3 inch tail of duct tape with no sticky side. Staple or suture tape to chest wall snug so tube does not move.
12. Tape/staple tube more inferior as well so that it is retained alongside of the patient.

PJ PEARLS:

- If time and tactics do not permit, perform a finger thoracostomy. Perform the same steps as above, but, after the chest wall is penetrated with a clamp, do the finger sweep, let the blood drain, and seal the incision with an occlusive material. Repeat as needed.
- In MCI, or tight time and space, place (stuff) a glove into an open or sucking chest wound up to the rib to create an occlusive chest seal, or duct tape a glove/IV bag/Ziploc, etc. over sterile dressing.

NOTE: Do not place a chest tube into a chest wall defect from injury. Perform tube and finger thoracostomies in a separate, uninjured site.

Options for chest tube management:

1. Clamp and drain intermittently. If clamped, closely monitor for recurrent tension pneumothorax.
2. Attach one way valve (commercial or improvised) and drain to gravity.
3. Apply low continuous suction if available.
4. Apply “turkey baster” with low pressure suction and leave in place. Can re-engage suction as needed, or every 1–4 hours.
5. Make every effort to measure volume of blood drainage and document amount and time.
6. Use a one-way valve if flying.

NOTE: Any patient who has undergone a finger or tube thoracostomy, or any other invasive procedure including cricothyroidotomy, fasciotomy, etc. requires Ertapenem if they have not already received it.

Intraosseous Infusion

Indications:

- Vascular access is required and an IV cannot be obtained – no more than 2 IV attempts.
- Immediate vascular access for a patient in hemorrhagic shock, or any patient in shock with collapsed veins.

If two IOs are started for a patient in shock, they may be converted later to IVs when time and tactics permit and the veins become palpable.

NOTE: EZ-IO device by drill or manual driver for humeral head, tibial and iliac bone infusion are approved for PJ use. Sternal site can be used but is least desirable.

Guidelines and Considerations:

1. Higher incidence of infection with intraosseous access than with IV access if left in place for greater than 24–48 hours.
2. Rapid fluid infusion may be painful, if so inject 1–2mL 1% lidocaine into intraosseous catheter.
3. Once needle in place, must protect it carefully.
4. Slower infusion rate compared to IV access – use pressure infusion bag to achieve higher flow rates if required.
5. Can give normal saline, blood, and most medications via IO infusion.

CONTRAINDICATIONS:

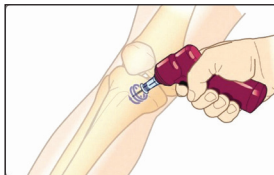
Infection at the site of puncture, fracture, previous IO insertion attempt in same bone, injury in same extremity/bone.

Equipment:

1. Gloves, PPE
2. Intraosseous needle (16 gauge or larger for adult), syringe, and IV administration set
3. Manual driver or drill
4. Alcohol or betadine swab/wipe
5. Tape, sterile dressing
6. Lidocaine, syringe, needle. **NO EPINEPHRINE**

EZ-IO Procedure: Tibia

1. Determine that no contraindications are present:
 - a. Tibial Fracture
 - b. Previous orthopedic procedure on tibia, previous IO attempt on tibia
 - c. Infection over insertion site
2. Find insertion site 1 finger breadth medial to tibial tuberosity. This is the flat plateau on the medial side of the tibia below the knee.
3. Clean insertion site with alcohol or Betadine
4. Anesthetize skin at insertion site
5. Begin insertion:
 - a. Hold tibia with one hand
 - b. Position needle set at 90° to insertion site
 - c. Push needle through skin until contacting bone
 - d. Apply firm and consistent pressure to manual EZ-IO needle
 - e. Continue twisting manual EZ-IO needle until “pop” is felt or needle flange touches skin
6. Remove driver from needle set
7. Remove stylet from catheter
8. Confirm catheter tip position:
 - a. Catheter should be firmly seated at 90° angle
 - b. Consider aspiration of small amount of marrow to confirm placement
 - c. Easy flow of flush solution
9. Attach EZ-Connect or standard luer lock to primed IV fluid administration set
10. Flush catheter with 10mL of NS and ensure free flow of fluid
11. Initiate fluid infusion and monitor for signs of extravasation or infiltration
12. Apply EZ-IO wristband and stabilizer dressing
13. Secure tubing and catheter



Drawing courtesy of Vidacare Corp. San Antonio, Texas.

EZ-IO Procedure: Humeral Head (HH)

1. Place the patient's hand on the umbilicus, this brings the HH forward.
2. Use the pads of your second through fourth fingers to feel the spherical HH.
3. Place the IO needle directly anterior/in from the front (not lateral) over the HH.
4. Follow the same procedures as step 5 on page 47.

NOTE: Due to the mobile nature and design of the humeral joint, arm movement and contraction of the deltoid muscle (e.g., simple abduction, rotation, or extension of the arm) can dislodge the IO catheter. Raising the arm horizontally above the plane of the torso will often impinge the IO catheter and dislodge or bend the catheter. The arm should also be stabilized to limit movement.



PJ PEARLS:

Use the HH in most situations so you are:

- Working near the airway and have easy access to both the HH and the airway
- Able to place 2 lines at once IAW the *Combat Shock Protocol* in less than 60 seconds
- Proficient in the most commonly used technique due to combat patients may have amputated/mangled lower extremities

Burn Management

NOTE: This information complements the MTPs in Chapter 4 and expounds upon the 9, 10, 20, 30 principles for burn care.

2nd degree or greater burns covering 20% of the total body surface area (TBSA), or those with smoke inhalation injury (and airway or breathing problems), are life threatening. Burns that affect vision, decrease hand function, or cause severe pain can take the warfighter out of action.

Hypothermia risk is high in burn patients. Anticipate that all burn casualties will become hypothermic and take immediate measures to prevent it by covering patient. Aggressively rewarm if temperature falls below 36°C (96.8°F).

Telemedicine: Management of burns is complex. Also, burns are highly visual and a lot can be communicated via pictures or video. Establish telemedicine consult as soon as possible.

If the unit flight surgeon can't be reached, contact the USAISR Burn Center for consultation:

US Army Institute of Surgical Research (USAISR) Burn Center

DSN 312-429-2876 (429-BURN)

Commercial (210) 916-2876 or (210) 222-2876

E-mail to burntrauma.consult.army@mail.mil

Airway Management

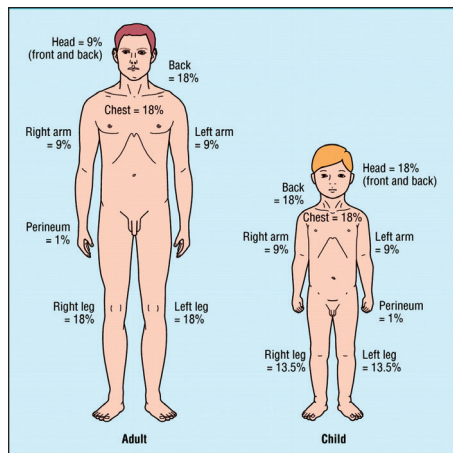
- Patients with smoke inhalation injury may present with a range of symptoms in terms of severity.
- Patients with severely symptomatic smoke inhalation injury (e.g., respiratory distress, stridor) require immediate definitive airway (cuffed tube in trachea) because they are at risk of immediate airway loss. Oxygenate and ventilate.
- Patients with signs of inhalation injury and burns >40% TBSA are at high risk for airway edema and need to be monitored closely for signs of respiratory distress. Be prepared for urgent intervention.
- While it is appropriate in a hospital setting with advanced medical providers to intervene early, our policy is to avoid definitive airway placement unless it is necessary for casualty survival.
 - The indication for a definitive airway is respiratory distress and/or stridor.
 - Rapid-sequence intubation, followed by continuous sedation and airway maintenance, supplemental oxygen, portable ventilator.
 - In the case of laryngeal edema and the inability to intubate, perform a cricothyroidotomy followed by continuous sedation and airway maintenance, supplemental oxygen via an oxygen concentrator, portable ventilator if the patient is not breathing adequately on their own. If there is airway obstruction from edema without significant lung injury, the patient may not need to be on a ventilator. Rely on pulse oximetry, capnography and clinical findings to guide decision making.

NOTES:

- Make a single attempt at laryngoscopy (cord visualization), if unable to visualize the cords due to edema, proceed to surgical airway. If able to visualize the cords, make no more than 2 attempts at endotracheal intubation.
- Burns or explosions in a closed space are associated with higher risk of inhalation injury than burns occurring in open areas.
- Supraglottic airway is not appropriate because edema will continue to increase over 48 hours and these tubes do not overcome vocal-cord edema.
- Endotracheal tube must be secured circumferentially around the neck using cotton ties or similar. Tape does not stick reliably in the field due to dirt, sweat, and nature of injury (facial trauma/burns).
- Place nasogastric tube to decompress stomach in intubated patients.
- Perform frequent endotracheal suction of intubated patients to ensure tube patency and remove mucus/debris (approximately once an hour or more frequently if oxygen saturation [SpO₂] drops).
- If there is evidence of inhalation injury, use 3–5mL of endotracheal saline to facilitate suctioning and prevent tube inspissation and obstruction.
- Monitoring end-tidal CO₂ is an important capability for all intubated patients. A rising end-tidal CO₂ could indicate clogging of endotracheal tube or poor ventilation from another cause (e.g., bronchospasm, tight eschar across chest).
- Perform a surgical escharotomy of the chest for tight, circumferential, full-thickness burns that impair breathing. Incision goes through the full thickness of the burn and into the fat. Expect some pain and bleeding.
- Use bronchodilators (e.g., albuterol inhaler) for intubated patients with inhalation injury, if available.
- Ventilator management of burn patients can be complicated and evolve as pulmonary conditions change due to volume overload/edema and acute respiratory distress syndrome (ARDS). Telemedicine consultation with skilled providers is recommended.

Assess Burn Size

- For small wounds, calculate the size of the wound by using the patient's hand size (including fingers) to represent a 1% TBSA. For larger wounds, calculate the patient's initial burn size using the Rule of Nines (see diagram to the right).



NOTE: Significant over- or underestimation of burn wound size (by more than 10%) may lead to significant morbidity. Underestimation may lead to under-resuscitation and organ failure (e.g., renal failure, shock); overestimation may lead to resuscitation morbidity (e.g., respiratory failure, compartment syndromes).

1st degree (superficial) burns look like a mild-moderate sunburn. They appear red, blanch readily, do not blister, and hurt when touched. Do NOT include these wounds in the estimation of TBSA used for fluid resuscitation.

2nd degree (partial thickness) burns are moist, blister, blanch, and hurt. Include these wounds in the TBSA estimation.

3rd degree (full thickness) burns appear leathery, dry, nonblanching, do not hurt, and often contain thrombosed vessels that are visible. Include these wounds in the TBSA estimation.

First degree burns



Second degree burns



Third degree burns



Fluid Resuscitation

Over the first 24–48 hours post burn, plasma is lost into the burned and unburned tissues, causing hypovolemic shock (when burn size is >20%). The goal of burn-shock resuscitation is to replace these ongoing losses while avoiding over-resuscitation.

Best: Isotonic crystalloids e.g., lactated Ringer's, Normal Saline (do not exceed 4L of NS due to the risk of metabolic acidosis). Utilize rule of 10s ($10\text{mL/hr} \times \%TBSA$).

- Start intravenous (IV) or intraosseous (IO) administration IMMEDIATELY.
- IV/IO can be placed through burned skin if necessary.
- NO bolus (unless hypotensive, in which case, bolus only until palpable pulses are restored).
- Adults: Measure burn size (TBSA) and multiply by 10. This is the IV fluid rate per hour.
 - For example, if the burn size is 30%: $30 \times 10 = 300$. Starting rate is 300mL/hr.
- For patients with weight >80kg, add an extra 100mL/hr for each 10 kg.
 - For example, for a 100 kg patient with 30% burns, the starting rate is 300mL/hr + 200mL/hr = 500mL/hr.
- **If resuscitation is delayed, DO NOT try to “catch up” by giving extra fluids.**
- For children, $3 \times TBSA \times \text{body weight in kg}$ gives the volume for the first 24 hours. One half is given during the first 8 hours.

Better: Enteral (oral or gastric) intake of electrolyte solution

- Sufficient volume replacement will require “coached” drinking on a schedule using approximately the same amount of fluids that would be given IV/IO (see page 50).
- Oral resuscitation of patients with burns up to about 30% TBSA is possible.
- If a nasogastric tube (NGT) is available, it is preferable to resuscitate with infusion of electrolyte solution via NGT (e.g., 300–500mL/hr). Observe for nausea to avoid vomiting.

Minimum: Rectal infusion of electrolyte solution. Rectal infusion of up to 500mL/hr can be supplemented with oral hydration (see Hydration side bar.) Not reliable though, this is a last choice).

HYDRATION NOTE: Plain water is ineffective for shock resuscitation and can cause hyponatremia. If using oral or rectal fluids, they must be in the form of a premixed or improvised electrolyte solution to reduce this risk.

Examples:

World Health Organization (WHO) Oral Rehydration Solution (per package instructions or 1L of potable water with 6 level teaspoons sugar, 0.5 level teaspoon salt)

Mix 1L of D5W solution with 2L of Plasma-Lyte

Per 1L water: add 8tsp sugar, 0.5tsp salt, 0.5tsp baking soda

Per quart of Gatorade: add 0.25tsp salt, 0.25tsp baking soda (If no baking double the amount of salt in the recipe.)

Urine Output

Urine output (UO) is the main indicator of resuscitation adequacy in burn shock.

Urine output goal: Adjust IV (oral/rectal intake) rate to UO goals of 30–50mL/hr. For children, titrate infusion rate for a goal UO 0.5–1mL/kg/hr.

Best: Place Foley catheter

- If UO too low, increase IV rate by 20% q2hr (e.g., if UO = 20mL/hr and IV rate = 300mL/hr, increase IV rate by $0.20 \times 300 = 60\text{mL/hr}$. New rate is 360mL/hr).
- If UO too high, decrease IV rate by 20% q2hr until the goal of 30–50mL/hr is achieved.

Better: Capture urine in premade or improvised graduated cylinder

- Collect all spontaneously voided urine and carefully measure; >180mL q6hr is adequate for adults.
- A Nalgene® water bottle is an example of an improvised graduated cylinder.

Minimum: Use other measures

- If unable to measure UO, adjust IV rate to maintain HR less than 140, palpable peripheral pulses, good capillary refill, intact mental status.
- Measure the BP and consider treating hypotension, but remember: BP does not decrease until relatively late in burn shock, because of catecholamine release. On the other hand, BP may be inaccurate (artificially low) in burned extremities.

Extremity Burns

Goal: Prevent and manage (edema) of burned extremities to prevent long-term damage from impaired tissue perfusion.

- Remove any constrictive items/clothing to include watches, bracelets, or rings.
- Elevate burned extremities above the level of the heart, ensure limb is protected from excessive movement and secondary injury.
- Monitor extremities for decreased capillary refill, progressive pain, increased tension of the muscles to palpation and decreased pulses.
- Perform escharotomies (refer to detailed description below) if pulses are diminished or absent in circumferential burns.
- Bleeding is typically limited but may require application of hemostatic dressings.
- Obtain teleconsultation if able.

Pain Management

Burns can be extremely painful and require a deliberate approach to analgesia with consideration for long term control.

- Pain management may be initiated with an IV/IM dose of Ketamine or Hydromorphone per pain management protocol.
- For prolonged care of burn patients, a ketamine infusion may provide more consistent analgesia and help conserve supplies of analgesic medications.
- Ketamine infusion (500mg/250mL NS = 2mg/mL) administered at 5–15mL/hr (0.1–0.3mg/kg/hr) for analgesia.
- Burn wound care is extremely painful. Procedural sedation should be considered prior to performing wound cleaning, debridement, escharotomy or dressing changes.

Infection

Burn wounds are easily infected.

Goal: Prevent burn wound infection through wound care. If evacuation to higher level of care is anticipated within 24 hours, simply cover burns with clean, dry gauze and leave intact blisters in place. Always avoid wet dressings, because of the risk of hypothermia. If evacuation is not anticipated for more than 24 hours, and time, medication, and human resources permit, provide wound care as soon as possible after the injury (within the first 24 hours). If resources are not available initially, provide wound care as soon as possible.

- Clean wounds and debride loose dead skin by washing with any antibacterial soap in clean water, dress wounds with any available dressings; optimize wound and patient hygiene to the extent possible given environment.
- Cover with clean sheet or dry gauze. Leave blisters intact. Avoid wet dressings.
- Begin antibiotics for fevers above 100.4°F, and for patients that may have been exposed to the elements for greater than several hours. Prophylactic IV antibiotics are not indicated for burn injury in the absence of infection.
- For missions where the patient is expected to reach definitive care in 24 hours post injury, apply dry sterile dressings after initial debridement. Change dressings at 12 hour intervals.

- For missions where the patient is expected to reach definitive care in excess of 24 hours post injury, silver nylon dressing covered by Kerlex can be used.
- Silverlon can be left in place for 3–5 days as long as the wound is clean when the Silverlon is applied.
 - Moisten (do not soak) Silverlon dressings with sterile or potable water every 6 hours.
 - The outer gauze dressings should be changed, leaving the Silverlon in place, sooner than 3 days if they become saturated with exudate or otherwise dirty.
 - If the patient develops any evidence of infection, the Silverlon must be removed and the wound inspected sooner than 3–5 days.
 - The Silverlon can be removed and cleaned in sterile, or at least clean uncontaminated, water and reused for up to 5 days.

Escharotomy

WARNING: Do not attempt these procedures if not trained or qualified. NOT ALL PJs are taught, or qualified, to perform this procedure. Pararescue Medical Directors will authorize properly trained Paramedics to perform this procedure.

NOTE: Escharotomy and fasciotomy incisions are different, do not confuse them.

Indications: Relief of circulatory and/or respiratory compromise due to circumferential full thickness burns. This procedure is rarely required in the field, but has been performed by PJs.

Equipment:

- Scalpel
- Sterile gloves and sterile dressing
- Hemostatic gauze for bleeding

Procedure:

1. Irrigate and debride as needed. Outline where escharotomy is to be performed.
2. Perform procedural sedation (dissociation) with ketamine 100mg IV/IO. This will provide approximately 10 minutes of sedation and can be repeated as required to successfully complete the procedure. Versed 2mg IV/IO should be administered for significant patient agitation as sedation wanes = emergence phenomenon.
3. Sterile prep of incision area. Perform procedure under as sterile/aseptic conditions as able.
4. Using scalpel, cut through eschar until subcutaneous tissue is exposed. Will appear as fatty tissue. Subcutaneous tissue will often protrude through incision when adequate depth is reached and eschar will separate.
5. Continue line of incision extending entire length of eschar on opposite sides of extremity or chest (posterior/anterior or lateral/medial), being careful **NOT** to **CUT** into **UNDERLYING FASCIA** (fibrous tissue layer) or muscle. Only cut through the visible scar tissue of the skin.

6. Utilize the belly of the scalpel blade (not the point), and incrementally go deeper as needed. Do not commit to going deep on the initial incision. When the tension is released, it should appear obvious. This technique will ensure that the cut is not excessively deep.
7. Control bleeding with pressure and ligation (suture) as needed.
8. After procedure completion, check for improved respiratory/circulatory status.
9. Apply bulky dressing and elevate burned extremities.
10. Monitor for signs of hemorrhage, loss of circulatory/sensory/motor functions, and infection.

Escharotomy Precautions:

REFER TO DIAGRAM ON NEXT PAGE

- FINGERS are incised along both sides of each finger involved.
- LEGS are decompressed with mid-medial and mid-lateral incisions.
- TOES are done in similar manner as fingers.
- CHEST is decompressed with incisions in the mid-axillary line from clavicle to costal margin inferiorly and may be joined by transverse incisions connecting the mid-axillary incisions if adequate relief of constriction is not obtained.

Figure (right): The incisions on the extremities are placed along the mid-medial and/or mid-lateral joint lines. **However, these sites also contain superficial vessels or nerves and care must be taken not to sever these.** The incisions on the chest are intended to free up a mobile "plate" of tissue to restore adequate chest movement with breathing.

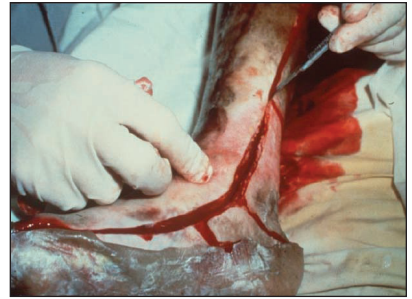
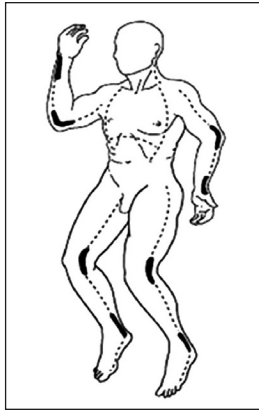
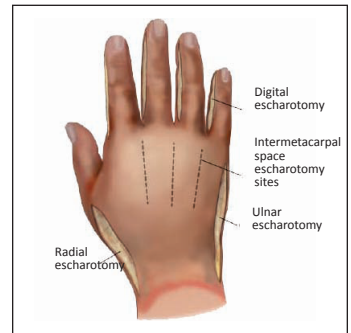
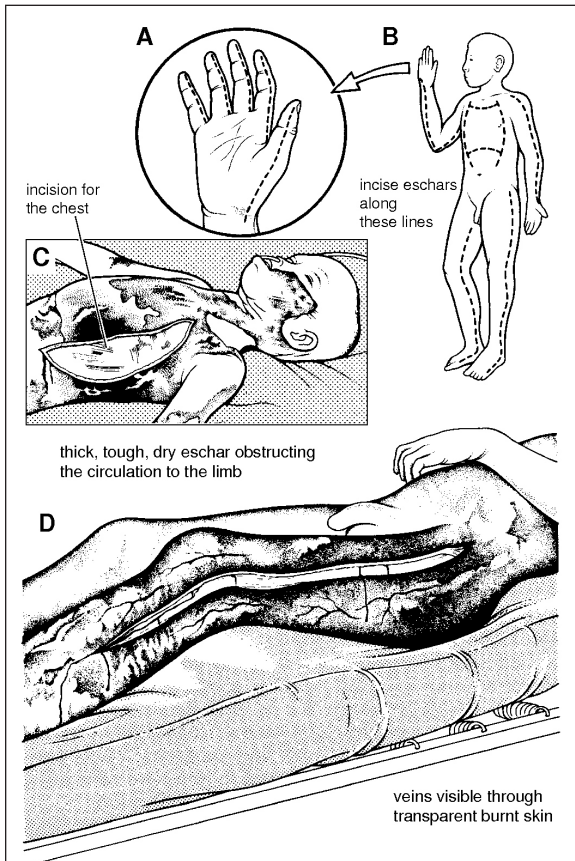


Figure (above): Escharotomy of the leg and foot, using a scalpel. When using a scalpel, there may be increased blood loss when performing the procedure.

EMERGENCY ESCHAROTOMY



Fasciotomy and Compartment Syndrome



1. Do not attempt these procedures if not trained or qualified. NOT ALL PJs are taught, or qualified, to perform this procedure. Pararescue Medical Directors will authorize properly trained Pararescuemen to perform this procedure.
2. Compartment syndromes require a high index of suspicion.
3. PJs are only authorized to perform lower leg fasciotomy (below the knee) with medial and lateral incisions. Do not perform thigh or upper extremity fasciotomies.

Signs and Symptoms:

1. Be suspicious of compartment syndrome in the following conditions:
 - a. Fractures
 - b. Crush injuries
 - c. Vascular injury
 - d. Circumferential burns
 - e. Multiple penetrating injuries (fragmentation)
 - f. Blunt trauma
2. Clinical signs: Accurate diagnosis requires a high rate of suspicion:
 - a. Classic: Late Signs – “5Ps”
 - i) Pain
 - ii) Pallor
 - iii) Pulselessness: Be aware that peripheral pulses are present in 90% of patients with compartment syndrome
 - iv) Paresthesia (numbness)
 - v) Paralysis
 - b. Findings that will drive the decision to perform fasciotomy:
 - i) Increasing pain
 - ii) Pain out of proportion to the physical findings, and sometimes the injury
 - iii) Pain with passive motion of muscles in the involved compartment
 - iv) Progressive tension to palpation in the involved compartment by fingertip palpation
 - c. Increasing swelling, decreasing motion, and increasing pain not responsive to pain medication in the appropriate clinical setting should raise the possibility of a developing compartment syndrome.
 - d. Compartment Syndromes may take hours or days to develop. For patients with suspected Compartment Syndromes, re-evaluate every 4–6 hours for 48 hours.
 - e. Compartment Syndromes may occur in the: thigh, lower leg/calf, foot, forearm, or hand.

Management:

1. Orthopedic/Compartment Syndrome Management
2. Apply traction splints as necessary for mid femur fractures
3. Assess fractures and splint in position of function

4. Check neurovascular status after any manipulation
5. Hypotensive patients are at increased risk of developing compartment syndrome
6. Non-Surgical Treatment
 - a. Pain Management: See *Pain Management Protocol*
 - i) Increasing pain medication requirements may indicate a developing compartment syndrome
 - ii) Aggressive analgesia or sedation may decrease a patient's level of consciousness such that the increasing pain of a compartment syndrome is not recognized
 - b. Elevation – Maintain extremity at level of the heart **DO NOT ELEVATE!**
 - c. Loosen encircling dressings
7. Surgical (Fasciotomy)
 - a. See *Procedural Sedation Protocol* prior to doing procedures
 - b. Only consider fasciotomy if:
 - i) Evacuation is delayed 6 hours or longer
 - ii) **AND** the following indications exist
 - 1) Pain with passive motion of the involved muscle group
 - i. Increasing pain with decreasing response to pain meds
 - ii. Increasing swelling and tightness in the involved compartment
 - c. Fasciotomy may be a limb saving procedure in the proper clinical setting. When done for the wrong reasons, or done incorrectly, the potential for serious complications exists.

Procedure:

1. Leg/calf

- a. LATERAL Incision
 - i) Identify lateral aspect of the tibia and the fibula further laterally. Perform incision one finger breadth (about 2cm) in front of fibula, between this bone and the tibia.
 - ii) Incise the skin first, down the level of the fascia, which will appear as a white shiny surface relative to the surrounding subcutaneous soft tissues superficially.



The incision location anterior to the fibula



Identify the tibia, fibula, and the intermuscular septum. Make the Fasciotomy incisions anterior and posterior to the septum.

b. MEDIAL incision



The dotted line represents the palpable tibial border and the solid line on the tibia represents the incision line.

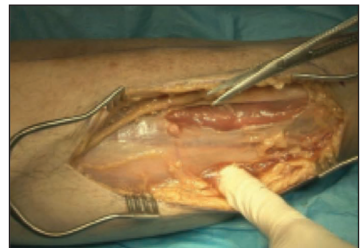
- i) The skin incision is created one finger (approximately 2 centimeters) behind the medial aspect of the tibial bone. The skin incision should be extended across the middle third of the lower leg.



- ii) After incising the skin, use blunt dissection to get down to the fascia.

- iii) Incise the fascia to expose the muscle underlying below.

- iv) Make the fascial incision the full length of the skin incision.



NOTE: The muscle will “pop” out from pressure through the incision.

- c. Initiate *Urgent* evacuation.

Field Amputation for Extraction/Extrication

Principles:

- Perform an amputation if unable to extract or extricate patient due to time or tactics that preclude patient and mission safety, or it is technically impossible to extricate the limb.
 - Tactical considerations include enemy contact and threat
 - Technical safety may include concerns regarding further or impending structural collapse, environmental dangers, fire, etc.
 - Disentanglement procedures have been exhausted or are deemed futile
 - Time: Life over limb; the patient's overall condition is deteriorating
 - The limb is entrapped and mangled beyond recognition and is attached by minimal soft tissue
- If a second PJ or medical asset is available, document agreement of need for amputation with name/date/time.
- **Perform the amputation as distal (low on the extremity) as possible – save as much length as possible.**

Guidelines:

- Assess patient and provide MARCH PAWS treatment if time and tactics permit.
- Obtain IV/IO access, intranasal route as back up.
- Document confirmation of need to amputate by 2nd PJ/Medic if present.
- Inform the patient of the need to do this to save his/her life.
- Provide sedation per *Procedural Sedation Protocol* if patient is responsive and if tactically feasible.
- Administer Ertapenem IV/IO/IM peri-amputation; don't delay procedure to administer antibiotics.
- Administer local anesthetic with lidocaine circumferentially and deeply. Aspirate and confirm not in a vessel.
- Check and prep equipment – scalpel/knife, bone saw/sawzall (with or without bone blades), 4 combat gauze, Kerlex/adaptic dressings, ACE wraps/duct tape/cravat or other item to wrap the stump effectively.
- Use universal precautions as able.
- Place 2 tourniquets as distally as possible, never over a joint.
- Clean site if possible – water, betadine or soap if available.
- If it is a completion amputation (soft tissue only) a scalpel can be used. If a scalpel is unavailable, a knife or trauma shears can be used (clean dirt, rinse with water, and wipe blades with alcohol first).
- If the limb is entrapped and intact, incise the limb circumferentially outside to in, cut down to bone. Once in contact with bone, use the bone or a hand saw to saw through. (Hand saws used for pruning bonsai trees have been recommended by USAR teams).
- The entire amputation can be performed with a sawzall by cutting through in one cut without the initial circumferential incision. If tactical situation permits, utilize fresh blade and consider wrapping the incision site in a few wraps of duct tape prior to making this cut.

NOTE: Using this method will induce significant vibration to the casualty and should be considered based on equipment available and tactical situation.

- Apply hemostatic dressing with pressure for residual bleeding.
- Secure the stump with dressings/tape. Leave the tourniquets in place.
- If the amputated limb is retrievable, place sterile saline soaked gauze over the end and place the limb in a plastic bag, keep out of sight of the patient, do not put on ice, and deliver to the surgeon.
- Maintain sedation and analgesia.
- Perform detailed documentation including indication, name of second PJ agreeing on need for amputation, all meds given.

Fracture Hematoma Block

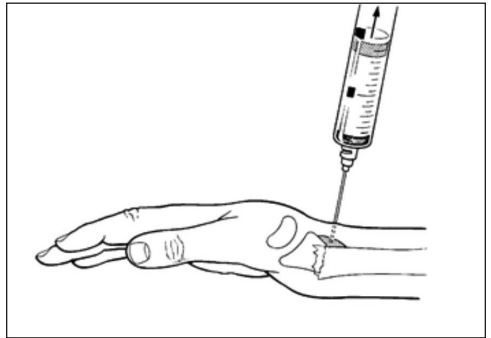
Indications: Pain control for fracture reduction. Commonly used for closed fractures of the distal forearm and hand. Is relatively easy and quick to perform.

CAUTION: May cause infection of skin and fracture if overlying skin not cleaned appropriately. Be sure to wait about 5 to 10 minutes after procedure before attempting reduction.

Contraindications: Do not attempt in open fractures and do not attempt to inject visibly soiled skin. Do not give more lidocaine if total will exceed toxic dose (if lidocaine was used for another procedure, be sure that cumulative dose does not exceed toxic dose).



Procedure: Thoroughly clean skin over fractured area to prevent infection. Can use 1% lidocaine (5 to 15mL) or 2% lidocaine (5 to 10mL) for injection. **NO EPINEPHRINE.** Inject lidocaine with needle and syringe into fractured area and around fractured bone. Aspirate prior to injection to ensure that the needle is not intravascular. The aspirate will have blood mixed with fat/marrow, but should not be bright red or pulsatile. Larger fractures may require larger volumes of lidocaine but keep in mind the toxic dose of lidocaine (4.5mg/kg or max of 300mg; 30mL of 1% lidocaine = 15mL of 2% lidocaine = 300mg). Pain relief seen in roughly 5 to 10 minutes and will last for 1–2 hours.

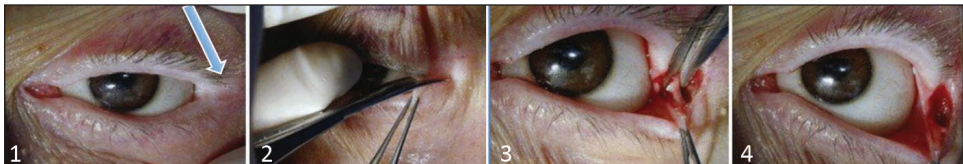


Lateral Canthotomy

WARNING Do not attempt these procedures if not trained or qualified. NOT ALL PJs are taught, or qualified, to perform this procedure. Pararescue Medical Directors will authorize properly trained Pararescuemen to perform this procedure.

Lateral canthotomy is indicated for casualties presenting with: **Retrobulbar Hemorrhage (RBH)** bleeding into the orbital space which is behind the eyeball, is a vision-threatening condition causing increased pressure behind the eye on the optic nerve leading to irreversible vision loss. It is also known as orbital compartment syndrome. As with other compartment syndromes, the goal is to lower the pressure as soon as possible to prevent tissue damage. Vision loss typically will occur after approximately 90 minutes of increased pressure.

1. The first step is prompt recognition of eye injury and need for intervention
 - a. Severe eye pain
 - b. Proptosis: bulging of the affected eye compared to other eye
 - c. Increased intraocular pressure (IOP) by palpation (increased firmness compared to opposite eye)
 - d. Decrease in or loss of visual acuity
2. Prevent further injury
 - a. Apply ice pack **around** the eye while avoiding direct compression of the eye
 - b. Activate evacuation (PRIORITY)
 - c. Initiate teleconsult with photos
 - d. Maintain patient in position with head elevated
3. If no improvement, perform **lateral canthotomy** as indicated as soon as possible, preferably within 90 minutes of injury.
4. The indication for lateral canthotomy is orbital compartment syndrome. **Do not perform this procedure if the eyeball structure has been violated. If there is a penetrating globe injury, apply a Fox shield for protection and seek immediate ophthalmic surgical support.**
5. Inject 2% lidocaine into the lateral canthus (1).
6. Crush the lateral canthus with a straight hemostat, advancing the jaws to the lateral fornix (2).
7. Using straight scissors, make a 1cm long horizontal incision of the lateral canthal tendon, in the middle of the crush mark (3).
8. The lower eyelid is cut, relieving orbital pressure. If the intact cornea is exposed, apply, hourly, copious erythromycin ophthalmic ointment or ophthalmic lubricant ointment to prevent devastating corneal desiccation and infection. Do NOT apply absorbent gauze dressings to the exposed cornea (4).



Nasogastric Tube

Indications:

1. Gastric decompression for ileus (bowels not moving due to any cause), spinal injury, abdominal trauma, acute abdomen, burn cases with PFC, GI bleeding, electrocution, intractable vomiting, intubated patient, aeromedical evacuation for severe trauma.
2. Feeding and hydration in extended care setting if patient is unable to swallow and IV/IO not available or preferred.



NG tube placement is contraindicated in patients with suspected fractures of the cribriform plate, basilar skull, or open skull fractures. If an NG tube is needed it may be passed orally.

NOTE: NG tube will most likely be used in a prolonged field care setting. For intubated casualties, orogastric tube is recommended.

Equipment:

1. NG Tube and water-soluble lubricant (viscous lidocaine preferred)
2. 5cc syringe and tape
3. 60cc syringe (for aspiration)

Procedure (NG Tube):

1. Using the NG tube: Measure the distance from the bottom of the xiphoid process, to the ear lobe, to the tip of the nose. This will determine length of NG to be inserted.
2. If conscious, lidocaine jelly can be used as a lubricant or topical anesthetic for the nasal cavity (applied via cotton-tip applicator). Once anesthetized, have the patient breathe through his/her mouth. Insert lubricated NG tube through the larger nostril with angle of tube horizontal (STRAIGHT BACK). **NOT** UP and SUPERIOR into the open portion of the nose.
3. Once distal end reaches posterior pharynx, slightly flex patient's neck (if C-spine precautions allow) and instruct to swallow quickly, tell them they will feel a tickle and keep swallowing. As patient is swallowing, continue to insert tube until predetermined length is reached.
4. After insertion, verify placement by injecting air into the NG tube with the 60cc syringe while listening over the epigastrium with a stethoscope. If bubbling is heard, aspirate stomach contents to verify placement and secure the NG tube with tape.
5. Clamp tube and use gentle suction intermittently with 60cc syringe, or leave it draining in a bag to gravity in which case the tube and bag must be kept lower than the stomach. Clamp and intermittent suction are probably the best operational option.
6. If using for hydration and feeding, reconfirm placement every time by listening with stethoscope over epigastrium.

Urethral Catheterization (Foley)

Indications:

Inability to void due to spinal cord damage; rupture of bladder; distal urinary tract obstruction; burns of genitalia

1. Depressed sensorium
2. Need to precisely monitor urine output: shock, multisystem trauma, burn patients, crush syndrome/extrication, rhabdomyolysis, etc.



Catheterization is contraindicated in urethral transection, scrotal hematoma, pelvic fracture, high-riding or free-floating prostate.

Equipment:

1. Sterile gloves
2. 4 × 4 gauze
3. betadine solution
4. 1-inch surgical tape
5. Water-soluble lubricating jelly
6. 10cc syringe
7. Sterile fluid source
8. Foley catheter with collection bag for urine

Procedure:

NOTE: Use sterile technique throughout the procedure.

Male Catheterization:

1. Check patency of catheter balloon.
2. Drape between patient's penis and scrotum (Can use glove wrapper as drape).
3. Grasp penis with 4 × 4 gauze and retract foreskin. Clean head of penis from meatus outward with betadine. Repeat for total of 3 times.
4. Holding penis at 60° angle, slowly insert the catheter until resistance is felt. Apply gentle but firm pressure pushing catheter through the bladder sphincter muscle. (Do not force catheter. It may be necessary to wait until sphincter relaxes). Have container ready to collect urine.
5. After there is a urine return, insert catheter to its full length and inflate balloon with 5–10mL of sterile fluid (do not use air). Gently pull the catheter out until slight resistance is felt. Secure catheter to right leg with tape.

CAUTION: Don't inflate balloon until urine has started to flow through the catheter.

Do not give antibiotics prophylactically. Only give antibiotics if the patient develops a **fever or other signs of infection**.

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Suprapubic Needle Cystotomy

Indications:

1. Unable to catheterize patient and bladder becomes distended (may be visible, or evident by dull percussion sounds extending more than midway from the pubic bone to the umbilicus).
2. Severe genital trauma, extended care setting, or evac more than 3 hours.

Equipment Needed:

1. 18 gauge IV cannula, or
14 gauge 3.25 inch IV catheter
2. 25 gauge needle
3. Betadine
4. 4 × 4 gauze
5. sterile gloves
6. 5cc syringe
7. tape
8. 30 inch IV extension tube
9. urine collection container
10. Lidocaine



Procedure:

1. Clean area 1–2cm superior to symphysis pubis (pubic bone) with betadine (6 to 8 inches). Repeat 3 times.
2. Don gloves and drape area.
3. Anesthetize area where 18 gauge needle will be inserted.
4. Insert 18 gauge needle directly (**must be EXACTLY**) in midline on the upper edge of pubic bone.
5. Keep needle at 90° angle to the skin. Insert slowly while pulling gently on plunger of the syringe. Stop insertion when urine begins to flow into the syringe.
6. Continue negative pressure until syringe is filled. Remove syringe and needle leaving catheter in place. Secure catheter in place with tape.
7. Attach 30 inch IV tubing to catheter and drain urine into container.
8. After urine flow ceases, clamp off the IV tubing, and suture the catheter in place.
9. Unclamp the IV tubing and drain the bladder every 3–6 hours or as needed.

PJ PEARL:

A simpler option is to use sterile technique and drain the bladder every 3 hours or as judged needed with a new angiocath (such as for ND) and not leave a tube. Administer Ertapenem if not already done.

Wound Irrigation

Indication:

Cleaning of wounds prior to applying long term dressings or primary closure.

NOTE: If a wound is bleeding heavily, controlling bleeding takes precedence.

CAUTION: DO NOT irrigate wounds with hydrogen peroxide, betadine scrub solution, isopropyl alcohol, or other chemicals. The 'Rule of Thumb' is to only put on a wound what can be placed on the eye.

Procedure:

1. Provide analgesia and anesthetize the wound, if required. Lidocaine jelly can be used topically, but is much less effective than intradermal lidocaine.
2. Remove gross debris manually with fingers, forceps or clamps.
3. Using low pressure irrigation technique, irrigate the wound with NS, LR or other isotonic sterile solution. If NS or LR is not available for wound irrigation, potable water may be used for wound irrigation.
4. Irrigation can be accomplished by fitting an 18 gauge angiocath to a 30–60cc syringe and squirting the wound using **LIGHT** pressure on the plunger of the syringe. **DO NOT** 'inject' the tissue of the wound with the catheter: The catheter tip should be held about ½–1" from the wound. Dry the wound and wound area prior to bandaging.
 - a. Another option is to use a plastic/Ziploc bag with water, create a pinhole and press the bag and irrigate from the hole. Can use IV tubing, camelback hose, etc. Running the wound under a potable water faucet or pouring water from a water bottle slowly are additional options.
 - b. Alternatively, damp sterile dressings may be used to blot the wound area. Do not vigorously scrub internal tissue.
5. Very dirty wounds can be irrigated with an antimicrobial wound wash or a solution of 1% Betadine in NS (add 1mL of 10% betadine solution for every 9mL of NS), then given a final 'rinse' with plain NS.
6. Abrasions (such as 'road rash') may have to be scrubbed to remove dirt and imbedded debris.
7. Wounds should be irrigated with a minimum of 100mL or until the wound is clean. Grossly contaminated wounds (such as an open fracture with dirt ground into the broken bones) may require physical debridement along with irrigation.
8. Use universal precautions when irrigating a wound. Proper wound irrigation technique will splash irrigating solution everywhere.

Wound Debridement

Indications:

For removal of devitalized tissue and/or debris. In most cases, simple bandaging is all that is required for field management of wounds. Consider debridement with delayed primary closure if:

1. Evacuation to higher level of care is delayed >12–14 hours OR
2. The patient has a grossly contaminated wound with more than 8 hours until transport to higher level care

NOTE: Provide adequate procedural sedation and local anesthesia with good exposure and adequate lighting. Document total lidocaine administered; do not exceed 300mg.

CAUTION: Work gently, precisely, and methodically. **DO NOT cut any structure not positively identified as skin, muscle, or fat.**

Procedure:

1. Extend wound if necessary to allow adequate exploration.
2. Irrigate and explore wound with gloved finger. Remove any remaining foreign matter and drain entrapped accumulations of fluids or exudates.
3. Control bleeding by direct pressure or ligation.
4. Excise (cut) devitalized tissue preserving all vessels, skin, nerve and bone if possible.
5. Re-irrigate wound and control bleeding.
6. Apply bulky dressing and monitor patient for recurring hemorrhage or signs of infection.

NOTE: For larger wounds requiring packing, pack with gauze and change daily per wound management protocol. This will aid in debridement of devitalized tissue.

Wound Suturing

Indications:

Suturing most of wounds sustained in combat is not indicated due to the high risk of infection. Before wound closure is contemplated, carefully consider the risk of infection and possibility of retained foreign bodies within the wound. Suturing should only be considered when there will be a delay to definitive care >12 hours and adequate irrigation and debridement can be accomplished in the field.

Procedure:

1. Irrigate and debride the wound as described above.
2. Ensure the use of sterile technique and use of PPE.
3. Anesthetize the wound with 1% lidocaine with or without epinephrine depending on suture location (no epi in fingers, toes, penis, nose).

NOTE: Do not exceed 300mg or 4.5mg/kg lidocaine.

4. Select appropriate suture material:
 - a. 4-0 Nylon is the best choice for closure of general skin wounds
 - b. 5-0 or 6-0 Nylon should be used for closure of facial wounds
 - c. 4-0 Vicryl or gut (not nylon) is appropriate for closure of deep tissue

NOTE: Vicryl should not be used on skin as it is absorbed through an inflammatory response that will lead to excessive scarring.

5. Using interrupted sutures, close the wound with sufficient stitches to align the wound edge and prevent gaps. Use running and locking suture for bleeding wound.
6. Dress the wound appropriately.
7. Monitor for signs of infection.
8. If evidence of infection occurs, remove stitches and apply appropriate dressings; consider antibiotics if signs of cellulitis are present (moxifloxacin).
9. Most sutures should be removed in 7–10 days, facial sutures in 5 days.

PJ PEARLS:

- Use a figure 8 suture around a bleeding vessel or site.
- If uncertain about closing any wound leave it open to heal.

Delayed Primary Closure

Indications:

Technique of choice for management of dirty or contaminated wounds occurring in a combat environment that cannot be taken to higher level medical care within 12–14 hours. In most cases, the secondary closure will be done after timely evacuation to a higher level of care.

CAUTION: Delayed primary closure should **NOT** be done on the face.

Procedure:

1. Anesthetize the wound and control any bleeding. Debride any necrotic tissue and irrigate wound removing all visible foreign bodies and debris.
2. Place a single layer of fine mesh gauze into the wound, and then loosely pack the wound with Kerlex or fluffs.
3. Apply a Kerlex bulky dressing around the wound, keep the dressing clean and dry.
4. Change dressing every 24 hours and monitor for signs of infection (fever, foul drainage or severe pain/redness around site).
5. After three days, remove the dressing and inspect the wound. If the wound appears clean and has no apparent infection, debride the wound again, then close with sutures in conjunction with medical consultation, if available.

7. Blood Administration and Protocol

Overview

1. As the medical community gains a better understanding of hemorrhagic shock and fluid resuscitation, traditional protocols are being revisited. Many studies are now suggesting that the use of crystalloids and colloids, in these casualties, will likely increase the risk of morbidity and mortality due to the damaging effects on pH and the clotting cascade; therefore, when it comes to resuscitation in hemorrhagic shock, it is recommended to limit fluid replacement to Whole Blood (WB) or blood products.
2. When treating a casualty suffering from hemorrhagic shock, fluid selection should be prioritized in the following order:
 - a. Cold stored Low Titer 'O' Whole Blood (LTOWB)
 - b. Low titer 'O' Fresh Whole Blood (FWB)
 - c. Plasma (reconstituted dried, liquid or thawed), Red Blood Cells (RBCs) and platelets in a 1:1:1 ratio
 - d. Plasma and RBCs in a 1:1 ratio
 - e. Plasma alone or RBCs alone
 - f. Non-screened/untitered type 'O' FWB
 - g. Non-screened/untitered type specific FWB
3. Cold stored WB is blood that has not been modified except for the addition of an anticoagulant. WB provides the equivalent of plasma, RBCs and platelets in a 1:1:1 ratio and has been tested and certified free of blood-borne pathogens or other infectious diseases.
4. Low titer FWB is drawn from pre-screened/titered donors to make up a walking blood bank (WBB) program. FWB will have a shelf-life of 24 hours and should be transfused immediately or stored at 33–43°F (1–6°C) within 8 hours after collection.
5. Any separated component, including plasma, RBCs or platelets is considered a blood component and therefore CANNOT be correctly referred to as blood.
 - a. Plasma is recognized as an important component in preventing and treating coagulopathy in trauma as well as serving as an effective volume replacement. On average, a unit contains a volume of 200–250mL. Due to the lack of RBCs, type matching is not necessary.
 - b. RBCs increase the recipient's oxygen-carrying capacity by increasing the mass of circulating red cells. On average, a unit of WB contains a volume of 500–600mL and a unit of RBC's contains a volume of 300–400mL. For battlefield emergency use, type 'O' positive or negative will typically be available.
 - c. Platelets work with plasma to improve blood clot formation and clot stability.
6. If neither LTOWB (cold stored or fresh) nor blood products are available, then it may be appropriate to draw from a non-screened/untitered type 'O' FWB donor. If a type 'O' donor is not available, then, as a last resort, draw from a type specific donor, type-matched to the casualty. If available and time and tactics permit, donor blood should be tested with rapid test kits to decrease the risk of infectious disease transmission.

Transportation of Blood/Blood Products

1. Blood/cold stored blood products (RBCs, liquid/thawed plasma) must be transported in an approved storage container, e.g., Golden Hour Container (GHC) or Golden Hour Medic (GHM).
 - a. To ensure maximum efficiency of the containers, precondition the Thermal Isolation Chamber (TIC) in a -15° to -30°C (5° to -22°F) freezer for a minimum of 8 hours until frozen hard. Remove the TIC panel from the freezer and allow it to stand at room temperature for approximately 22 minutes allowing it to warm to operating temperature. Place in the external container.
 - i) GHC maximum capacity is 4 units RBC/plasma or 2 units of whole blood. The GHM holds 2 units of any blood product.
 - ii) GHC is approved up to 48 hours of continuous use. GHM is approved up to 24 hours of continuous use.



Golden Hour Container (GHC)



Golden Hour Medic (GHM)

Transfusions – General Information

WARNING: Do not attempt these procedures if not trained or qualified. NOT ALL PJs are taught, or qualified, to perform this procedure. Pararescue Medical Directors will authorize properly trained Pararescuemen to perform this procedure.

1. Resuscitate with whole blood (preferred), or plasma and PRBCs in a 1:1 ratio, or plasma or PRBCs alone.
2. Prior to initiation of transfusion, the following will be checked if able:
 - a. Vital signs (Temperature, Pulse, Respirations, BP). Measure, evaluate and record baseline vital signs. Every effort should be made to monitor temperature as **an increase in temperature may be the first indicator of a transfusion reaction**. In the field, mental status and radial pulse substitute for BP measurement.
 - b. Casualty blood type should be confirmed.
 - i) Pre-deployment – use local MTF/Blood Bank to confirm teammates' blood types and antibody titers (if Type O).
 - ii) Use EldonCard® on scene to confirm all blood types if not vetted teammate.
 - iii) Last option is to rely on dog tags, tattoos, or patches.

WARNING: Identification tags for ABO/Rh verification should be utilized as a last resort only. Accurate identification and verification of the donor's blood and the intended recipient may be the single most important step in ensuring transfusion safety.

- c. Active warming loss prevention should be used to prevent casualty hypothermia – fluid warmers, HPMKs.
3. Ideally blood products should be warmed to approximately 98.6°F (37°C) prior to transfusion.

WARNING: Do not exceed 102°F (39°C). This may cause an inflammatory reaction and lyse some of the red cells.

Do not use warmers directly against the fluid bag because of the risk of hemolysis or damage to the blood or blood product. Blood or blood components should not be warmed in a microwave, unless it is specifically designed for that purpose.

4. Blood/blood components may be infused using a pressure infuser that encases the entire blood collection bag. Do not exceed 300mmHg with the pressure infusion device.

PJ PEARL:

- A 60cc syringe with a 3-way stopcock is an acceptable alternative to pressure infusion but is labor intensive.

5. The largest bore IV catheter should be used. An IO device may be used. Ensure that a strong flush is done and good flow is obtained prior to using an IO infusion. Attempt to establish 2 lines. If IO lines have been established, these can be converted to 2 large bore IV lines when time, tactics and clinical conditions permit.
6. Resuscitate and attempt to maintain a palpable radial pulse or clinical improvement. If BP monitoring is available, maintain target systolic BP of 110 to 120 if no active hemorrhage, at least 100mmHg in the presence of TBI, and in the range of 90 to 100 if there was active torso hemorrhage.

Reactions

1. When performing any administration of blood or blood components the patient should be continuously monitored for signs and symptoms of an immunologic blood transfusion reaction. The first 10–15 minutes of any transfusion are the most critical.
 - a. Anaphylactic Reaction (occurs 1: 20,000–50,000)
 - i) Shock
 - ii) Hypotension
 - iii) Angioedema (red, swollen face/lips/tongue)
 - iv) Respiratory distress
 - b. Acute Hemolytic Transfusion Reaction
 - i) Acute Hemolytic (RBCs break) Reaction usually has onset within 1 hour
 - ii) Evidence of disseminated intravascular coagulopathy (DIC) – oozing from blood draw, IV sites
 - iii) Flushing, especially in the face
 - iv) Fever and increase in core temp of $>2^{\circ}\text{F}$ (1°C)
 - v) Shaking, chills (rigor)
 - vi) Flank pain or the acute onset of pain in the chest (retrosternal), abdomen and thighs
 - vii) Wheezing, dyspnea
 - viii) Anxiety, feeling of impending doom
 - ix) Nausea and vomiting
 - x) Hypotension
 - xi) Pain, inflammation, and/or warmth at the infusion site
 - xii) Red or Brown Urine (hemoglobinuria) – The onset of red urine during or shortly after a blood transfusion may represent hematuria (indicating bleeding in the lower urinary tract or hemoglobinuria indicating an acute hemolytic reaction).
 - c. Febrile Non Hemolytic Reactions
 - i) Fever not as severe as with an acute hemolytic reaction
 - ii) Chills
 - iii) Dyspnea
 - d. Urticarial Reactions – Urticaria
 - e. Other transfusion related signs and symptoms
 - i) Flushing (especially in the face), urticaria or edema
 - ii) Increased pulse or respiratory rate
 - iii) Nausea, vomiting or diarrhea
 - iv) Pain and/or edema at the infusion site
 - v) Headache
 - vi) Feeling of impending doom
 - f. Citrate Toxicity
 - i) Mild
 - 1) Perioral and periorbital paresthesia
 - 2) Metallic taste in the mouth
 - 3) “Tingling” sensation around the mouth or in the extremities
 - ii) Severe
 - 1) Carpo-pedal spasms
 - 2) Twitching

- 3) Chills
- 4) Stomach cramps
- 5) Pressure in the chest
- 6) Hypotension and possible cardiac arrhythmia
- 7) Nausea and/or vomiting
- 8) Tetany
- 9) Laryngeal spasm
- 10) Seizures
- 11) Bradycardia

g. Treatment

- i) Mild Toxicity – Slow or stop transfusion until symptoms subside. Ensure proper mixture and concentration of citrate.
- ii) Severe Toxicity – 10mL of a 10% solution of calcium gluconate SLOW IV push.

WARNING: Do not rapidly infuse calcium nor give more than one dose without the ability to monitor electrolytes. This may lead to cardiac arrhythmias.

Treatment of Immunologic Blood Transfusions Reactions

1. The first step in treating ALL transfusion related issues is to **STOP** the transfusion and save all of the blood products and equipment used for administration and typing for follow-up testing.
 - a. Anaphylactic Reactions
 - i) Epinephrine 0.5mL of 1:1000 IM
 - ii) Airway maintenance and oxygenation
 - iii) Resuscitate hypotensive patients with IV fluids
 - iv) Diphenhydramine, dexamethasone, Pepcid
 - b. Acute Hemolytic Transfusion Reaction (AHTR)
 - i) Immediately STOP the transfusion.
 - ii) Initial Treatment:
 - 1) Secure and maintain airway.
 - 2) Begin an IV infusion of crystalloid if BP is stable, otherwise infuse a different unit of blood. Treatment of hemorrhagic shock takes priority over crystalloid infusion to flush the kidneys if the patient is still in hemorrhagic shock.

NOTE: DO NOT run any fluid through the line that was carrying blood. Replace the IV/IO site.

- 3) The goal of fluid resuscitation is to maintain a urine output of 100–200mL/hr until the urine is clear of hemolyzed RBCs if infusing crystalloid.
- 4) However, if urine output is not obtained within 2–3 hours of administration of fluid, consider the development of Acute Renal Failure and discontinue further fluids.
- 5) Consider using acetaminophen (Tylenol®, Ofirmev® [IV]) 1g PO, PR, or IV (q6hr to treat discomfort associated with fevers. (Avoid the use of aspirin or other NSAIDs).
- 6) Administer 25–50mg of diphenhydramine (Benadryl®) IM, or IV to treat associated histamine release from AHTR and help manage the chills/rigor.

NOTE: Antihistamine (IV administration) must never be mixed with blood or blood products in the same transfusion lines.

- iii) **SAVE** remaining donor blood and any typing information available and evacuate with patient. This will allow for ABO/further diagnostic testing at the MTF.

c. Febrile Non Hemolytic Reactions

- i) Treat with antipyretics. Acetaminophen (1g PO, PR, or IV, avoid the use of aspirin and other NSAIDs).
- ii) If symptoms abate and there is no evidence of an acute hemolytic reaction consider restarting the transfusion.
- iii) Pretreatment with antipyretics and antihistamines is recommended in this protocol and commonly done although there is no evidence that it decreases the incidence of fever and urticaria associated with transfusions.

d. Urticarial Reactions

- i) Treat with 25–50mg diphenhydramine (Benadryl®) IM or PO.
- ii) If symptoms abate and there is no evidence of an acute hemolytic reaction consider restarting the transfusion.

Indications for a Blood Transfusion

1. The patient is in shock from a known cause of hemorrhage.
2. One or more major amputations with or without signs of shock – administer 1 unit of whole blood or 1 unit each of PRBCs and plasma.

NOTE: The amputation patterns above are the only traumatic injuries that constitute a STAND ALONE IMMEDIATE FIELD INDICATOR for transfusion that requires no confirmation with vital sign parameters. An amputation is defined as any severe trauma to a limb that involves complete or partial loss of the limb (to include severely mangled but not severed). However, if the patient has signs of shock transfuse to reverse signs of shock.

CAUTION: Control external bleeding before or simultaneously (if another PJ or Medic is there) with initiation of blood product transfusion.

- a. Traumatic Arrest: patient with exsanguination who had signs of life when received from ground forces and has since become pulseless, apneic and unresponsive should receive immediate transfusion (**transfusion is more important than chest compressions in cases of exsanguination and should take priority**, it is controversial if it is worth doing chest compressions for a traumatic cardiac arrest, i.e., loss of pulse after bleeding but other signs of life present).
- b. Initiate transfusion with TXA and 2 units of blood product (*Combat Shock Protocol*). Give additional units if clinically indicated.
 - i) Traumatic injuries where early blood transfusions are most likely to be needed:
 - 1) Penetrating thoracic/abdominal/junctional (junctional includes axilla/inguinal/cervical) injury

- 2) Pelvic fracture
- 3) Multiple injuries
- 4) Proximal amputations (above knee or elbow)

Administer Blood Products Provided from Blood Bank/MTF

1. Inspect blood product for gas, discoloration, clots, foreign objects or sediment and no cracks or leaks from the bag. Visually inspect the temperature indicator.
 - a. **RED = UNACCEPTABLE**
 - b. Blood products must be transfused within 4 hours of removal from storage container
2. Close all 3 clamps on Y tubing (under NO circumstances should non-filtered tubing be used), or use single in-line filter tubing if available. Attach blood warmer if available.
3. Insert spike into blood product. Open roller clamp on administration line, allowing blood to prime the line and fill half of the drip (upper) chamber. If there is a lower chamber completely fill the lower chamber.
4. Confirm there are no air bubbles in the primed line.
5. Attach administration line to IV catheter.
6. Open roller clamp all the way and allow blood to flow wide open for patients in shock. If they have 1 or more amputations and a radial pulse and are alert, start slowly over 10–15 minutes and confirm no transfusion reaction (watch patient, check VS q5min × 2 or 3).

WARNING Under no circumstance will other medications or IV fluids (other than .9% NS) be introduced through the transfusion line.

NOTE: The IV/IO port accommodating blood products may be utilized to introduce medications or IV fluids only if the blood tubing is disconnected and the port is flushed before and after medication infusion.

7. Monitor vital signs at least every 15 minutes during the transfusion. Compare with baseline vitals.
8. Observe for adverse reactions. If reaction occurs stop transfusion and identify/treat reaction.
9. Document IAW local procedures

Administer Freeze Dried Plasma (FDP)

Upon reconstitution, a bottle of French FDP is equivalent to 210mL of human plasma

FDP is reconstituted in the following manner:

1. Remove the protective capsules from the 2 flasks and disinfect the surface of each lid.
2. Pierce the lid of the flask containing the water with one of the bevels of the transfer system and then use the other bevel to pierce the lid of the flask containing the powder.
3. Pour the entire contents of the water flask into the flask containing the powder.
4. During reconstitution, gently agitate the flask to homogenize the mixture; (do not shake).
5. Wait 3–5 minutes for the product to dissolve entirely before injecting. In most cases, French FDP forms a cloudy liquid, sometimes with rare visible particles that do not constitute signs of degradation.



Before infusion, check that the glass flask is intact. Do not use the content of a damaged flask under any circumstances.

6. Obtain a set of pre-infusion vital signs if tactical conditions permit. Ideally, vital signs will be checked and recorded 15 minutes after the first infusion, and this will be repeated in 15 minutes, then every 30 minutes (x2) and then hourly OR until transfer of care occurs.
7. Immediately inject the entire preparation IV/IO.
8. Obtain a set of post-infusion vital signs if tactical conditions permit.
9. Closely monitor the recipient for signs of an adverse reaction and for adequacy of resuscitation (return of radial pulse or improvement in systolic blood pressure to approximately 90mmHg, improvement in mental status, improved hemorrhage control).

NOTE: A US Pharmacopeia Convention (USP)-grade calcium solution (approved for parenteral administration) will be administered per SOF protocol after 4 units of French FDP have been infused to avoid citrate toxicity.

Administer Fresh Whole Blood (FWB)

NOTE: FWB will be administered in the field by a PJ for a trauma patient (or rarely a GI bleeder on civil SAR) who is dying. The benefits outweigh the risks. Unlike hospital based transfusions for anemia, push the blood as rapidly as able for severe shock through 2 lines.

Use FWB when indicated if standard blood products aren't available, there is a need to supplement existing blood products during PFC, and are specifically trained to do so.

Contraindications:

Inability to find donor blood that is compatible with casualty's blood type

Donor contraindications:

- Received a prior blood transfusion
- Pregnant female
- Infected donor
- Plan to do retrospective testing: take donor to medical treatment facility for testing

Equipment checklist:

1. FDA approved blood collection bag (no more than 500mL capacity)
2. Blood administration set (180 micron filter)
3. 2 Clamps for blood line
4. Normal saline (50mL bag minimum)
5. Catheters (preferably 16 gauge for speed of infusion)
6. Alcohol pads
7. Eldon Blood Typing kit × 2
8. PRN Adapter (needle saline lock)
9. 550 cord – 9.5" strand
10. Diphenhydramine 50mg
11. Epinephrine 1:1000 (or epinephrine auto-injector)

12. Tape
13. Op-site
14. Constricting band
15. 18 gauge hard needle

Steps:

Collection process

1. Clamp line on collection bag prior to removal of cap
2. Place collection bag on ground
3. Place constricting band on extremity
4. Prep injection site
5. Insert 16 gauge catheter into donor arm
6. Attach PRN adapter to 16 gauge catheter (ok to use steel needle if required)
7. Remove cap from collection needle
8. Save cap from needle
9. Insert needle into PRN adapter
10. Remove clamp from collection line
11. Observe blood flow into collection bag
12. Rock the collection bag back and forth occasionally during the filling process (this motion distributes the anticoagulant evenly throughout the blood)
13. Mark bag with donors name and time of collection
14. Secure line to donors arm
15. Leave constricting band on (should only restrict venous flow)
16. Field indicators the collection bag is full
 - a. Field expedient method: 9.5 inch piece of string wrapped around bag – the ends should just touch or slightly overlap
 - b. Field expedient method: Bag should feel stiff with large dimples on the sides
17. Clamp the line on the collection bag
18. Remove needle from PRN adapter
19. Carefully recap collection needle
20. Tie two overhand knots tightly in the collection line close to the bag
21. Cut collection line between the knots
22. Discard collection line and needle
23. Insulate blood bag from extremes in heat or cold

Infusion process

1. Record a baseline set of vital signs from the recipient to include (at a minimum):
 - a. Temperature
 - b. Pulse
 - c. Respiratory rate
 - d. Blood pressure
2. Connect blood administration set to bag of normal saline and flush all extensions with saline (this action prevents blood from adhering to the transfusion line)
3. Connect blood bag to unused line on blood administration set, prime the line and half fill the upper chamber
4. Start 2 IV sites in recipient if not already

5. 1 site for blood infusion
 - a. 1 site for TXA, more blood or emergency access
 - b. Blood may be administered through IO needles if IV access is unobtainable
 - c. Connect blood administration line to IV site on recipient
6. Open regulator clamp until administration line is dark red all the way up to recipient's arm
7. Record a complete set of vitals every 5 minutes while blood flows into casualty
8. Monitor for transfusion reactions
9. Treat transfusion reactions in accordance with unit protocol
10. If after 15 minutes (three sets of complete vitals) recipient has no signs of transfusion reaction, continue to infuse remaining blood if administering slowly for reason other than shock
11. When blood collection bag is empty flush saline through line to deliver the residual blood
12. Discontinue transfusion when recipient vital signs have stabilized or transfusion is complete
13. Prepare for evacuation or continue PFC

Patient documentation

1. Document recipient and donor info
2. Send empty blood bags with the patient
3. Send Eldon blood cards with the patient

PJ PEARLS:

- If bags of donor blood remain after casualty has been evacuated, re-infuse blood back into donors.
- Blood can be safely stored in an FDA approved collection bag at room temperature for 24 hours (this is not recommended because the blood should be given immediately to the casualty or re-infused into the donor).
- Donor blood type for this procedure should be exactly the same as recipient blood type. However, in extreme circumstances (a patient is obviously dying and there is no exact match available), Operators may utilize Group O fresh whole blood from a live donor.
- Eldon card should be performed on donor and recipient just prior to transfusion.
 - Easy to follow instructions on package
 - Added confirmation just prior to transfusion builds Operator confidence
- **NOTE:** there is an approximately 11% error rate on the blood types on dog tags.
- Donors could return to fight after one unit donation. In exceptional circumstances, two units may be collected from a single donor, but that will place the donor out of the fight.
- May attempt to restore donor volume with IV crystalloids.
- If the blood infusion filter fills with clots it may become necessary to use a new infusion line.
- STOP the transfusion for anything that seems wrong: fever, chills, flank pain, sudden/severe deterioration with dropping BP and respiratory distress, tea/cola colored urine (best if Foley in all patients in shock when possible). Flush with crystalloids, treat for anaphylaxis, infection, etc., if there is clinical suspicion.

8. Tactical Medical Emergency Protocols (TMEPs)

The protocols below were selected because they are used in Combat and Civil SAR Missions. They were originally created by specialists from US Special Operations Command and are clear, concise, and focused. The term PJ has been used to replace SOCM (Special Operations Combat Medic) and appropriate modifications have been made for relevancy based on data and expert opinion. Patrol medicine protocols have been deleted. The entire Advanced Tactical Paramedic Protocols Handbook (ATP-P) is available digitally on the *Journal of Special Operations Medicine* Online website at <http://www.jsomonline.org> via the PJ login or a hardcopy of the handbook can be bought on the JSOM Online Store at <https://www.jsomonline.org/jsomstorefront/index.php>. References and a list of contributors and authors are available in the ATP-P Handbook. Revisions were made to the ATP protocols specific to Pararescue.

The Protocols outlined in the following pages carry the following assumptions:

- **The PJ is in an austere environment where a medical treatment facility or a unit sick call capability is not available. If a medical treatment facility or a Medic authorized to treat patients independently is available, then the patient should be seen in those settings rather than by a PJ.**
- Immediate evacuation may not be possible and, even if it is, may still entail significant delays to definitive treatment. The medical problem may worsen significantly if treatment is delayed.
- The PJ will contact a consulting physician as soon as feasible.
- PJ treatment will be performed under the appropriate Protocol.
- **Medication regimens are designed to minimize the number of medications PJs are required to learn and carry. Medications can have several indications. Refer to the PJ Med list in the following section.**
- Appropriate documentation of diagnosis and treatment rendered in the patient's medical record will be accomplished and handed over with the patient to the forward operating base or MTF.
- Note these Protocols **are not** designed to allow PJs to conduct Medical/Civic Action (MEDCAP) missions independently.
- Evacuation recommendations are based on the appropriate therapy per Protocol being initiated on diagnosis.
- The definitions of Urgent, Priority, and Routine evacuations are based on the recommended maximum evacuation timelines found in Joint Publication (FM) 4-02.2 of 1, 4, and 24 hours respectively. The terms immediate, delayed, minimal and expectant, as well as Cat A, B or C are also used and dependent on the Area of Operations.
- **For any infection, limit contact and use universal precautions.**

CLINICAL PEARLS

When IV route is recommended, but not obtainable, consider IO, IM, IN, PO, or PR unless contraindicated. If IV indicated and no veins seen, or 2 failed attempts, proceed to IO.

Current, available PO formulations: Benadryl, Zofran ODT, Decadron, moxifloxacin, meloxicam, acetaminophen, Imodium.

DO NOT give epinephrine IV **unless given under the ACLS protocols or the *Neurogenic/Spinal Shock Protocol*. Specific training/equipment is required.**

All IV medications may be given slow IV push with the exception of antibiotics, which should be in a drip, unless otherwise specified.

*Tactical option for ertapenem IV is use in a 10mL syringe with NS and IV slow push (approx. 1mL/min over 10 minutes, simulating a 10-minute drip).

Document dose, route and time of all medications so the receiving facility may be informed.

Do not use local anesthetic with epinephrine on the ears, nose, digits, or penis. In general PJs do not carry lidocaine with epi.

If oxygen is listed in a protocol, realize that it is recommended; O2 may not be available. Only use O2 if limited resources when oxygen saturation is below 90% and is symptomatic. Otherwise only use O2 for sats <90%.

Due to the high level of physical fitness of SOF personnel, there may be a prolonged period of mental lucidity and apparent stable vital signs despite a severe injury. Also, tactical athletes will have lower heart rates and blood pressures than the general population, another of several reasons we rely on mental status and radial pulse to diagnose shock.

Medical Documentation (PJ patient care card, or DD 1380, AT MIST): In order to ensure proper care and medical information transfer during patient treatment, a standardized format for medical documentation is required. Reporting in AT MIST format and MARCH PAWS for the T portion is the PJ standard.

If the PJ patient care card or the DoD TCCC card is not available, use the **AT-MIST** format below

AT MIST

- **A**ge
- **T**ime of injury, illness
- **M**echanism of injury or illness
- **I**njuries or illness (diagnosis)
- **S**ymptoms and Signs
- **T**reatments (MARCH PAWS algorithm)

Abdominal Pain

SPECIAL CONSIDERATIONS:




1. Common causes in young healthy adults include appendicitis, cholecystitis, pancreatitis, perforated ulcer, and diverticulitis.
2. Consider constipation/fecal impaction as a potential cause of abdominal pain.
3. Consider bowel perforation if abdominal pain begins within 72 hours of a blast injury.

Signs and Symptoms for Urgent Evacuation:

1. Severe, persistent or worsening abdominal pain is the key sign
2. Rigid abdomen
3. Rebound abdominal tenderness
4. Focal tenderness
5. Distension
6. Fever >101°F
7. Uncontrollable vomiting
8. Presence of bloody vomitus or stools
9. Presence of black tarry stools
10. Presence of coffee ground vomitus

NOTES: If 7, 8, 9, 10 only, and vital signs are stable, use judgment for *Priority* Evacuation. Progressive absence of passing gas and bowel movements can be danger signs.

Management:

1. Start IV with normal saline (NS), 1 liter bolus, followed by NS 150mL/hr.
2. Keep NPO except for medications. If no IV is attainable, provide intermittent small bolus PO hydration.
3. NG tube for extended care
4.  Ertapenem (Invanz) 1g IV daily
5.  Fentanyl for pain (**DO NOT USE NSAIDs**)
6.  Zofran for nausea and vomiting
7. Tylenol with sips of water for fever


DISPOSITION:

1. *Urgent* evacuation to a surgical facility.

Signs and Symptoms Suggestive for Continued Observation:

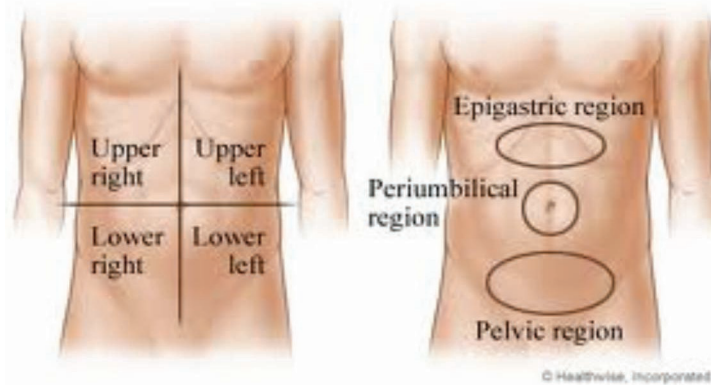
1. Epigastric burning pain
2. General cramping
3. Passing gas or having BMs
4. Nausea and/or vomiting
5. Soft abdomen, absence of rebound tenderness
6. If diarrhea is present, treat per *Gastroenteritis Protocol*

Management:

1. Antacid of choice, can be Rolaids or Tums type meds
2.  Famotidine (Pepcid) 20mg PO bid
3. PO hydration

DISPOSITION:

1. *Evacuation for worsening.*



Locations: Organs/diagnosis

RUQ: liver/hepatitis, liver trauma with hemorrhage, gall bladder/cholecystitis

Epigastrium: stomach/bleeding ulcer, pancreas/pancreatitis

Left upper quadrant: stomach, spleen/trauma with hemorrhage

RLQ: appendix/appendicitis

LLQ: colon/diverticulitis

Pelvic region: bladder, females-ovarian pathology/ruptured ectopic pregnancy, ovarian torsion, ruptured ovarian cyst

PJ PEARLS:

Appendicitis: Classic – crampy periumbilical pain for hours to days, followed by sudden localization of pain to RLQ. May be associated with nausea, constipation and anorexia. Can have atypical story.

Cholecystitis: Often overweight, 40s, often female, RUQ pain radiating to right scapula, pain worse after eating fatty or greasy foods. Possible association with jaundice (yellow skin and sclera, clay colored stools, dark urine).

Bleeding ulcer: Presents with epigastric pain, pallor, bloody or black/tarry stool, bloody vomit.

Pancreatitis: Often has an ETOH history, severe epigastric pain going into midline back, nausea.

Diverticulitis: Severe LLQ pain, occasionally urinary frequency, change in bowel movements.

Ruptured ectopic pregnancy: Missed period, sexually active without birth control, sudden severe pelvic pain, may be associated with hemorrhagic shock.

Ruptured ovarian cyst: Sudden severe pelvic pain on right or left, no other symptoms.

Altered Mental Status

AEIOU-TIPS

Anaphylaxis, alcohol, asthma

Epilepsy (post-ictal)

Environment (hypothermia or heat stroke)

Infection – meningitis, encephalitis, sepsis

Overdose, oxygen (hypoxia)

Underdose (of medications), uremia (kidney failure)

Trauma

Insulin, hypo/hyperglycemia


Psychiatric

Something in the brain (blood, pus, tumor), blood can include stroke, TBI

The treatment for altered mental status is dependent on narrowing down the cause.

Treatments will include: Narcan, supplemental oxygen, glucose, antibiotics, epinephrine, Versed and other medications. Refer to various sections in the handbook for treatment of issues.

SPECIAL CONSIDERATIONS:

1. **ACUTE MOUNTAIN SICKNESS (AMS)**
2. Usually occurs at altitudes of 8,000ft and higher
3. Consider pretreatment when rapid ascent to altitudes above 8,000ft may occur:
 - a. Acetazolamide (Diamox) 125mg bid started 24 hours before ascent
 - b.  Dexamethasone (Decadron) 4mg PO bid started 24 hours before ascent for patients allergic to sulfa drugs, take with food
 - c. Ground test all meds before ops
4. Consider pretreatment if rapid ascent above 11,500ft occurs (as with airlifts):
 - a. Dexamethasone (Decadron) 4mg PO q6hr within 24 hours of ascent plus acetazolamide (Diamox) 125mg PO bid (if not allergic to sulfa)
5. Symptoms may occur as quickly as 3 hours after ascent
6. Can avoid onset by limiting initial ascent to no higher than 8,000ft then 1,000ft per day thereafter. The key to prevention is slow, gradual ascent. Everyone acclimatizes differently.
7. **HIGH ALTITUDE CEREBRAL EDEMA (HACE)**
8. Rare below 11,500ft
9. Headache is common at altitude. Ataxia and altered mental status at altitude are HACE until proven otherwise.
10. **HIGH ALTITUDE PULMONARY EDEMA (HAPE)**
11. Caused by the hypoxia of altitude, HAPE is the most common cause of death from altitude illness.
12. Usually occurs above 8,000ft. Respiratory distress at high altitude is HAPE until proven otherwise.
13. Nifedipine (Procardia) is recommended as prophylaxis in personnel who have a history of previous HAPE and are required to operate at altitude. Acetazolamide (Diamox), sildenafil (Viagra), tadalafil (Cialis), dexamethasone (Decadron), salmeterol (Serevent), and albuterol (Proventil) may be considered if nifedipine is not available.







HACE and HAPE may coexist in the same patient!


Signs and Symptoms:

1. **AMS** is generally benign and self-limiting, but symptoms may become debilitating. Worsening condition should prompt consideration of a more life-threatening condition (HAPE or HACE)
 - a. AMS: Diagnosis is made in presence of headache **AND** one or more of the following: anorexia, nausea, vomiting, insomnia, dizziness, lassitude, or fatigue
 - b. No correlation with fitness level (likely genetic predisposition)
2. **HACE:** Unsteady/wide based/unbalanced (ataxic) gait with altered mentation are hallmark signs
3. **HAPE:** Dyspnea at rest is the hallmark sign. Other symptoms may include cough, crackles upon auscultation, pink frothy sputum, tachypnea, tachycardia, fever, central cyanosis, or low oxygen saturation disproportionate to the elevation level.

Management:

1. Halt ascent. Immediately descend at least 3,000ft for HACE, HAPE, or refractory AMS if tactically feasible.
2. **IF AMS SYMPTOMS PRESENT**
 - a.  Acetazolamide (Diamox) 250mg PO bid **UNLESS PATIENT IS ALLERGIC TO SULFA**
 - b.  Dexamethasone (Decadron) 4mg PO q6hr if patient is allergic to sulfa. If dexamethasone (Decadron) is administered, no further ascent until asymptomatic for 24 hours after last dexamethasone dose.
3. **IF HACE SYMPTOMS PRESENT: ATAXIA OR ALTERED MENTAL STATUS**
 - a. Administer supplemental oxygen to bring SpO2 above 90% (if available)
 - b.  Dexamethasone (Decadron) 8mg IV/IM STAT, then 4mg IV/IM q6hr
 - c. Individuals with HACE should not be left alone and especially not be allowed to descend alone.
4. **IF HAPE SYMPTOMS PRESENT: SHORTNESS OF BREATH AT REST**
 - a. Administer supplemental oxygen to bring SpO2 above 90% (if available)
 - b.  Nifedipine (Procardia) 30mg SR q24hr. Consider albuterol (Ventolin) 2 inhalations q6hr as an adjunct treatment.

WARNING: Do not use Nifedipine in HACE; the drop in blood pressure may worsen the symptoms of this condition.

- c. Minimize patient exertion during descent for HAPE since this will exacerbate symptoms.
5. Treat per *Pain Management Protocol*, but avoid the use of narcotics since they may depress respiratory drive and worsen high altitude illness.
6.  Zofran (4mg IV q4hr PRN) for nausea.
7. For signs or symptoms of either HAPE or HACE: If immediate descent is not tactically feasible and a GAMOW bag is available, use a GAMOW bag in 1-hour treatment sessions with bag inflated to a pressure of 2psi (approximately 100mmHg) above ambient pressure. Four or five sessions are typical for effective treatment. **GAMOW BAG TREATMENT IS NOT A SUBSTITUTE FOR DESCENT.**
8. Treat per *Dehydration Protocol*.

DISPOSITION:

1. Most cases of AMS are relatively mild, resolve in 2–3 days, and do not require evacuation.
2. Avoid vigorous activity for 3–5 days.
3. *Priority* evacuation for AMS patients that worsen despite therapy.
4. *Urgent* evacuation for patients with suspected HACE or HAPE.
5. Individuals who have recovered from HACE or HAPE should not re-ascend without medical officer clearance.

NOTE: If patient has progressive HAPE despite the above interventions, positive pressure ventilations (BVM, intubation/ventilator) is definitive treatment.

Anaphylactic Reaction

SPECIAL CONSIDERATIONS:





1. Acute, widely distributed form of shock (vasodilation) which occurs within minutes of exposure to allergens.
2. Primary causes include insect envenomation, medications, and food allergies.
3. Death can result from airway compromise, inability to ventilate, or cardiovascular collapse.
4. The Medic's responsibility is to know if members in the unit have such a condition. Moreover, the Medic must also ensure that the member has some sort of anaphylaxis kit and is trained to use it.
5. Consider localized allergic reaction. Anaphylaxis is a life-threatening emergency.

Signs and Symptoms:

1. Wheezing (bronchospasm)
2. Dyspnea
3. Stridor (laryngeal edema)
4. Angioedema (swollen, red face)
5. Urticaria (hives, itching)
6. Hypotension
7. Tachycardia

Management:

FOR PATIENTS WITH SIGNS AND SYMPTOMS OF AIRWAY INVOLVEMENT AND/OR CIRCULATORY COLLAPSE:

1.  Epinephrine is the mainstay of therapy.
 - a. Administer Epi-Pen
 - b. **OR** epinephrine 0.5mg (0.5mL of 1:1000 IM). **DO NOT USE INTRAVENOUSLY.**
 - c. Repeat epinephrine q5min PRN
2. Oxygen with pulse oximetry monitoring
3. If severe respiratory distress exists, aggressive airway management with bag-valve-mask and airway adjuncts (oral and nasopharyngeal airways). Intubate early if no response to epinephrine.
4. IV normal saline TKO (saline lock)
 - a. Administer 1–2 liters crystalloid (LR or NS) bolus for hypotension
 - b. Titrate to establish systolic blood pressure >90mmHg or palpable radial pulse if BP cuff not available.
5.  Diphenhydramine (Benadryl) 50mg IV/IM/PO/SL
6.  Dexamethasone (Decadron) 10mg IV/IM/PO
7. If wheezing is present after epinephrine administration, consider albuterol (Ventolin), 2–3 puffs q5min, repeat up to 3 times. The metered dose inhaler works best when used with a spacer (e.g., rolled up piece of paper, cardboard from toilet paper roll, etc.).
8.  Famotidine (Pepcid) 20mg PO bid

DISPOSITION:

1. *Urgent* evacuation.

Asthma (Reactive Airway Disease)




SPECIAL CONSIDERATIONS:

Other disorders to consider: anaphylactic reaction, spontaneous pneumothorax, HAPE, and pulmonary edema.

Signs and Symptoms:

1. Wheezing bilaterally. Unilateral wheezing could be foreign body, tumor, or other obstruction.
2. Dyspnea
3. Difficulty with speaking in full sentences

Management:

1.  Albuterol (Ventolin) (metered dose inhaler – works best when used with spacer), 2–3 puffs q5min, repeat up to 3 times
2. **IF THERE IS NO RESPONSE TO ALBUTEROL** (Ventolin)
 Epinephrine 0.5mg (0.5mL of 1:1000 solution) IM. **DO NOT USE INTRAVENOUSLY.** May repeat one epinephrine dose in 5–10 minutes
3. Oxygen with pulse oximetry monitoring
4. IV access with saline lock
5.  Dexamethasone (Decadron) 10mg IV/IM/PO
6. If there is fever, pleuritic chest pain and productive cough, treat per *Bronchitis/Pneumonia Protocol*

DISPOSITION:

1. *Urgent* evacuation if no response to treatment.
2. If the patient responds to management, observe for 4 hours.
 - a. Return to Duty if there is no wheezing or dyspnea and normal oxygen saturation. Continue albuterol (Ventolin) (2 puffs q6hr) and re-evaluate in 24 hours. Continue decadron 10mg IM daily for 4 days.
 - b. *Urgent* evacuation if symptoms persist.

Back Pain



SPECIAL CONSIDERATIONS:

Motor weakness, saddle anesthesia, sensory loss, loss of bowel or bladder control in the setting of back pain is a neurological emergency requiring *Urgent* evacuation.

Signs and Symptoms:

1. Pain may worsen with movement.
2. Pain may radiate into legs.

Management:

1. Treat per *Pain Management Protocol*.
2. Apply cold compress to painful area for 20–25 minutes tid.
3.  Primary – ibuprofen 800mg PO TID (taken with food)
4.  Secondary – ketorolac 15mg IM/IV q6hr. If persistent spasm after NSAID – consider midazolam 2mg IM x 1.
5. Minimize activity initially, but encourage gradual stretching and return to full mobility as soon as tolerated.
6. If back pain is accompanied by fever and/or urinary symptoms, treat per *Flank Pain Protocol*.

DISPOSITION:

1. Evacuation is often not required if the back pain responds to therapy.
2. *Routine* evacuation for severe cases not responding to therapy.
3. *Urgent* evacuation for patients with neurological involvement (other than pain) such as:
 - a. Focal muscle weakness below pain level, abnormal neurologic examination
 - b. Bowel or bladder dysfunction
 - c. Saddle anesthesia




SPECIAL CONSIDERATIONS:

1. Pulmonary Over-Inflation Syndrome (POIS) may occur from ascent from depth if compressed air was used or exposure to blast overpressure.
2. The most commonly affected site is the middle ear and tympanic membrane, but paranasal sinuses and teeth may be affected.
3. Pulmonary barotrauma occurs when compressed air is breathed at depth followed by ascending with a closed airway (i.e., breath-holding), and can cause pneumothorax or arterial gas embolism.

Signs and Symptoms:

1. Pain in the ear(s), sinuses, teeth.
2. Pulmonary over-inflation syndrome (POIS) may present with chest pain, dyspnea, mediastinal emphysema, subcutaneous emphysema, pneumothorax or AGE.
 - a. Arterial gas embolism (AGE) – unconsciousness, paralysis, weakness, fatigue, large areas of abnormal sensations, convulsions. Symptoms usually occur within 10 minutes of surfacing after a dive or shortly after overpressure exposure (blast injury).
 - b. In all cases of AGE, associated pneumothorax is possible and should not be overlooked.

Management:

1. If flying, descend in altitude until relief is felt (if feasible).
2. Middle ear:
 - a. If a tympanic membrane rupture is present or suspected, protect the ear from water or further trauma.
 - b.  Moxifloxacin (Avelox) 400mg PO daily if contamination is suspected.
 - c.  Pseudoephedrine (Sudafed) 60mg PO q4–6hr PRN.
 - d. **DO NOT** use ear drops. If TM is not ruptured, use oxymetazoline (Afrin nasal spray).
 - e. Refer to higher level of care when feasible.
3. Paranasal Sinus barotraumas:
 - a.  Pseudoephedrine (Sudafed) 60mg PO q4–6hr PRN.
4. Pulmonary barotraumas (to include subcutaneous emphysema):
 - a. If no respiratory distress, monitor patient closely. Use pulse oximetry if available.
 - b. If respiratory distress occurs – Treat per *Spontaneous Pneumothorax Protocol*.
5. If Pulmonary Over Inflation Syndrome (POIS) is suspected, administer 100% oxygen and 1 liter normal saline IV 150mL/hr. *Urgent* evacuation to recompression chamber.

NOTE: If an unpressurized airframe is used, avoid altitude exposure greater than 1,000ft.

6. Treat per *Pain Management Protocol*. (Avoid narcotics if recompression is anticipated.)

DISPOSITION:

1. *Urgent* evacuation for cerebral arterial gas embolus, POIS or pneumothorax with respiratory distress.
2. *Routine* evacuation for mild to moderate middle ear, sinus, or pulmonary barotraumas without respiratory distress. Continue to monitor until evacuated.
3. *Routine* evacuation for consultation for Tympanic Membrane ruptures.

Behavioral Changes (Psychosis, Depression, and Suicidal Impulses)

SPECIAL CONSIDERATIONS:

1. In a tactical setting consider sleep deprivation as a cause.
2. Etiologies are numerous and will often dictate the management; thus, mental status changes could be caused by head trauma, metabolic and endocrine disease processes, environmental toxins, infections, combat stress disorder, hypoxia, hyperthermia, hypothermia, pharmaceutical agent use (e.g., mefloquine) or withdrawal.
3. Consider diabetic hypoglycemia as a cause of altered mental status.

Signs and Symptoms:

1. Acute behavioral changes include withdrawal, depression, aggression, confusion, or other behavioral patterns atypical for the individual.
2. Psychosis is an acute change in mental status characterized by altered sensory perceptions that are not congruent with reality:
 - a. Auditory and/or visual hallucinations
 - b. May include violent or paranoid behavior
 - c. Disorganized speech patterns are common
 - d. May include severe withdrawal from associates

Management:

1. Remove all weapons or potential weapons from patient AND treating Medic.
2. Check pulse oximetry, glucose level, temperature, pupils for constriction.
3. Place patient in safe environment under continuous surveillance.
4. Place either 1 tube of Glutose (oral glucose gel) or contents of one packet of sugar in the buccal mucosal region for possible hypoglycemia if unable to confirm via glucometer.
5. Take temperature:
 - a. If Temperature is below 95°F, treat per *Hypothermia Protocol*
 - b. If Temperature is above 101°F, treat per *Meningitis Protocol*
 - c. If Temperature is above 103°F, treat per *Meningitis and Hyperthermia Protocols*

NOTE: IF MENINGITIS IS SUSPECTED OR IF THERE IS A DECREASE IN MENTAL STATUS, USE VERSED WITH CAUTION, DUE TO POSSIBLE RESPIRATORY DEPRESSION, HYPOTENSION, AND MASKING OF PROGRESSION OF DISEASE-RELATED ALTERED MENTAL STATUS.

6. For acute agitation, combativeness, or violent behavior, restrain patient with at least four individuals and give midazolam (Versed) 5mg IM and repeat q15–30min PRN; if using IV/IO, use 2mg increments.

NOTE: If sedated or restrained, maintain constant vigilance for a change in the hemodynamic status or loss of airway reflexes or respirations.

DISPOSITION:

1. *Urgent* evacuation.

Blast Injuries

SPECIAL EVALUATION CONSIDERATIONS:

1. Primary blast injuries often leave no external evidence of head or torso injury; they occur more commonly in initial survivors of blast in three conditions.
 - a. Close to explosions but protected from ballistic injury
 - b. Casualty in enclosed spaces of vehicles or buildings
 - c. Casualty wholly or partly submerged in water when exposed to underwater blast
2. Bilateral tension pneumothoracies occur; some may not be decompressible with needles alone when bronchopleural fistulae are present.
3. Intestinal rupture can occur up to a week after blast injury so consider it with any new abdominal symptoms or fever.
4. Open wounds can be very tiny yet projectiles can penetrate deeply and perforate critical structures.

Obvious Injuries

1. Traumatic amputation(s) from bone shattering and tissue tearing
2. Penetrating trauma from the device, shrapnel, or surrounding debris
3. Blunt trauma from the body or a vehicle being blown from initial location
4. Burn trauma from device or ignition of clothing, vegetation, vehicle, or building
5. Crush trauma from motor vehicle crash (MVC) or structure collapse

Management:

1. See *Tactical Trauma Protocols* (TTPs) and *Tactical Medical and Emergency Protocols* (TMEPs)
2. Consider concomitant occult blast injuries below
3. Isolated eardrum rupture managed with keeping ear canal clean and dry, providing oral analgesia as necessary, and further evaluation by provider (ideally within 3 days but can be longer if no evidence of infection).

DISPOSITION:

1. *Urgent* evacuation for uncontrollable hemorrhage; any evidence of shock at any time; traumatic amputation except when isolated distal to mid-forearm or mid-leg, bleeding controlled, and hemodynamically normal and stable; any injury with unstable vital signs, any patient who underwent a MAR intervention, severe burns, moderate or severe TBI; chest decompression or positive-pressure ventilation.
2. *Priority* evacuation for isolated distal traumatic amputation (see #1); penetrating head, neck, or torso trauma without evidence of shock at any time; eye injury; other injury such as evisceration or open fracture with stable vital signs.
3. *Routine* evacuation for simple wounds and fractures as needed.
4. *Convenience* evacuation for isolated eardrum rupture and no evidence of TBI.

Occult Chest Injury

1. Hemoptysis can range in severity from occasional blood-tinged sputum to enough blood to compromise the airway.
2. Uncharacteristic dyspnea with exertion or any dyspnea at rest can be lung injury or evidence of shock.
3. Chest pressure, tightness, or pain with respirations can be lung injury or myocardial ischemia from air embolism.
4. Asymmetrical breath sounds, inspiratory crackles in any lobe(s), expiratory wheezing, prolonged expiratory phase.
5. Abnormal pulse oximetry without other explanation is likely pulmonary contusion (i.e., primary blast lung injury).
6. Any localized infarction syndrome of brain, eye, heart, spine, bowel, skin, or distal extremity due to air embolism.

Management:

1. Careful inspection for penetrating trauma
2. Allow casualty to assume position for best breathing; avoid any physical exertion by casualty if at all possible.
3. Provide supplemental oxygen if needed and available; avoid positive-pressure ventilation (PPV) if at all possible, unless pulse oximetry <75% on ambient air; if PPV necessary, try to keep peak airway pressures ≤ 35 and PEEP ≤ 10 cmH₂O.
4. Management of arterial gas embolism (AGE) discussed in TMEP on barotrauma; transport to hyperbaric chamber.

DISPOSITION:

1. *Urgent* evacuation for any hemodynamic abnormality at any time; necessity for airway control, chest decompression, or positive-pressure ventilation (PPV); evidence of stroke, visual deficit, myocardial ischemia or infarction, or spinal injury.
2. *Priority* evacuation for dyspnea or pulse oximetry <90% on ambient air; evidence of pneumothorax on clinical examination; hemoptysis not compromising airway.
3. *Routine* evacuation for stable pulse oximetry 5–10% less than baseline at given altitude.

Occult Abdominal Injury

1. Abdominal or testicular pain
2. Nausea or urge to defecate
3. Gross blood in stools or on digital rectal examination
4. Bloating, distension, or expansion of abdominal girth

Management:

1. Careful inspection for penetrating trauma
2. Fluid resuscitation following TCCC guidelines if necessary
3. Antibiotics for open wounds or findings consistent with acute abdomen and/or fever

DISPOSITION:

1. *Urgent* evacuation for any hemodynamic abnormality at any time.
2. *Priority* evacuation for any other symptoms or signs of occult intra-abdominal injury.

Symptoms and Signs of Occult Head Injury

1. Loss of consciousness, alteration of consciousness, post-traumatic amnesia, or persistent apathy
2. Speech that is not fluid and effortless
3. Abnormal grip strength, examination for pronator drift, or Romberg or tandem Romberg test
4. Results of Military Acute Concussion Evaluation (MACE) that indicate need for consultation with a provider

Management:

1. Careful inspection for penetrating trauma of eyes and cranium
2. Follow TCCC guidelines for moderate or severe traumatic brain injury (TBI)
3. Maintain pulse oximetry >90% if supplemental oxygen is available
4. Maintain systolic blood pressure >90mmHg if measured or maintain presence of radial pulse if not

DISPOSITION:

1. *Urgent* evacuation for GCS score ≤ 12 ; declining level of consciousness; abnormal level of consciousness and pupillary asymmetry; asymmetrical motor or sensory examination.
2. *Priority* evacuation for loss of consciousness >30 minutes, if that is only abnormality.
3. *Routine* evacuation for symptoms in one or more areas persistent beyond 72 hours.
 - a. Physical: headache, dizziness, balance problems, nausea, fatigue, sleep disturbance, blurred vision, sensitivity to light or noise, hearing deficit, ringing in the ears, transient motor abnormalities, numbness, tingling.
 - b. Cognitive: problems with attention, concentration, memory, speed of processing, judgment, executive control.
 - c. Behavioral: apathy, depression, anxiety, agitation, irritability, impulsivity, aggression.

Bronchitis/Pneumonia





SPECIAL CONSIDERATIONS:

1. Consider high altitude pulmonary edema (HAPE) at high altitudes.
2. Consider pulmonary embolism (PE) and pneumothorax (fever and productive cough are less typical S/S for these).

Signs and Symptoms:

1. Fever
2. Productive cough, especially with dark yellow, red tinged, or greenish sputum
3. Chest pain
4. Rhonchi may be present and breath sounds may be decreased over the affected lung
5. Dyspnea may be present in severe cases

Management:

1.  Moxifloxacin (Avelox) 400mg PO daily for 7 days
2.  If unable to tolerate PO intake, ertapenem (Invanz) 1g IV/IM
3.  Albuterol (Ventolin) by metered dose inhaler 2–4 puffs q4–6hr
4. If cough persists despite albuterol treatment, administer dexamethasone (Decadron) 10mg PO/IM/IV.
5. Treat per *Pain Management Protocol*.
6.  If febrile, acetaminophen 1g PO q6hr
7. Pulse oximetry monitoring
8. Oxygen PRN
9. Maintain hydration
10. If at high altitude, see *Altitude Illness Protocol* and treat for HAPE

DISPOSITION:

1. *Urgent* evacuation for severe dyspnea or hypoxia.
2. *Observation or Routine* evacuation as necessary.

Cellulitis/Cutaneous Abscess





SPECIAL CONSIDERATIONS:

1. Superficial bacterial skin infection.
2. Generally begins about 24 hours following a break in the skin, but more serious types of cellulitis may be seen as early as 6–8 hours following animal or human bites.
3. If abscess formation occurs, only attempt Incision and Drainage (I&D) in the tactical setting IF:
 - a. The abscess is clearly well demarcated and superficial.
 - b. Local anesthesia is available.

Signs and Symptoms:

1. Painful, erythematous, swollen, tender area
2. Fever may or may not be present
3. Typically, erythema spreads without treatment
4. Rapidly spreading and very painful infections suggest the possibility of necrotizing fasciitis, a life-threatening infection of the deeper tissues that should be treated and evacuated
5. Fluctuant (fluidy), tender, well-defined mass indicates abscess formation

Management:

1.  Moxifloxacin (Avelox) 400mg PO daily for 10 days
2.  **OR** Doxycycline 100mg tab PO bid for 10 days
3. Clean and dress wound and surrounding area
4. Use a pen to mark the demarcation border of the infection and re-evaluate in 24 hours
5. Limit activity until infection resolves
6.  Add ertapenem (Invanz) 1g IV/IM daily if worsening at 24 hours or no improvement at 48 hours of treatment
7. **If abscess is present:**
 - a. Incise and drain (I&D) if the environment permits:
 - i) Establish sterile incision site with Betadine
 - ii)  Local anesthesia using lidocaine
 - iii) Incise the length of the abscess cavity or into the “pointer” of the abscess, but no further
 - iv) Incision should be parallel to skin tension lines if possible
 - v) On initial treatment, leave wound open and pack with iodoform or dry sterile gauze. Subsequent dressings, loosely pack the wound, leave gauze protruding to facilitate drainage, wick the wound. **DO NOT SUTURE THE SITE**
 - b. Bandage site and perform wound checks daily
8. Treat per *Pain Management Protocol*

DISPOSITION:

1. Re-evaluate daily and watch for progression of erythema while on antibiotics.
2. Cellulitis in critical areas (head, neck, hand, joint involvement, perineal) requires *Priority* evacuation.
3. Use of IV antibiotics requires *Priority* evacuation.

PJ PEARL: we have seen many cases in OEF of cellulitis from infected insect/scorpion bites and in one case associated with fatal septic shock.

Cellulitis Examples



ABSCESS WITH ASSOCIATED CELLULITIS



Chest Pain



SPECIAL CONSIDERATIONS:

1. Protocol assumes lack of ACLS medications or monitoring/defibrillation equipment.
2. The ATP does not have field access to tests required to accurately determine the etiology of chest pain, thus early and rapid evacuation should be considered. High risk etiologies include myocardial infarction (MI), unstable angina, aortic dissection, pulmonary embolus, pericarditis, spontaneous pneumothorax, and esophageal rupture.



Signs and Symptoms – Cardiac:


1. The presence of one or more of the following risk factors increases the likelihood of coronary artery disease: smoking, diabetes, hypertension, elevated cholesterol, obesity, family history of MI at a young age, and patient age over 40.
2. The following are signs and symptoms suspicious for myocardial infarction as the etiology for chest pain:
 - a. Substernal chest pain that may radiate to the left arm, neck, or jaw
 - b. Pain described as pressure or squeezing
 - c. Pain exacerbated with exertion and relieved with rest
 - d. Associated dyspnea, diaphoresis (sweating), nausea, lightheadedness, or syncope
 - e. Tachycardia, irregular heart rhythm, or severe bradycardia
 - f. Bilateral rales/crackles in the lungs on auscultation
 - g. Significant hypertension or hypotension

Management:


1.  Aspirin (ASA) 325mg PO (non-enteric coated) – chew to speed absorption.
2. IV access with saline lock. Administer 250mL crystalloid (LR or NS) boluses as needed to correct hypotension with frequent reassessment.
3.  Fentanyl 50mcg IV, or 400–800mcg lozenge, then 25mcg q10–15min PRN pain unless hypotension is present. Maintain BP \geq 90mmHg systolic (palpable radial pulse). Can use morphine sulfate IV 2–5mg increments if available.
4. Oxygen for sats $<$ 90% with pulse oximetry monitoring. Use empirically if no pulse ox.
5. Nitrospray if good radial pulse, sys BP $>$ 90.
 - a. Dose: 0.3–0.4mg q5min PRN (max of 3 doses)
6. Avoid all exertion. Allow the patient to rest in a position of comfort. Frequently reassess the patient including hemodynamic status.

Other Etiologies of Chest Pain:

1.  The following signs and symptoms **MAY** suggest a GI etiology such as gastroesophageal reflux disease (GERD): acid reflux feeling, dysphagia, burning quality to chest pain, exacerbated by lying flat, foul or brackish taste in mouth. A trial of antacids or famotidine (Pepcid) 20mg PO bid may be useful if evacuation will be delayed.
2.  Severe chest pain following forceful vomiting may indicate esophageal rupture. Administer IV normal saline 150mL/hr, pain meds, and ertapenem (Invanz) 1g IV and evacuate as *Urgent*.

3.  Sudden onset of pleuritic chest pain (pain on inspiration) with dyspnea may indicate pulmonary embolism (PE) or spontaneous pneumothorax. Auscultate the lungs. Unilaterally diminished breath sounds suggest pneumothorax which may require decompression. Administer oxygen, establish IV access, administer aspirin 325mg PO for suspected PE, and evacuate as *Urgent*.

NOTE: After successful needle decompression for a tension pneumothorax, casualties should be monitored closely for reoccurrence during flight where decreases in atmospheric pressure will cause expansion of residual pneumothoraces. If circumstances allow, a chest tube with a one-way valve should be placed prior to evacuation to eliminate this potential complication.

4.  The following signs and symptoms **MAY** suggest a musculoskeletal etiology: pain isolated to a specific muscle or costochondral joint pain exacerbated with certain types of movements, no pain at rest, non-central chest pain reproduced upon palpation. A trial of NSAIDs such as Mobic or ibuprofen (Motrin) 800mg PO tid or Ketorolac 15mg IM/IV may be useful if evacuation will be delayed.
5. Chest pain with gradual onset and exacerbated by deep inspiration and accompanied by fever and productive cough **MAY** indicate lower respiratory tract infection. Consider treatment per *Bronchitis/Pneumonia Protocol*.

DISPOSITION:

1. *Urgent* evacuation.
2. Evacuation platform should include ACLS certified medical personnel and the equipment, supplies, and medications necessary for ACLS care.
3. Do not delay evacuation if unsure of chest pain etiology. Strongly consider early contact with a medical officer or MTF for consultation. Frequently reassess the patient suspected of a non-cardiac etiology to ensure stability and accuracy of the diagnosis.

Cold Injury


SPECIAL CONSIDERATIONS:

1. Refreezing after thawing results in a high probability of amputation.
2. Check for 60 seconds for pulse and respirations due to bradycardia.

Signs and Symptoms:

1. Hypothermia (decreased core temperature)
 - a. Mild – Shivering, poor coordination
 - b. Moderate – Cessation of shivering, disorientation, slurred speech, confusion
 - c. Severe – Unconscious
2. Freezing Cold Injury (frostbite)
 - a. Superficial – Skin is firm but not hard; painful, red skin
 - b. Deep – Painless, gray appearing skin; skin is hard, white, gray, ashen, waxy in appearance
3. Nonfreezing cold injury
 - a. Itching; pale, cool, blotchy wet skin; mild ulcerations may be present; numbness and tingling sensations

Management:

1. Non-freezing Cold Injury
 - a. Gently dry, do not rub involved area. Elevate feet, warm torso, hydrate orally, dry socks. NSAIDs may help. Evacuation depends on ambulatory ability.
2. Freezing Cold Injury
 - a. Do not walk on frozen feet/toes unless necessary for preservation of life
 - b. Do not rub with snow/ice
 - c. Do not vigorously massage tissue
 - d. Do not use space heaters or dry heat sources (fire, MRE heaters, hand-warmers, etc.)
 - e.  Ibuprofen, 800mg PO tid (Consider other NSAIDs if ibuprofen is not available)
 - f. If thawed, refreezing will most likely result in amputation
 - g. Once thawing has occurred, expect intense pain requiring narcotic use. Follow *Pain Management Protocol*
 - h. If refreezing likely:
 - i) Do not attempt to thaw frostbitten tissue
 - ii) Protect tissue from further injury by wrapping with dry gauze and separate the digits with the dressing
 - i. Refreezing not likely:
 - i) Superficial
 - 1) Warm water immersion
 - 2) Warm extremity in axilla or groin
 - 3) Drainage of clear blisters may be considered
 - 4) Apply soft Kerlex-type dressing
 - ii) Deep
 - 1) Warm water immersion (104–108°F) until tissue is soft (approximately 30 minutes)
 - 2) Apply loose dry dressing prior to transport
 - 3) Pain Management per *Pain Management Protocol*
 - 4) Do not drain hemorrhagic blisters

PJ PEARL: Clear blisters indicate superficial injuries and hemorrhagic blisters indicate deep injury. **NOTE:** In prolong field care or village operations, frostbite with dead digits should be left alone to fall off on their own. Do not amputate.

3. Hypothermia

- a. Move to warm environment, remove any wet clothing and begin rewarming (Blizzard Blanket, Ranger Rescue Wrap, etc.)
- b. Shield from wind
- c. If able to tolerate PO, provide food and hydrate patient
- d. Mild (90°–95°F/32°–35°C): exercise in place
- e. Moderate (82°–90°F/28°–32°C)/Severe (Below 82°F/28°C):
 - i) Begin active external rewarming (Blizzard Blanket, Ranger Rescue Wrap, etc.)
 - ii) Do not exercise patient. Maintain a flat supine position on insulation.
 - iii) Do not give patients food or oral fluids.
 - iv) If IV fluids are indicated, administer glucose containing IV fluids warmed to 40°C (101.6°F) or 1 amp of D50 with crystalloid.
 - v) If unconscious:
 - 1) Avoid sudden movements and rough handling due to increased ventricular fibrillation risk with core temps <28°C.
 - 2) Assess airway and breathing; if obtunded (GCS <8) or apneic, establish definitive airway and maintain adequate ventilation/oxygenation.
 - 3) Check pulse over 60 sec due the potential for profound bradycardia; if pulseless, initiate chest compressions.
 - 4) Obtain core temperature and place patient on monitor as soon as available – initiate standard ACLS if core temperature ≥28°C. Defibrillation can be attempted at lower temps but should be held after 3 failed attempts until core temperature reaches 28°C. Below 28°C, the benefit of ACLS is unclear and vasopressors should be held due to the risk of cumulative dosing.
 - 5) High quality CPR should be continued along with aggressive rewarming for any hypothermic patient in cardiac arrest regardless of core temperature. If continuous CPR is not possible due to the need to move the patient, an intermittent CPR cycle can be performed based on core temp.
 - <20°C: 5min CPR/≤10min patient movement
 - <28°C: 5min CPR/≤5min patient movement
 - ≥28°C: 1min CPR/≤1min patient movement

NOTE: Do not place chemical or mechanical warmers on the patient's skin. Monitor to avoid burns.

DISPOSITION:

1. *Urgent* evacuation for moderate/severe hypothermia cases to a facility capable of active rewarming and resuscitation.
2. *Priority* evacuation for cases of freezing cold injuries (frostbite).
3. *Routine* evacuation for cases of non-freezing cold injury which are non-ambulatory.
4. Evacuation not necessary for cases of non-freezing ambulatory cold injuries.

Crush Syndrome Protocol

Definition:

Massive, prolonged crush injury resulting in profound muscle and soft tissue damage places the patient at significantly increased risk for developing circulatory and renal complications due to release of potassium, acid and protein from the injured tissue.

SPECIAL CONSIDERATIONS:


1. Be aware of development of crush syndrome starting early post injury.
2. Employ the protocol if not immediately extricating a patient.
3. These medications are not part of the standard ATP aid bag and require development of a separate crush injury kit.

SPECIAL INSTRUCTIONS:

1. The principles of hypotensive resuscitation according to TCCC **DO NOT** apply in the setting of extremity crush injury requiring extrication.
2. In the setting of a crush injury associated with non-compressible (thoracic, abdominal, pelvic) hemorrhage, aggressive NS fluid resuscitation may result in increased hemorrhage and blood should be used – use your best judgment.
3. With extremity injuries, tourniquets should **NOT** be applied during Phase 1 unless there is hemorrhage that is not controllable by other means.
4. Be aware of development of cardiac dysrhythmias or cardiac arrest due to hyperkalemia immediately following extrication.

Management:


Phase 1: **IMMEDIATE** (while attempting extrication)

1. Perform MARCH PAWS (see page 17)
2. Monitor O2 sat with pulse ox and administer high flow oxygen if SpO2 <90%.
3. Give initial bolus of 1–2L of NS PRIOR to attempts at extrication and continue at 1.5L/hr. Can place 2 lines if able. Adjust to urine output (UOP) goal of >100–200mL/hr if able.
 - a. If IV/IO crystalloids are not available, consider oral intake of electrolyte solution such as water/rehydration salts, Pedialyte or a sports drink.
4. Ringer's lactate is not recommended due to the potassium content, but can be used for first 2 liters if nothing else available.
5. Maintain urine output at greater than or equal to 200mL/hr. If possible, insert Foley catheter.
6. Monitor mental status.
7. Follow *Pain Management Protocol* (TMEP).
8.  For open wounds give antibiotics – ertapenem (Invanz) 1g IV.
9. Utilize cardiac/EKG monitoring during extrication and evacuation.

PHASE 2: **IMMEDIATELY PRIOR TO EXTRICATION**

10. Immediately prior to extrication, apply tourniquets to crushed extremities, if possible.

Phase 2 Recommended Additional Resuscitative Drugs

- a.  Sodium bicarbonate – give 1mEq/kg IV immediately prior to extrication (Bristojet 1–2 amps). Additional dosing of sodium bicarbonate may be required if dysrhythmias or cardiac arrest persist after giving calcium chloride or gluconate.

PERFORM EXTRICATION

PHASE 3: **IMMEDIATELY FOLLOWING EXTRICATION**

Cardiac Dysrhythmias or Arrest

11. CPR **should be** initiated if cardiac arrest develops following extrication.
12. If extrication is greater than 4 hours **OR** in the presence of dysrhythmias **OR** peaked T-waves (sign of hyperkalemia), administer calcium gluconate (1gm, 10mL of 10% solution).

 **Caution** Calcium should not be given in bicarbonate containing solutions due to precipitation of calcium carbonate.

13. Additional dosing of sodium bicarbonate may be required if dysrhythmias or cardiac arrest persist after giving calcium gluconate.
14. Be prepared to treat hyperkalemia following extrication and as tourniquets are released.

DISPOSITION:

1. *Urgent Surgical* evacuation.

Deep Venous Thrombosis (DVT)


SPECIAL CONSIDERATIONS:

1. Risk factors: trauma, tourniquet application, periods of relative immobilization (sitting for >4hr such as extended airplane or vehicle ride), high-altitude exposure, genetic predisposition.
2. May be confused with a ruptured Baker's cyst in a tactical setting.

Signs and Symptoms:

1. Asymmetric pain and swelling in a lower extremity (often the calf muscles)
2. Warmth and ↑ pain in affected calf muscles on dorsiflexion of foot (Homans' Sign)

Management:

1. Monitor patient with SpO₂, sudden decrease in SpO₂ suggests a pulmonary embolism
2.  ASA 325mg PO
3. If sudden chest pain or respiratory distress occurs, consider pulmonary embolus and administer oxygen if available
4. Immobilize the affected extremity

DISPOSITION:

1. *Priority* evacuation if no respiratory distress or chest pain.
2. *Urgent* evacuation if respiratory distress or chest pain is present.

Dehydration

SPECIAL CONSIDERATIONS:

1. Troops in the field are often chronically dehydrated.
2. Prolonged missions, acute diarrhea (gastroenteritis), viral/bacterial infections, and environmental factors (heat stress or strenuous activity) all may exacerbate dehydration.
3. May also occur in colder high-altitude environments from dry air and hyperventilating with vapor loss from breathing.

Signs and Symptoms:

1. Lightheadedness (worse with sudden standing)
2. Mild headache (especially in the morning)
3. Dry mucosa
4. Decreased urinary frequency and volume
5. Dark urine
6. Degradation in performance

Management:

1. Increase oral fluids if tolerated:
 - a. Use carbohydrate/electrolyte drink mixes for fluid replacement, diluted (1:4 solution)
 - b. Avoid fluids containing caffeine
2. If unable to tolerate PO fluids, use an initial bolus of 1 liter normal saline IV, followed by repeat attempt at PO hydration. If still unable to tolerate PO hydration, repeat 1 liter bolus of normal saline IV. If normal saline is not available, use available IV fluids.

DISPOSITION:

1. Monitor closely for recurrence of dehydration.
2. *Priority* evacuation if dehydration persists after treatment.

Dental Pain


SPECIAL CONSIDERATIONS:

1. Most common causes are deep decay, fractures of tooth crown/root, acute periapical (root end) abscesses, or pericoronitis (pain associated with an impacted wisdom tooth).
2. If tooth pain occurs during flight, consider barodontalgia and refer to the *Barotrauma Protocol*.

Signs and Symptoms:

1. Intermittent or continuous pain (usually intense), heat or cold sensitivity
2. Visibly broken/cracked tooth
3. Severe pain on percussion
4. Intraoral swelling/abscess
5. Partially erupted wisdom tooth
6. Lost filling

Management:

1. Treat per *Pain Management Protocol*
2.  If signs and symptoms of infection are present, administer amoxicillin/clavulanic acid (Augmentin) 875mg PO bid for 7 days **OR** azithromycin. (Z-pak) 500mg PO initially followed by 250mg PO daily × 4 days.
3. If gums appear swollen and red, encourage increased oral hygiene and warm saline rinses bid.
4. If filling is lost, consider temporary filling/patch.

DISPOSITION:

1. Evacuation usually not necessary.
2. *Routine* evacuation if not responding to therapy.

Determination of Death/Discontinuing Resuscitation

SPECIAL CONSIDERATIONS:

1. Immediate determination of death is appropriate in a trauma patient without pulse or respirations in the setting of multiple casualties when resuscitative efforts would hinder the care of more viable patients.
2. Patients who are struck by lightning, have hypothermia, cold-water drowning, or intermittent pulses may require extended cardiopulmonary resuscitation.
3. It is assumed that personnel do not have access to ECG, or other monitoring equipment to evaluate heart rhythm, or deliver countershocks.

Signs and Symptoms:

Obvious Death – Persons who, in addition to absence of respiration, cardiac activity, and neurologic reflexes, have one or more of the following:

1. Decapitation
2. Massive crushing and/or penetrating injury with evisceration of the heart, lung or brain
3. Incineration
4. Decomposition of body tissue
5. Rigor mortis or post-mortem lividity

Management:

1. In the setting of obvious death, resuscitative efforts should not be initiated.
2. In trauma patients, particularly combat trauma, perform bilateral needle decompression before calling Vital Signs Absent (VSA).
3. If resuscitative efforts have been initiated, consider termination of resuscitation:
 - a. After 15 minutes (if the cause is unknown or due to trauma) or after 30 minutes (when the cause is due to hypothermia, electrical injury, lightning strike, cold water drowning, or other cause known to require a prolonged resuscitative effort) when:
 - i) There is persistent absence of carotid and other pulses, and respirations despite assuring airway patency and effective ventilation as well as administration of resuscitative fluids in hypovolemic patients and medications.
 - ii) Pupils are fixed and dilated. This is not applicable in the setting of lightning strikes or in the presence of drugs that cause pupil dilatation.
 - iii) No response to deep pain above or below the clavicles.
 - iv) Absence of end-tidal CO₂, (either colorimetric or wave form) from a correctly placed endotracheal tube or alternative airway.
 - v) Document all four items: 1. pulseless, 2. apneic, 3. unresponsive, 4. pupils fixed and dilated. Have a second PJ double check findings and co-sign patient treatment card. If there is a monitor, document end tidal CO₂ and asystole.
4. If there is any question as to the discontinuation of resuscitative efforts, then a medical officer should be contacted for guidance.
5. If CPR is prolonged and it is the decision of the team leader or medic that it is no longer effective or resources do not permit continuation, then document the reason and discontinue CPR.

DISPOSITION:

1. Evacuation of the remains when tactically feasible.
2. Always cover the head and torso at least with space blanket or other item, use flag when able, protect the Hero with dignity.
3. In the event of return of spontaneous circulation, *Urgent* evacuation.

Snake Envenomation

SPECIAL CONSIDERATIONS – General:

1. Toxic envenomations from a variety of sources, including insects, spiders, bees/wasps, scorpions, snakes, or marine life are all capable of causing life-threatening anaphylaxis and should be treated according to the *Anaphylaxis Protocol*.

Snakes:

1. Only a minority of snakebites from toxic snakes involve severe, life-threatening envenomations.
2. Incision, excision, electrical shock, tourniquet, oral suction, and cryotherapy are ineffective treatments and should **NOT** be performed to treat snakebites.
3. Suction devices are not effective for removing snake venom from a wound. If previously placed, remove the device.
4. Elapidae envenomations, especially from the coral snake, may show minimal local signs until sudden decompensation hours later.

Snake Signs and Symptoms:

1. Crotalidae (Pit vipers, rattlesnake, moccasin, bush master)-Vascular and bleeding
 - a. Sudden pain
 - b. Erythema
 - c. Ecchymosis
 - d. Hemorrhagic bullae
 - e. Bleeding from site
 - f. Metallic taste
 - g. Hypotension/shock
 - h. Swelling/edema
2. Elapidae (Coral snake, sea snake, mamba, cobra, taipan, kraits) – Neurologic
 - a. Cranial Nerve dysfunction (i.e., ptosis, difficulty swallowing)
 - b. Paresthesias
 - c. Fasciculations
 - d. Weakness
 - e. Altered mental status

Management of Snake Bites:

1. If signs and symptoms of anaphylaxis present, treat per *Anaphylaxis Protocol*
2. Supportive care (ABC) as necessary
3. Treat per *Pain Management Protocol using narcotics. Avoid NSAID use*
4. Treat per *Nausea and Vomiting Protocol*
5. If toxic snakebite suspected (significant pain, edema, evidence of coagulopathy or neurologic signs/symptoms):
 - a. Minimize activity and place on a litter
 - b. Remove all constricting clothing and jewelry
 - c. Start IV in unaffected extremity

- d. Monitor and record vital signs and extent of edema every 15–30 minutes
- e. IV crystalloid for hypotension as necessary
- f. Immobilize affected limb in neutral use
- g. Do not perform fasciotomy
- h. Cold therapy and suction therapy are contraindicated in snakebites

DISPOSITION:

- 1. *Urgent* evacuation if treated for anaphylaxis.
- 2. *Urgent* evacuation for confirmed elapidae bites.
- 3. *Urgent* evacuation if evidence of severe envenomation (systemic signs and symptoms, progressive ascending edema) exists.
- 4. Evacuation not required for crotalidae bites if signs and symptoms do not indicate anaphylaxis or development of severe envenomation after 4 hours of observation.

NOTE: If *urgent* evacuation is not possible, a telemedicine consult with an experienced treatment center is recommended to guide antivenin drip dosing or other supportive care requirements.

Marine Envenomation

SPECIAL CONSIDERATIONS:

- 1. Envenomation results from stings by jellyfish, fire corals, sting rays, sea urchins, bristle worms, fish spines, sea snakes, etc.
- 2. Jellyfish account for the vast majority of envenomation, which occur with contact to stinging cells on tentacles.
- 3. Stingrays are the most common cause of envenomation by marine vertebrates.
- 4. Sea snake venom is 2–10 times more potent than cobra venom, but only about 25% of those bitten develop symptoms (due to an inefficient delivery system and small mouth).
- 5. All of these envenomations are more likely to occur in intratidal regions, reefs, and surf zones.

Signs and Symptoms:

- 1. Envenomation by jellyfish:
 - a. Contact with jellyfish tentacles causes immediate, intense sharp and burning pain, followed by a local, linear, erythematous eruption.
 - b. Severe stings can cause anaphylactic reaction, hematuria, vomiting, syncope, hypotension, or paralysis.
- 2. Envenomation by fire coral is similar to jellyfish, but less severe and rarely causes complications. Pain symptoms usually resolve within 12 hours.
- 3. Envenomation by stingray:
 - a. Spine on tail contains retro-serrated teeth, with a venom gland along the groove.
 - b. Envenomation causes immediate, intense pain at site of injury out of proportion to exam, and edema.

- c. Pain tends to peak 30–60 minutes after puncture and can last for several days.
- d. Rare systemic symptoms include limb paralysis, hypotension, and bradycardia.
- 4. Envenomation by sea urchin:
 - a. Frequently cause multiple deep puncture wounds when stepped on.
 - b. Puncture and envenomation cause immediate, intense pain, erythema and local swelling.
 - c. If more than 15–20 punctures are present, then severe systemic symptoms can occur.
- 5. Envenomation by bristleworms:
 - a. Is caused by contact with bristle-like setae on feet of animal.
 - b. Contact is like brushing against a cactus plant and may result in many fine bristles embedded in the skin.
 - c. Causes painful inflammation, which is almost never serious.
- 6. Envenomation by fish spines:
 - a. First symptom is usually immediate localized pain out of proportion to clinical manifestations, lasting minutes to hours.
 - b. Puncture wound is usually cyanotic, with surrounding erythema and edema.
 - c. Pain is often noted in proximal lymph nodes.
 - d. Symptoms can progress to delirium, malaise, nausea, vomiting, and elevated temperature.
 - e. Infrequently leads to shock and death.
- 7. Envenomation by sea snake bites:
 - a. Fang and teeth marks consist of small puncture wounds and may number from 1–20.
 - b. Latent period of 10 minutes to several hours between bite and onset of symptoms.
 - c. May initially present with mental status changes, including euphoria, anxiety or restlessness.
 - d. Progresses to dry throat, nausea, vomiting, generalized weakness and paralysis, leading to respiratory distress/failure.
- 8. Envenomation by blue-ringed octopus bite:
 - a. Bite is painless and may go unnoticed.
 - b. Patient may become paralyzed with respiratory distress.
 - c. Symptoms are usually rapid in onset and extremely variable in severity.

Management:

- 1. Stings (Jellyfish, Sea Wasp):
 - a. Remove stinger, tentacles, etc. if possible, with gloved hand, forceps or tape.
 - b. Immediately flush with dilute acetic acid (vinegar). Alternative flush is isopropyl alcohol and seawater. Do not use fresh water.
 - c. Apply topical lidocaine.
 - d. Apply topical steroid.
 - e. Follow *Pain Management Protocol*
- 2. Bites (Sea snakes, blue ringed octopus) – See *Envenomation Protocol*.
- 3. Punctures (Sea urchin, stingray, fish spines, bristleworms):
 - a. Remove all penetrating foreign bodies with gloved hand, forceps or tape.
 - b. Irrigate with cold seawater.
 - c. Soak the affected area in nonscalding water (110°–115°) for 30–90 minutes to inactivate toxins.
 - d. Ultrasound or x-ray (if available for retained foreign body).
 - e. Antibiotics for deep puncture wounds: moxifloxacin.
 - f. Follow *Pain Management Protocol*.

DISPOSITION:

1. *Urgent* evacuation if evidence of severe envenomation (cardiovascular collapse, anaphylaxis, paralysis, ascending edema of limb).
2. Evacuation not required if signs and symptoms do not indicate severe envenomation after 24 hours of observation.

Insect/Arthropod Envenomation

SPECIAL CONSIDERATIONS – Insect/Arthropod Bite:




1. In cases of suspected black widow spider bites, consider other causes for acute abdominal pain.

HYMENOPTERA (BEE, WASP, HORNET)

Signs and Symptoms:

1. Pain
2. Swelling/edema
3. Puncture site(s) from stinger or fangs
4. Warmth
5. Erythema
6. Signs of anaphylaxis

Management:

1. If signs and symptoms of anaphylaxis present, treat per *Anaphylaxis Protocol*
2. Remove stinger by scraping from side
3. Apply ice or cold water
4.  Apply topical 1% hydrocortisone cream
5. Apply topical lidocaine
6.  Ibuprofen 800mg PO tid × 7 days
7.  Diphenhydramine (Benadryl) 25–50mg q6hr PRN PO/IV



ARTHROPOD (Spider)

1. Black Widow (Red hour glass on back)
 - a. **Signs and Symptoms:**
 - i) Pinching bite followed by local swelling and burning
 - ii) Large muscle group spasms/tremors
 - iii) Abdominal pain and/or rigidity within 60 minutes
 - iv) Nausea and vomiting
 - v) Diaphoresis
 - vi) Hypertension
 - vii) Tachycardia



Black Widow

b. Management:


- i) Treat per *Pain Management Protocol* (narcotic analgesia)
- ii)  Midazolam (Versed) 2–5mg PO q6–8hr or 2–5mg IV/IM/IO for relief of muscle spasm
- iii)  Diphenhydramine (Benadryl) 25–50mg q6hr PRN PO/IV

2. Brown Recluse (notice violin shape on back)

a. Signs and Symptoms:

- i) Local pain and ulceration at site within 2–8 hours with surrounding erythema
- ii) Hemorrhagic vesicle progressing to slowly enlarging eschar
- iii) Fever, chills, nausea, joint pain

b. Management:

- i) Elevate bite site
- ii) Avoid strenuous activity
- iii) Treat per *Pain Management Protocol* (narcotic analgesia)
- iv)  Diphenhydramine (Benadryl) 25–50mg q6hr PRN PO/IV
- v) Use an antibiotic appropriate for MRSA if cellulitis exists



Brown Recluse




Brown Recluse Bite

SCORPION

Signs and Symptoms:

1. Local pain, swelling, and erythema
2. Nausea and vomiting
3. Paresthesias
4. Tongue fasciculations
5. Sympathetic (tachycardia, hypertension, hyperthermia) or parasympathetic (hypotension, bradycardia, hypersalivation, incontinence) overdrive can develop
6. Seizures
7. Agitation
8. Blurry vision/Rotary eye movements

Management:

1. Treat per *Pain Management Protocol*
2. Treat per *Nausea and Vomiting Protocol*
3. Apply ice packs to bite site
4. Supportive care as necessary
5.  Diphenhydramine (Benadryl) 25–50mg q6hr PRN PO/IV
6. Evacuation typically not required for localized insect stings and scorpion bites
7. Urgent evacuation for anaphylaxis, systemic signs, and abdominal rigidity
8. Routine evacuation for tissue necrosis from brown recluse spider bite
9. No evac for localized bites and stings

Epistaxis




SPECIAL CONSIDERATIONS:

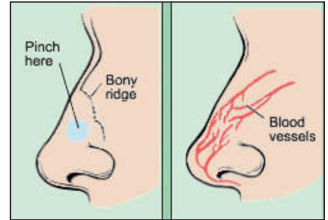
1. Common at high altitude and in desert environments due to mucosal drying.
2. May be anterior or posterior.
3. Posterior epistaxis may be difficult to stop and may cause respiratory distress due to blood flowing into the airway. This type of epistaxis is uncommon in young healthy adults. It is more commonly seen in older, hypertensive patients.

Signs and Symptoms:

1. Nosebleed
2. Often previous history of nosebleeds

Management:

1. Clear clots and other material from airway (if required) by having patient sit up, lean forward, and blow his/her nose. Pinch nose as shown and have patient lean forward.
2. **IF BLEEDING CONTINUES:**
 - a.  Oxymetazoline (Afrin) nasal spray 2 squirts in each nostril then pinch anterior area of nose firmly for full 10 minutes **WITHOUT RELEASING PRESSURE.**
 - b. **If bleeding continues**, insert oxymetazoline (Afrin) soaked nasal sponges (or small pieces of hemostatic gauze) bilaterally along the floor of the nasal cavity. Continue pinching the nose just below the nasal bridge for 10 minutes.
 - c. TXA soaked gauze can be utilized if Afrin fails to achieve hemostasis. In cases of severe and/or persistent epistaxis, consider administering TXA 2g IV.
3.  Once bleeding has stopped (after 30 minutes), remove the oxymetazoline (Afrin) nasal sponge (or hemostatic gauze) and apply mupirocin (Bactroban) or other antibiotic ointment, to the affected nostril tid.
4. Normal saline IV TKO PRN (based upon severity of nose bleed).
5. **IF BLEEDING CONTINUES:**
 - a. Prepare 14 French Foley catheter (tip is cut to minimize distal irritation)
 - b. Advance catheter along floor of nose (straight in) until visible in mouth
 - c. Fill balloon with 5mL of normal saline
 - d. Retract catheter until well opposed to posterior nasopharynx
 - e. Add an additional 5mL of normal saline to balloon, but don't overpressure if encountering significant resistance before the full volume
 - f. Clamp in place without using excessive anterior pressure
 - g.  Moxifloxacin (Avelox) 400mg PO daily until packing is removed
 - h. **LEAVE BALLOON AND PACKING IN PLACE FOR 72 HOURS**



DISPOSITION:

1. *Priority* evacuation for severe epistaxis not responding to therapy or if Foley catheter is used.
2. Evacuation may not be required if epistaxis is mild, anterior, and resolves with treatment.

Flank Pain (Includes Renal Colic, Pyelonephritis, and Kidney Stones)



SPECIAL CONSIDERATIONS:

1. May proceed to life-threatening systemic infection.
2. May be associated with testicular torsion. Ensure normal external GU exam first.

Signs and Symptoms:

1. Urinary Tract Infection
 - a. Dysuria – painful urination
 - b. Polyuria – large volume of urine
 - c. Increased frequency of urination
 - d. Change in urine color or odor
2. Back pain
3. Flank pain
4. Nausea/vomiting
5. Costo-vertebral angle (CVA) tenderness
6. Fever
7. Hematuria

Management:

1. Treat dehydration, pain, nausea/vomiting as indicated.
2. If fever present:
 - a.  Moxifloxacin (Avelox) 400mg PO daily
 - b.  Ertapenem (Invanz) 1g IV/IM if unable to tolerate PO or unresponsive to oral treatment

DISPOSITION:

1. *Priority* evacuation for persistent flank pain and/or fever.




SPECIAL CONSIDERATIONS:

1. Etiology of acute diarrhea is often viral, but bacterial or parasitic infections are common in the deployed environment.
2. Consider antibiotic-related diarrhea if on antibiotics at onset.
3. Consider parasitic infection if symptoms persist for 3 or more days.
4. Must rule out malaria if fever and GI symptoms exist in a malaria area.

Signs and Symptoms:

1. Acute onset of nausea, vomiting, and diarrhea
2. Fever may or may not be present

Management:

1.  Loperamide (Imodium) 4mg PO initially, then 2mg PO after every loose bowel movement with a maximum dose of 16mg qd
2. Do not use loperamide in the presence of fever or bloody stools
3.  Moxifloxacin (Avelox) 400mg PO daily for 3 days
4. Treat nausea/vomiting, and hydrate as indicated
5.  If diarrhea persists after 3 days of therapy, or diarrhea develops while already on antibiotics, give metronidazole (Flagyl) 500mg PO tid for 10 days if available

DISPOSITION:

1. *Urgent* evacuation if grossly bloody stools or hypotension.
2. *Priority* evacuation if dehydration occurs despite above therapy.
3. *Routine* evacuation if diarrhea develops while already on antibiotics.

Headache

SPECIAL CONSIDERATIONS:

1. The number of differential diagnoses for the acute headache is large and includes disorders that encompass the spectrum of minor to severe underlying disorders.
2. Consider altitude sickness, intracranial bleeds, meningitis, and carbon monoxide poisoning.

Signs and Symptoms:

1. If the headache is atypical for the patient, check for elevated blood pressure (if possible), fever, neck rigidity, visual symptoms, mental status changes, motor-sensory deficits, and hydration.

Management:

1. If the patient has fever, stiff neck, photophobia, petechial rash, or nausea and vomiting, treat per *Meningitis Protocol*.
2. Treat per pain, nausea/vomiting, dehydration, altitude as indicated.

DISPOSITION:

1. Evacuation is usually not required if the headache responds to therapy.
2. Acute headache in the presence of fever, severe nausea and vomiting, mental status changes, focal neurological signs, or preceding seizures, loss of consciousness, or a history of “it’s the worst headache in my life” constitutes a true emergency and requires *Urgent* evacuation.
3. Consider *Urgent* or *Priority* evacuation for anyone without a prior history of headaches if their pain is severe.

Head and Neck Infection (Includes Epiglottitis and Peritonsillar Abscess)



SPECIAL CONSIDERATIONS:

1. Most common causes in young healthy patients include odontogenic (dental origin) or cutaneous sources or post-injury (wound or fracture) infections. These infections may progress rapidly from minor to airway/life-threatening.

Signs and Symptoms:

1. Pain, fever and malaise
2. Intra/extra oral swelling
3. Difficulty opening mouth
4. Pus
5. Difficulty swallowing
6. Airway compromise

Management:

1. Manage airway and breathing first!
2. Place patient in position of comfort
3. Monitor pulse oximetry
4. Oxygen PRN
5. IV access
6.  Ertapenem IV (Invanz®) 1g IV, over 30 minutes
7. Treat per *Pain Management Protocol*
8.  Consider dexamethasone (Decadron) 10mg IV for any airway involvement
9. **Avoid airway manipulation unless absolutely necessary**

CAUTION: Have cricothyroidotomy kit available **BEFORE ATTEMPTING INTUBATION.**

10. If airway intervention is indicated, make a single attempt at intubation if feasible
11. If intubation is attempted, do not make any repeat attempts. If intubation has failed, the next step is a cricothyroidotomy (using local anesthetic and *Procedural Sedation Protocol* if conscious)

DISPOSITION:

1. *Urgent* evacuation if any airway compromise is present.
2. *Routine* evacuation if no airway compromise and the infection is not widespread.

Heat Illness

SPECIAL CONSIDERATIONS:

1. Dehydration often accompanies heat illness.
2. Colloids should be avoided in favor of crystalloids.
3. Heat Stroke is a life-threatening effect of hyperthermia and characterized by altered mental status and elevated core temperature typically >104°F.
4. Patients are at risk for multisystem organ failure, and careful monitoring is essential even after return to normothermia.

Signs and Symptoms:

1. Generally involve physical collapse or debilitation during or immediately following exertion in the heat
2. Heat Exhaustion: Temp generally $\leq 104^{\circ}\text{F}$, headache, dizziness, nausea, tachycardia, and normal mental status
3. Heat Stroke: Temp generally $>104^{\circ}\text{F}$, above symptoms and altered mental status (delirium, stupor, coma)

Management:

1. **Early rapid cooling reduces mortality and morbidity, and it should be initiated as soon as possible.** Cooling should be the primary goal before transport.
2. Place in cool area and remove clothing.
 - a. For Heat Stroke: The best option for rapid cooling is full body ice water immersion (keeping head elevated out of water). If this is unavailable, a continual dousing of cold water (as would occur in a cold shower or with ice water-soaked towels) provides the fastest cooling rate. A less ideal option is to spray the patient with water plus rapid air movement provided by a fan. Apply these active cooling measures until the core temperature reaches 102°F , then take the patient out so they don't overshoot normal temperature and become hypothermic.
3. Place oral glucose gel (Gu) or 1 packet of sugar in buccal mucosal region.
 - a. Treat per *Dehydration Protocol*. Heat stroke and heat exhaustion with associated severe muscle pain and/or cola colored urine will typically require 2–3 liters of crystalloid and continued IV hydration to obtain a urine output of 200mL/hr.
4. If the patient is unconscious after exercising on a hot day, limit fluid resuscitation to a max of 2L of crystalloids unless hemodynamically unstable and a Foley is in place (and optimally laboratory support).
5. Treat per *Nausea and Vomiting Protocol*.
6. For cola colored urine or severe muscle pain, treat per *Rhabdomyolysis Protocol*.

DISPOSITION:

1. *Urgent* evacuation for Heat Stroke.
2. *Routine* evacuation for Heat Exhaustion.

HIV Post Exposure Prophylaxis (PEP)

SPECIAL CONSIDERATIONS:

1. Initiation of the highly active antiretroviral therapy (HAART) should ideally occur within 2 hours of exposure, but still has some effect up to 72 hours after exposure.
2. Antiretrovirals have a significant side-effect profile, including nausea, vomiting, diarrhea.
3. Obtain a sample of the source's blood for HIV and hepatitis testing, if possible.
4. Use of a commercially available Rapid HIV Test Kit that uses either an oral specimen or whole blood is recommended for source testing within 1–2 hours to determine if HAART therapy should be initiated.

PJ PEARL: These meds are not in the Pararescue Formulary; however, accidental needle sticks or punctures by sharp bone shards from patients with traumatic amputations have occurred. PJs were subsequently placed on prophylactic therapy. It is important to be aware of this risk and ensure treatment is available. Many deployments are to regions with high rates of HIV.

High Risk Exposures:


1. Percutaneous injury (needle stick or other contaminated penetrating injury).
2. Exposure or exchange of body fluids with persons at high risk for HIV.
3. Transfusion of blood products that have not undergone standard U.S. blood bank or equivalent testing for transmissible diseases.
4. When attempting to evaluate a high-risk exposure, take into account the source of the bodily contamination, ex: blood from an American military member would generally fall into low risk.

Management:

1. Wash area with soap and water to clean area and minimize exposure.
2. Use a Rapid HIV Test Kit to determine if therapy should be initiated.






In high risk situations, do not delay initiation of therapy if the test kit is not available. HIV PEP should be started within 1–2 hours of exposure.

3. Consult with unit medical officer ASAP to discuss the case and obtain further guidance after any significant exposure.
 - a. If the Rapid HIV Test is positive, initiate PEP.
 - b. If high-risk exposure occurs and a Rapid HIV Test is unavailable, initiate PEP.
 - c. If a Rapid HIV Test is neg, seek medical officer guidance to determine the need for PEP.
4. Initiate antiretroviral triple therapy according to medical oversight.
5. Do not use alcoholic beverages after Combivir administration.
6.  For GI side-effects of medication, treat per *Nausea and Vomiting Protocol*.
7. Maintain hydration and nutrition status.

VITAL SIGNS OF CANINES:

1. Temperature:
 - a. Normal Rectal Temp is 100–102.5°F.
 - b. Temperature after exercise: 103–106°F.
2. Pulse:
 - a. Normal pulse rate will vary from 60–80bpm. Can beat up to 130 with exercise.
 - b. The pulse rate and respiration rate will vary from dog to dog, and will also vary if the dog is at rest or working.
 - c. The femoral artery is located on the inside of a dog's rear thighs. Guide hand as if passing someone a plate. Grab the dog on the rear of its thigh with fingers inside and palpate the artery.
3. Normal respiration rate for an adult dog will vary between 10–40 respirations per minute.
4. Capillary refill time: less than 2 seconds.
5. Mucous membrane color: generally pink, but may have pigmented areas depending on breed.
 - **WEIGHT RELATED DRUG DOSES ARE AT THE END OF THIS PROTOCOL.**
 - **MOST DOG HANDLERS WILL CARRY A DRUG CARD FOR THE DOG.**

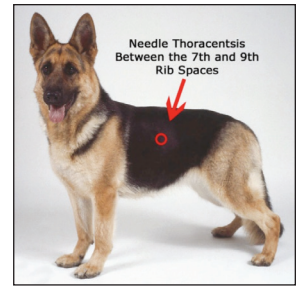
RESTRAINT (SOF medical personnel should work with handler to learn muzzling techniques):

1. Always muzzle dog when working on them.
2. Physical restraints with muzzles or improvised muzzles.
 - a. Field expedient muzzle:
 - i) Kerlix is tied in a half-hitch on top of the muzzle, then in a half-hitch below the muzzle and then tied behind the ears.
 - ii) The leash is wrapped around the snout; this method is not as secure.
3. Chemical restraint if needed to protect handler and Medic.
 - a.  Dexdomitor is the recommended drug for chemical restraint if not traumatic injury. 10–15mcg/kg (0.3–0.4mg) IM or IV, reversed with Antisedan. Dexdomitor after onset gives 20–30 minutes of good sedation when administered with labeled dose.
 - b.  Versed can be used for mild sedation and restraint at 0.2mg/kg IM or IV (6mg). Can cause paradoxical excitement (usually with IV administration).
 - c.  Use Versed and ketamine (at 5mg/kg IV) in combination for moderate sedation. May cause hyper-excitability and involuntary muscle movements. Watch for potential aggression when effects are wearing off.



Monitoring:

1. Pulse Ox – Placed on tongue, ear, prepuce, vulva, or other non-pigmented, highly vascular area (i.e. lip).
2. EKG – Alligator clips in armpit and groin (left). If alligator clips are unavailable, place the buttons or leads behind the largest pad on the foot.
3. Animals do not have palpable carotid pulses. Obtain a femoral pulse in the inguinal crease.

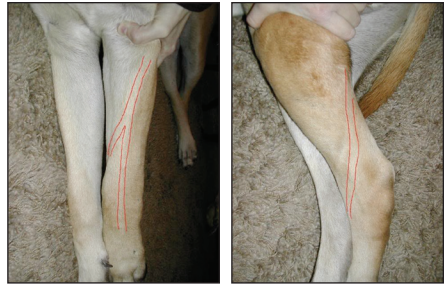


IM INJECTION SITES:

Lumbar epaxial, hamstring or quadriceps muscles.

IV SITES:

1. Usually the easiest/best vein to use for a K9 IV is the one found on their forelegs. The cephalic vein is located on the middle of the foreleg. This is the most commonly used vein for fluid administration and IV delivery of drugs. The jugular vein can be used as a last resort for IV access.
2. If the person occluding the vein rolls it laterally, this will place the vein directly on top of the dog's leg, easing access.
3. Maintain a firm hold on the dog's leg as the catheter is placed.
4. Start distally on the vein. If attempt fails, move proximally and reattempt the IV.
5. In the hind leg, the lateral saphenous vein is used. This vein has a tendency to roll and is more difficult to maintain and secure.
6. In both procedures use plenty of tape to secure the IV line. Your patient will try to pull it out. If they are ambulatory, movement will often dislodge the IV. IVs in conscious dogs must be monitored.



HYDRATION STATUS:

1. Normal Hydration: Pick up skin and release. It should return to the position that it was, within 1 second.
 - a. Capillary Refill Time (CRT) is measured by pressing on a non-pigmented (pink) area of the gums over the canine tooth. Using one finger, press down firmly until the gums turn white under pressure and release. Also, note the normal color of the dog's gums and mouth. The gums may vary from black, pink, reddish brown, or any combination of colors.
2. Dehydration:
 - a. 6–8% dehydration – loss of skin elasticity, tacky gums, mildly prolonged CRT
 - b. 10–12% dehydration – tented skin, dry gums, prolonged CRT, sunken eyes, increased HR, rapid/weak pulses

3. Dehydration Fluid Replacement
 - a. Estimate dehydration
 - i) 5% give 1L bolus IV
 - ii) 10% give 2L bolus IV
 - b. Fluid choice is normal saline or lactated Ringer solution
 - c. The best technique to rehydrate the dog is through oral consumption

K9 Heat Injuries

SPECIAL CONSIDERATIONS:

1. Heat injuries are life threatening for an animal.
2. Dehydration accompanies heat injuries.
3. Crystalloids are preferred over colloids. However, use of colloids is better than nothing.

K9 Heat Exhaustion

Signs and Symptoms:

1. Recent activity and history
2. Rectal temp may be over 105
3. Fast and shallow panting that does not slow in a couple of minutes
4. Heart rate may be over 140 bpm
5. Brick red mucous membranes
6. Pulse may be bounding or thready and weak
7. Dog looking for a cool place to lay down or just stops working

K9 Heat Stroke

Signs and Symptoms:

1. Recent activity and history
2. Temp over 106°F
3. Pale gums
4. Rapid and shallow breathing
5. Collapse
6. Weak
7. Uncoordinated
8. Seizures
9. Vomiting
10. Diarrhea

Management:

1. Shade or AC
2. Wet down or submerge in room temperature water. If possible, fan dog afterwards.
Do not put a wet dog in the kennel. This will create a sauna like effect upon the dog.
3. Alcohol on pads
4. Cool ice packs under groin and arm pits
5. IV fluid therapy
6. Continuous monitoring until temp drops to below 103°F, then stop cooling, dry animal and continue to monitor temp at 15 minute intervals until stabilized.


K9 High Altitude Sickness and Pulmonary Edema**SPECIAL CONSIDERATIONS:**

1. Typically not seen in dogs, but may occur.



Signs and Symptoms:

1. Reduced appetite
2. Listlessness
3. Reduced activity levels
4. "Mildly dusky" tongue color/pale gums
5. Brown or pink tinted fluids from mouth or nose
6. Lung sounds (fluid in lungs)

PROPHYLAXIS:

1.  Acetazolamide (Diamox)
 - a. 250mg PO bid 24 hours prior to ascent and continued for 48 hours after maximum altitude is reached
 - b. If the 500mg sustained release tablet is used, dose is 500mg PO q24hr

TREATMENT:

1. Descend from altitude and treat symptoms
2. Oxygen
 - a. Example of blow by oxygen administration
 - b. Put O2 line in a cage/Vari kennel and cover with a poncho line, rain coat, etc.
3.  Dexamethasone, 4mg IV/IM/PO q6hr
4.  Albuterol inhaler can be attempted
 - a. Apply field expedient muzzle as shown.
 - b. Improvise a nebulizer by using a plastic bag or paper bag. Open the bag, squirt the albuterol into the bag. Place the bag over the muzzle and let the dog breath a few breaths from the bag.



SPECIAL CONSIDERATIONS:

1. Control bleeding first, based on K9-TCCC standards and guidance for humans.
2. Follow MARCH algorithm.
3. Complete K9 TCCC guidelines can be found on deployedmedicine.com.

Signs and Symptoms for Shock:

1. Pale color in gums, capillary refill time greater than 2 seconds
2. Dry lips and gums, dehydration
3. Excessive drooling in some poison cases
4. Weak femoral pulse
5. Rapid heart rate of 150–200 beats per minute
6. Cool extremities
7. Hyperventilation, rapid breathing generally over 25 breaths per minute
8. Confusion, restlessness, anxiousness
9. General weakness

Advanced Stages of Shock:

1. Continued depression and weakness to the point of not being able to move or becoming unresponsive or unconscious
2. Dilated pupils
3. Capillary refill time greater than 4 seconds
4. White mucous membranes
5. Body temperature below 98°F, taken rectally

Management:

1. **MARCH** Algorithm (see page 17)
2. **M**assive hemorrhage: Control bleeding per TCCC standards

NOTE: CoTCCC recommended windlass, limb tourniquets designed for humans (e.g., C-A-T, SOFTT-W) tend to slip distally and generally fail on MWDs due to conformational differences and should not be used as first line therapy for hemorrhage control in MWDs.

The only tourniquet that should be considered for use on a massive extremity hemorrhage in a MWDs is a stretchable and elastic tourniquet such as the SWAT-T. This type of material allows it to mold to nearly any limb size and conformation in conjunction with its wide design, allows it to serve as an effective circumferential pressure bandage on a MWDs limb.

Junctional tourniquets have not been evaluated in dogs and are not recommended at this time.

3. **A**irway
 - a. An injured dog or an animal in shock may not recognize familiar people. The dog may bite out of pain or fear. If the dog is having trouble breathing or panting heavily, **DO NOT** apply a muzzle. If a muzzle is placed on the dog it must be monitored at all times and removed at the

first sign of overheating or vomiting. If possible, get another person who can hold the dog, while performing an examination and treating the dog.

- i) Carefully pull the tongue out of the animal's mouth.
 - ii) Even an unresponsive dog may bite by instinct!!
 - iii) Make sure that the neck is reasonably straight; try to bring the head in-line with the neck.
 - iv) Do not hyperextend in cases where neck trauma exists.
- b. Visibly inspect the airway by looking into the mouth, and down the throat for foreign objects occluding the airway. Unlike human CPR, rescuers may reach into the airway and remove foreign objects that are visible.
- c. Intubation if necessary to assure airway
- i) Do not attempt to intubate a conscious animal, personnel must have prior training. ET tube size can range from 7–10.
- d. If intubation is not possible, then attempt surgical airway.
- e. After achieving a patent airway, one must determine whether the animal is breathing, and whether this breathing is effective.

NOTE: Surgical airways are not warranted in an unconscious or anesthetized MWD that has no direct upper airway trauma unless the performance of basic airway positioning maneuvers is unsuccessful in opening the airway and / or the provider is unable to successfully perform ETI.



Blind Insertion Airway Device/Nasopharyngeal airways/ Extraglottic Airway Devices have not been evaluated in canines and should not be utilized in MWDs.

- i) Surgical Cricothyrotomy (CTT) Use techniques recommended for humans
 - 1) Bougie-aided open surgical, flanged and cuffed airway cannula, 6–9 mm internal diameter, 5–8 cm intratracheal length.
 - 2) Standard open surgical, flanged and cuffed airway cannula, 6–9 mm internal diameter, 5–8 cm intratracheal length.
- ii) Surgical Tube Tracheostomy (TT)
 - 1) Use the largest internal diameter tube that fits into MWD trachea; aim for a TT that is at least 70% of the estimated internal tracheal lumen diameter.
 - 2) Select a TT length of 5–8 cm or one that does not extend beyond the thoracic inlet/ point of shoulder.
- iii) Procedure
 - 1) Position MWD on its back, extend the neck and place something under it to force it upwards, making it easier to visualize the trachea.
 - 2) Make a full thickness skin incision along the center of the neck 2–3 finger widths below the larynx (voice box) using a scalpel blade.
 - 3) If obstruction is in the trachea you must use a lower spot; otherwise use landmarks given.
 - 4) Do NOT make a transverse skin incision (perpendicular to the long axis of the trachea), as this increases the risk of injury to adjacent vessels and nerves.
 - 5) Use a scalpel to carefully separate the muscles the run parallel to the incision.
 - 6) Hold the muscles apart to visualize the trachea.

- 7) Make an incision in the trachea.
- 8) Stabilize the trachea with non-dominant hand.
- 9) Make an incision between two rings of the trachea (between the 3rd and 4th or 4th and 5th tracheal cartilages). Do NOT extend the incision more than one-half (50%) of the diameter of the trachea. Do NOT incise at the cricothyroid ligament, as is done in people.
- 10) Remove blood or mucus, if present.
- 11) Insert the tracheal retractor into the trachea.
- 12) Hook a lower tracheal ring and lift up so you can visualize the tracheal opening.
- 13) Insert tracheostomy tube (ideal) or endotracheal tube through the incision and direct the distal opening down the trachea.
- 14) Use the largest tube that will fit in the trachea (7–11mm internal diameter tubes are typical).
- 15) Immediately provide supplemental oxygen.
- 16) Breathe in the tube or use a hand-operated resuscitator.
- 17) Secure the tracheal tube by attaching gauze bandage to the tube and tying it around the dog's neck in a bow knot. Inflate the cuff until you get back pressure.
- 18) If using a tracheostomy tube, secure the tracheostomy tube to the patient using umbilical tape, roll gauze, or similar material tied to the wings of the tube and passed around the neck and tied with a quick release knot. Insert the inner cannula (if provided) in the tracheostomy tube (if used) and inflate the cuff of the tracheostomy tube.

f. AIRWAY CONSIDERATIONS:

- i) Size 9 or 10 mm cuffed endotracheal tube, secure with gauze or IV tubing. Tie around ears.
- ii) Passive flow airway – secure air line to muzzle.
- iii) Field expedient masks.
- iv) Dogs do not tolerate NPAs.

4. Respirations


- a. Look, Listen, and Feel
- b. If the dog is not breathing, compressions should be initiated (100 per minute) immediately while a second person is securing the airway.
- c. Ventilate at 8–10 breaths per minute.
- d. If available, use supplemental oxygen.
- e. Needle thoracocentesis: Place the dog in the lateral recumbent position, go mid-way between sternum and spine between the 7th and 9th ribs.

5. Circulation

- a. Be sure that there are no major (pooling/spurting blood) points of bleeding. Control as necessary.
- b. Hemorrhagic Shock Fluid Resuscitation (Administration Routes):
 - i) Preferred is IV
 - ii) Secondary route is IO (humeral head or tibia)



NOTE: Sternal/manubrium IOs are contraindicated in K9s.


- c. Incorporate crystalloids and colloids as needed.
 - i) Shock dose of fluids is 90mL/kg 10-20-10-20 rule.
 - ii) Give 1/4 shock dose every 10–20 minutes while continuously reassessing.
 - iii) Use hypertonic saline in cases that are refractory to crystalloids or in head trauma.
 - iv) 4–6mL/kg/bolus (max 2 boluses).
- d. Blood transfusion (dog-to-dog), if available. Can collect a 450mL transfusion bag from a healthy MWD to transfuse to another MWD. (Only use other MWDs with known health history as blood donors—no local canines with questionable disease status.) Cannot use human blood products for K9s (e.g., FWB, FFP, FDP, etc.).
- e. Monitor for circulatory overload
- 6. **Hypothermia:** Prevent loss of body heat, dry hair-coat if wet, wrap in blanket.
- 7. **Antibiotic Therapy for Penetrating Wounds**
 - a.  Ertapenem (Invanz) 250mg IV/IM tid

K9 RDX (C-4) Ingestion

Signs and Symptoms:

1. Tonic – clonic convulsions
2. Coma
3. Lethargy
4. Confusion
5. Muscle spasms
6. Nausea/vomiting
7. Abdominal tenderness
8. Cardiac arrhythmias

Treatment:

1. Apomorphine is in all handler med bags. If recognized immediately after ingestion (prior to the occurrence of clinical signs), use apomorphine in conjunctiva of eye. Vomiting will start in 10–20 minutes after application. Flush conjunctiva thoroughly after they begin vomiting.
2.  Control seizures with midazolam (Versed), 5mg IV bolus for a 30kg dog. Repeat as necessary to a maximum of 4 doses.

Ipecac is contraindicated in the treatment of K9 toxic ingestion.

3. If there is time during evacuation, initiate IV fluids.

DISPOSITION:

1. Evacuate to veterinarian immediately for follow up or supportive care.

K-9 Anaphylaxis

Signs and Symptoms:

1. Vomiting
2. Diarrhea
3. Restlessness
4. Labored breathing
5. Signs of shock
6. Coma

Treatment:

1. Epinephrine 0.01mg/kg (0.3mg) IM repeat q5–15min PRN
2. Diphenhydramine 2.2mg/kg (60mg)
3. Aggressive fluid therapy (assume shock)
4. Supplemental oxygen

Lightning Injury

Prevention:

Avoid being the tallest object in an open area. Do not take shelter under a single tall tree or next to metal/conducting objects. Stay clear of antennas/radios during thunderstorms. Inside an enclosed vehicle is relatively safe. Seek shelter in a grove of trees if possible. If caught in the open, crouch low with feet together. Team should spread out so a single strike will not hit all team members (hand grenade rules).

Signs and Symptoms:

1. Victims may be confused, paralyzed (especially lower extremity paralysis), have fluctuating blood pressure, be unconscious but have vital signs or be in cardiopulmonary arrest.
2. Other injuries can include ruptured TMs, temporary blindness or deafness, altered mental status or amnesia.
3. Most symptoms will resolve by themselves over hours to days.

NOTE: Victims of lightning strike ARE NOT electrically charged and may be touched immediately after injury.

Treatment:

1. **Single Casualty:**
 - a. CPR and ALS as required
 - b. Dress any burns
 - c. Evacuate ASAP
2. **Multiple Casualties:**
 - a. **REVERSE TRIAGE** (treat the apparently dead personnel FIRST, rather than last)
 - b. Patients who are awake, able to move or talk will likely survive
 - c. Patients in cardiopulmonary arrest may only need 1–2 minutes of CPR to regain pulse and respirations
 - d. Treat any blast injuries or burns and evacuate ASAP

Loss of Consciousness (Without Seizures)



SPECIAL CONSIDERATIONS:

1. The most common cause of loss of consciousness in healthy adults is orthostatic hypotension (associated with sudden standing) or vasovagal syncope (associated with sudden adverse stimulus – injections are a common cause).
2. Also consider hypoglycemia, anaphylactic reaction, medication, recreational drug use, head trauma, hyperthermia, hypothermia, myocardial infarction, lightning strikes, and intracranial bleeding.

Signs and Symptoms:

Unconsciousness

Management:

1. Follow BLS guidelines.
2. Management of orthostatic hypotension and vasovagal syncope is accomplished by placing the patient in a supine position, ensuring the airway is open. Patients experiencing these two disorders should regain consciousness within a few seconds. If they don't, consider other etiologies and proceed to the steps below.
3. Pulse ox monitoring and supplemental O2 for O2 sat <90%.
4. Sugar or energy gel in buccal mucosal region for hypoglycemia.
5. IV fluid for dehydration.
6.  Naloxone (Narcan) 0.8mg IV/IM for opioid overdose/pinpoint pupils. Repeat q2–3min PRN to max dose of 10mg.
7. Antibiotics for fever or suspected severe infections, sepsis.
8.  Epi, Benadryl, Decadron, Pepcid for suspected anaphylaxis.
9. If no response treat per appropriate Protocol per Special Considerations #2.

DISPOSITION:

1. *Urgent* evacuation, unless loss of consciousness due to orthostatic hypotension or vasovagal hypotension.
2. The evacuation package should include personnel certified in Advanced Cardiac Life Support (ACLS), with equipment, supplies and medications necessary for ACLS care.



SPECIAL CONSIDERATIONS:

1. Malaria **MUST** be considered in all febrile patients currently in, or recently in, a malaria area.
2. It is not uncommon for malaria to present like pneumonia or gastroenteritis (with vomiting and diarrhea).
3. The use of chemoprophylaxis does not rule out malaria.
4. Consider bacterial meningitis in evaluating – treat for both disorders if meningitis is suspected.

Signs and Symptoms:

1. Prodrome of malaise, fatigue, and myalgia may precede febrile paroxysm by several days.
2. Paroxysm characterized by abrupt onset of fever, chills, rigors, profuse sweats, headache, backache, myalgia, abdominal pain, nausea, vomiting, and diarrhea (may be watery and profuse) in *P. falciparum*.
3. Intermittent fever to >40°C (105°F) OR fever may be near continuous in *P. falciparum* malaria; classic “periodicity” is usually absent. Profuse sweating between febrile paroxysms.
4. Tachycardia, orthostatic hypotension, tender hepatomegaly, and delirium (Cerebral malaria).

Management:

1.  Malarone (atovaquone 250mg/proguanil 100mg) 4 tabs daily for 3 days with food **PLUS** primaquine 30mg daily for 14 days (**MUST** rule out G6PD deficiency before giving primaquine).
2.  Acetaminophen (Tylenol) 1,000mg PO q6hr PRN for fever.

DISPOSITION:

1. *Urgent* treatment and evacuation for complicated malaria (cerebral, pulmonary, unstable vital signs). These indicate a medical emergency.
2. *Routine* evacuation for uncomplicated cases (normal vital signs, normal mental status, tolerates PO, no cough/shortness of breath).

Meningitis




SPECIAL CONSIDERATIONS:

1. May be bacterial, viral, or fungal. The bacterial type may cause death in hours, even in previously healthy young adults, if not treated aggressively with appropriate antibiotics.
2. Consider malaria as a differential diagnosis. Treat for both if malaria cannot be ruled out.

Signs and Symptoms:

1. Classic features include:
 - a. Severe headache
 - b. High fever
 - c. Pain with any neck movement, particularly forward flexion (ask patient to touch his chest with his chin)
 - d. Altered mental status
2. May also include:
 - a. Photophobia
 - b. Nausea and vomiting
 - c. Malaise
 - d. Seizures
3. Positive Brudzinski's (pain with head and neck flexion) and Kernig's (neck pain with hip flexion and knee extension) signs

Management:

1. If meningitis is suspected, treatment should be initiated immediately.
2. Establish IV access.
3.  Dexamethasone (Decadron) 10mg IV/IM q6hr; first dose with or prior to antibiotic administration.
4.  Antibiotic coverage:
 - a. Ceftriaxone (Rocephin): 2g IV q12hr (IV preferred/IM if required) **OR**
 - b. Ertapenem: 1g IV q24hr (IV preferred/IM if required)
5. Treat per *Pain Management Protocol*.
6. Treat per *Nausea and Vomiting Protocol*.
7. If seizures occur, treat per *Seizure Protocol*.
8.  Moxifloxacin (Avelox) 400mg PO once.

DISPOSITION:

1. *Urgent* evacuation.

Nausea and Vomiting



SPECIAL CONSIDERATIONS:

1. Avoid rapid IV administration of promethazine (Phenergan).
2. **DO NOT** give subcutaneous promethazine (Phenergan).
3. Diphenhydramine (Benadryl) and promethazine (Phenergan) may cause drowsiness.

Signs and Symptoms:

Nausea and vomiting

Management:

1.  Ondansetron (Zofran) 4–8mg IV/IM/PO q4hr PRN.
2.  **OR** Diphenhydramine (Benadryl) 25–50mg IV/IM/PO q6hr PRN (may be useful for vertigo or motion sickness).
3. Treat per *Dehydration Protocol*.

DISPOSITION:

1. Evacuate per Protocol for underlying condition.

SPECIAL CONSIDERATIONS:



1. Any use of opiates or sedatives will degrade the mission performance of casualties.
2. Secure weapons and other controlled items (COMSEC/classified) when administering opiates or other mind-altering medications (ketamine/midazolam).
3. IM/IN absorption of opiates in trauma patients is variable – IV/IO is the preferred if available.
4. For all casualties given opioids, ketamine or benzodiazepines – monitor airway, breathing, and circulation.
5. Document a mental status exam (AVPU) prior to administration of opiates and ketamine.
6. Ensure Naloxone is available when administering opiates (0.4–2mg IV/IO/IN).

Signs and Symptoms:

Pain

Management: Start in sequential manner to maximize pain control and mission performance.

1. **Mild to Moderate Pain** (casualty still able to fight)

- a.  Acetaminophen (Tylenol) 1,000mg PO q8hr PRN
- b.  Non-steroidal anti-inflammatory drugs
 - i) Meloxicam (Mobic) 15mg PO daily PRN (CWMP) – no platelet inhibition
 - ii) **OR** ibuprofen* (Motrin) 800mg PO q8hr PRN
 - iii) **OR** ketorolac* (Toradol) 15mg IV/IM q6hr PRN

***Avoid in injuries at risk for hemorrhage due to anti-platelet activity**

2. **Moderate to Severe Pain**

a. **Hemodynamically Stable** – Oral

- i) Oxycodone/acetaminophen (5/325mg) – 1–2 pills initially, repeat doses 1 pill PO q4hr PRN.
 - 1) Used for longer term pain control (PCC/extended evacuation) if patient is stable and able to tolerate PO in order to conserve parenteral medications (eg. immobilized extremity fracture).
 - 2) Ensure that combined acetaminophen dose from all sources does not exceed 4g qd.
- ii) Transmucosal fentanyl citrate (Actiq Lozenge) 800mcg orally over 15 minutes (may repeat dose once).

WARNING Life-threatening hypoventilation/respiratory arrest could occur at any dose of Fentanyl, particularly in patients not taking chronic narcotics. Therefore, closely monitor for respiratory depression.

b. **Hemodynamically Stable** – Parenteral

- i) Hydromorphone (Dilaudid) 1mg IV/IO/IM. Subsequent doses of 0.5–1.0mg IV/IO can be given q30min PRN.
- ii) Fentanyl 50mcg IV/IO – may repeat q30min PRN.
 - 1) Intranasal – fentanyl 100mcg IN; may repeat q30min PRN.

- c. **Hemodynamically Unstable** – in hemorrhagic shock or respiratory distress or at risk to develop
 - i) Ketamine (Ketalar) 25mg IV/IO – slow push over 1 minute, may repeat q15min until pain is controlled or nystagmus occurs.
 - ii) Ketamine 50mg IM/IN – may repeat every 30 minutes until pain control or nystagmus. It is preferred to establish vascular access if able and provide repeat doses IV/IO (20mg).
- d. **Dissociative Sedation**
 - i) **Casualties may require dissociation beyond analgesia in the setting of severe injuries to ensure safety (casualty/team members), to facilitate overall mission success, or to perform an invasive procedure, secure an airway (RSI), or manage the casualty on a ventilator.**
 - ii) **SpO2 and EtCO2 should be monitored if tactically feasible. Must be prepared to manage the airway if not already secured.**
 - iii) **Vascular access (IV/IO) should be established as soon as possible following IM/IN dosing.**
 - iv) **Dosing Options:**
 - 1) Ketamine 150mg IV/IO slow IV push (1–2mg/kg) – repeat q15–30min PRN to maintain dissociation.
 - 2) Ketamine 300mg IM (2–3mg/kg) – repeat q30min PRN.
 - 3) Continuous Sedation (1–2mg/kg/hr)
 - i. Ketamine 1,000mg/250mL NS (4mg/mL) infused at 25–50mL/hr – titrated to adequate response.
 - ii. Drip concentrations can be varied to meet overall fluid requirement.
 - v) **Adverse Reactions:**
 - 1) Apnea – support breathing; typically transient and not clinically significant
 - 2) Incomplete dissociation – administer additional ketamine (50% of previous dose)
 - 3) Emergence reaction – administer midazolam (Versed®) 1–2mg IV/IO/IN
 - 4) Nausea/vomiting – ondansetron 4mg ODT/IV/IM – repeat q4hr PRN
- e. **Analgesia and sedation notes:**
 - i) Directions for administering OTFC:
 - 1) Place lozenge between the cheek and the gum.
 - 2) Do not chew the lozenge.
 - 3) 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.
 - 4) Reassess in 15 minutes.
 - 5) Add second lozenge, in other cheek, as necessary to control severe pain.
 - 6) Monitor for respiratory depression.
 - ii) Ketamine comes in different concentrations; the higher concentration option (100mg/mL) is recommended when using IN dosing route to minimize the volume administered intranasally.
 - iii) TBI and/or eye injury does not preclude the use of ketamine. However, use caution with OTFC, IV fentanyl, ketamine, or midazolam in TBI patients as this may make it difficult to perform a neurologic exam or determine if the casualty is decompensating.
 - iv) 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 a narcotic. IV ketamine should be given over 1 minute.

- v) The use routine of benzodiazepines such as midazolam is NOT recommended for analgesia. When performing procedural sedation, benzodiazepines may also be considered to treat behavioral disturbances or unpleasant (emergence) reactions. Benzodiazepines should not be used prophylactically and are not commonly needed when the correct pain or sedation dose of ketamine is used.
- vi) Polypharmacy is not recommended; benzodiazepines should NOT be used in conjunction with opioid analgesia.

Pneumothorax – Acute (Atraumatic)

SPECIAL CONSIDERATIONS:

1. Consider also: anaphylaxis, pulmonary embolism, high altitude pulmonary edema (HAPE), asthma, myocardial infarction and pneumonia.
2. More common in tall, thin individuals and smokers.

Signs and Symptoms:

1. Acute, unilateral chest pain
2. Dyspnea – typically mild
3. No wheezing
4. Decreased or absent breath sounds on affected side

Management:

1. Pulse oximetry monitoring
2. Oxygen (use oxygen for all suspected acute pneumothoraces)
3. Consider needle decompression for suspected tension pneumothorax or symptomatic pneumothorax.
4. If needle decompression shows immediate patient improvement, followed by worsening of condition, consider repeat needle decompression.
5. Use tube thoracostomy:
 - a. Recurrence of respiratory distress after 2 successful needle decompressions
 - b. Evacuation time >1 hour with continued respiratory distress
 - c. Patient requires positive pressure ventilation
6. If at altitude, descend as far as tactically feasible
7. If evacuation will occur in an unpressurized aircraft, consider decompression for high altitude evacuation and recommend lowest tactically feasible altitude.
8. Treat per *Pain Management Protocol*

DISPOSITION:

1. *Urgent* evacuation for respiratory failure and respiratory distress despite therapy.
2. *Priority* evacuation for patients whose respiratory status is stable.

Rhabdomyolysis Protocol


SPECIAL CONSIDERATIONS:

1. Aggressive hydration is the cornerstone of treatment.
2. Causes: Limb ischemia, carbon monoxide poisoning, electrical or thermal burns, blunt trauma or crush injury, snake bite, hyperthermia, hypothermia, excessive physical exertion.

Signs and Symptoms:

1. Acute muscle pain (myalgias)
2. Muscle weakness, fever, malaise, nausea, vomiting
3. Tea-colored urine
4. Oliguria/anuria

Management:

1. Normal saline 1–2L bolus IV/IO followed by 500mL – 1L/hr
 - a. Avoid Ringer's lactate due to the potassium content
 - b. **Titrate to achieve target urine output of >200mL/hr**
 - c. Monitor intake/output hourly. Consider Foley catheter to aid measuring output
2. Reassess vital signs and mental status frequently
3. Utilize cardiac monitoring if available
4. Potential Problems/Complications
 - a.  Monitor for signs and symptoms of hyperkalemia (cardiac dysrhythmia, peaked T waves) – administer 1g calcium and 40mEq sodium bicarbonate (1 ampule) IV/IO.
 - b. Persistent oliguria despite adequate fluid resuscitation
 - c. Avoid Lasix
 - d. Compartment syndrome – see *Prolonged Field Care/Extended Care TTP*

DISPOSITION:

1. *Urgent* evacuation.

Seizure



SPECIAL CONSIDERATIONS:

1. May be caused by head injury, infection, high fever, alcohol withdrawal, drug use, toxins, and structural abnormalities of the central nervous system (CNS).
2. Possible history of previous seizures, recent head trauma, CNS infection, or headaches.

Signs and Symptoms:

1. Involuntary repetitive muscle movements that are abrupt in onset
2. Associated unresponsiveness
3. Typically lasts 90–120 seconds
4. Followed by period of confusion and somnolence (postictal state)
5. Evidence of recent seizure activity may include urinary incontinence and acute intraoral trauma (e.g., tongue biting)

Management:

1. Avoid trauma to patient during the seizure, but do not restrain patient
2.  Midazolam (Versed) 5mg IV/IO q5min or 5–10mg IM/IN q15min (no maximum dose) – IV/IO preferred if able to establish it
3.  Levetiracetam (Keppra) 20mg/kg IV should be administered if continued or recurrent seizure following first dose of Versed
4. Do not attempt to force an object into the mouth to open airway
5. Support and maintain airway and ventilation as needed to include SpO₂
6. If seizures are accompanied by fever:
 - a. Consider meningitis and treat per *Meningitis Protocol*
 - b. Consider malaria if in malaria endemic area and treat per *Malaria Protocol*
7. Utilize Glucometer and administer glucose (or gel) for hypoglycemia

DISPOSITION:

1. *Urgent* evacuation.

Sepsis/Septic Shock



SPECIAL CONSIDERATIONS:

1. Sepsis is a severe, life-threatening, systemic inflammatory response secondary to a serious bacterial infection.
2. Rapid onset – death may occur within 4–6 hours without antibiotic therapy.

Signs and Symptoms:

1. Hypotension
2. Fever
3. Tachycardia
4. Altered mental status
5. Dyspnea
6. May see skin rash
7. History or source of infection – bug bite, cough, SOB, urinary symptoms, etc.

Management:

1. Reach out to medical control early due to complexity/severity of condition.
2. Obtain IV/IO access.
3.  Ertapenem 1g IV/IO daily.
4. If patient is hypotensive, give 30mL/kg normal saline or Ringers lactate fluid bolus. Consider additional fluids if still hypotensive, then an additional liter titrated to maintain systolic blood pressure >90mmHg or palpable radial pulse.
5.  Consider initiating an epinephrine infusion for persistent hypotension after 3–4L (30mL/kg) fluid bolus, place epinephrine 1mg (1:1000) into 500mL NS (2mcg/mL) and administer 2–10mL/min (4–20mcg/min).
6. Place Foley catheter and monitor urine output.
7. Monitor for decreased mental status and be prepared to manage airway. Sedation and positive pressure ventilation will potentiate hypotension. Ensure continued aggressive fluid resuscitation.

DISPOSITION:

1. *Urgent* evacuation.

Smoke Inhalation


SPECIAL CONSIDERATIONS:

1. Consider possible carbon monoxide (CO) poisoning and need for hyperbaric oxygen in all significant cases of smoke inhalation.
2. Normal oxygen saturation by pulse oximetry DOES NOT rule out CO poisoning.
3. Burns to the upper airway may not be immediately obvious. Strong consideration should be given to early airway intervention if upper airway burns are suspected.

Signs and Symptoms:

1. History of smoke exposure
2. Burns-Coughing-Respiratory distress (may be delayed in onset)

Management:

1. Administer oxygen.
2. Constant monitoring for airway and respiratory status.
3. Intubate for stridor or respiratory distress, use surgical airway if laryngeal edema is seen with the laryngoscope or 2 failed attempts.
4.  Albuterol (Ventolin) by metered dose inhaler 2–4 puffs q4–6hr.
5. Limit patient exertion if possible.

DISPOSITION:

1. *Urgent* evacuation for respiratory distress, suspected inhalation burns.
2. *Priority* evacuation if not in distress but significant inhalation suspected.

Subungual Hematoma


SPECIAL CONSIDERATIONS:

1. None

Signs and Symptoms:

1. Pain from the affected nail
2. Purplish-black discoloration under the nail

Management:

1. If there is severe pain – decompress the nail with a large gauge needle by rotating needle through the nail directly over the discolored area until the underlying blood has been released and the pressure is relieved. Make sure that it is introduced into the affected nail with a gentle but sustained rotating motion. Some people heat the needle tip first to sterilize and ease the puncture.
2. Gentle pressure on the affected nail may help to evacuate more blood.
3. Treat per *Pain Management Protocol*.
4. If a fracture is suspected, tape the injured finger or toe to an adjacent digit.
5.  If fracture is suspected in a setting of a subungual hematoma, give Moxifloxacin (Avelox) 400mg PO daily for 7 days.

DISPOSITION:

1. Evacuation should not be required for this injury if the subungual hematoma is successfully treated.



SPECIAL CONSIDERATIONS:


1. The primary concern in testicular pain is differentiating testicular torsion from other causes of testicular pain.
2. Testicular torsion is an medical emergency requiring urgent correction to prevent loss of the affected testicle.
3. Other common causes of testicular pain include epididymitis and orchitis, infections commonly caused by STIs, as well as hernias and testicular masses.

Signs and Symptoms:

1. Testicular Torsion:
 - a. Sudden onset testicular pain
 - b. Usually associated with activity
 - c. Associated testicular swelling
 - d. Abnormal position of the affected testicle
 - e. Absent cremasteric reflex
 - f. Symptoms not relieved by testicular elevation
 - g. Usually associated with pain induced nausea and vomiting
2. Epididymitis:
 - a. Gradual onset of worsening pain
 - b. May have fever and/or dysuria
 - c. Can also be traumatic
 - d. Symptoms may be relieved with elevation
 - e. Significant swelling may be present

Management:

1. If pain is sudden onset and the testicle is lying abnormally in the scrotum, an attempt to manually turn the testicle is warranted.
 - a. A single attempt to rotate the testicle outward (like opening the pages of a book) should be made.
 - i) With torsion of the left testis, hold the testicle with the right thumb and forefinger and then rotate the testicle *clockwise* 180°. This manipulation may need to be repeated 2–3 times, because testicular torsion may involve rotations of 180°–720°. These repeated attempts should be guided by resolution of pain and return to normal anatomy.
 - ii) For torsion of the right testicle, the procedure is similar except that the testicle is held using the left thumb and forefinger and the testicle is rotated in a *counterclockwise* direction.
 - b. If pain increases, 1 attempt to rotate the opposite direction should be made.
 - c. Successful correction will result in relief of pain.
2. Suspect **Urinary Tract** Infection if:
 - a. Gradual onset of pain with a normal lying testicle
 - b. Dysuria-painful urination
 - c. Urinary urgency and frequency
 - d. Cloudy, malodorous, or dark urine may be present

- e. Suprapubic (bladder) discomfort
 - f. Manage with antibiotics (preferably ceftriaxone (Rocephin) 1g IV/IM if available, followed by azithromycin 1g PO once if available), otherwise use moxifloxacin.
3. Treat per *Pain Management Protocol*
 4. Treat per *Nausea and Vomiting Protocol*
 5. If torsion is not present, treat as presumed STI. Consider the following antibiotics if available.
 - a.  Ceftraxone (Rocephin) 250mg IM **OR** ciprofloxacin (Cipro) 500mg PO.

DISPOSITION:

1. *Urgent* evacuation for testicular torsion even if manually relieved with detorsion.
2. For other causes of testicular pain, treat cause and consider evacuation if symptoms persist more than 3 days, and if the patient is operationally compromised.

9. Pararescue Drug Formulary

Drug Formulary Guidelines and Considerations

The keys to safe drug utilization are caution and attention to detail. Familiarity with adverse drug effects and being prepared to deal with those effects are paramount to safe drug use. The following Formulary is for all Pararescuemen regardless of MAJCOM, *additional medications* may be authorized if coordinated through USAF Pararescue Medical Director, MOAB, and documented in Memorandum format through applicable MAJCOM SGP, or equivalent.

Management of Controlled Substances PJs will:

- Sign out controlled substances for requisite alert status, training, Temporary Duty (TDY), deployment, or mission, and sign in controlled substances to the medical materiel section when no longer required.
- Be responsible and accountable for the security and safeguard of all issued medications and controlled substances.
- Inspect and rotate medications prior to expiration date and turn in expired medications to the medical logistics section for disposal.
- Inspect controlled substances for adequate quality and quantity whenever they are signed out and/or prior to assumption of alert duty.
- Report type and quantity to Medical Logistics NCOIC within 12 hours when medications are used.

NOTE: In the event of ongoing operations, every effort will be made to report use within 12 hours of mission completion. Prescribed controlled substances must be documented in either the SF 600, Chronological Record of Medical Care, or the Consolidated Mission Report and must be reported to the unit's medical logistics upon return.

- Inspect controlled substances for adequate quality and quantity prior to turn in. If discrepancies are noted, report them to the controlled medical item custodian (CMIC).
 - During TDY or deployments, controlled substances will be safeguarded using the following procedures:
 - At a TDY or deployed location, medications should be stored double-locked in a secure area with 24-hour access (alert facility/rescue coordination center, MTF, security forces, etc.).
 - In the absence of an approved safe, vault, or secure storage area, controlled substances will be maintained on the individual.
 - Controlled substances may be stored on board mission aircraft if they are in a hi-valued bin or placed in a standard weapons storage container when the container is used solely for medication storage. Storage containers must be secured to a floor tie down ring and the container hasp must be secured with a combination lock.
- NOTE:** When required, the combination should only be given to the aircraft commander.
- Access to the controlled substance bin must be authorized by the PJ team leader or team member who signed for the controlled substances being stored.
 - A daily inspection of the controlled substances stored on any aircraft is required. Loss or theft at a TDY or deployment location will be immediately reported to the commander of the storage facility and to the home station squadron commander with an immediate investigation initiation.

Transportation of Controlled Substances:

- Include a statement authorizing personnel to carry professional gear, e.g., medical kits containing various medications including controlled substances, in the remarks section of administrative orders.
- It is best to list an inventory of specific medications actually transported. If this is not possible, list “Narcotics Courier” on the orders of all personnel potentially able to carry controlled substances. Also note that some countries are concerned about illegally manufactured drugs from over-the-counter medications (e.g., Sudafed).

Destruction of Controlled Substances:

- Two disinterested individuals of equal or greater rank will witness the destruction. The following witness statement will be placed on the controlled substance registrat (AF 579) and signed by the PJ and two witnesses: “I have witnessed on this date the destruction of the materiel described on this document, in the quantity and manner indicated.”
- Material will be destroyed in a manner that precludes the re-use of any portion of the item for any purpose. Items such as needles and syringes must be unrecognizable as well as unusable.

The following factors can influence the therapeutic effects of medications:

- Age
- Body Weight
- Sex
- Route of administration
- Time of administration
- Rate of inactivation and excretion
- Tolerance
- Pathological state – poor perfusion, hypothermia
- Genetic factors
- Drug interaction

Allergy and Hypersensitivity:

Hypersensitivity reactions can vary in presentation. Antibiotics are the most common cause; however, any medication may be at fault. Allergic reaction to any antigen, e.g., snake envenomation, insect stings, pollens, etc., can cause similar symptoms.

Reactions may include, but are not limited to:

- Allergic rhinitis, reactive airway/asthma or profound hypotension
- Local reactions may include GI distress (nausea, vomiting, cramps, and diarrhea) and/or dermal presentation (pruritic (itchy) skin, urticaria (hives), local rash.
- Life threatening reactions (**anaphylaxis**) can occur within minutes and may include:
 - Tightness in the chest and wheezing
 - Skin changes: diffuse redness, hives and flushing
 - Angioedema or red, swelling of the face
 - Rapidly progressive respiratory distress due to laryngeal edema, bronchospasm and fluid accumulation in the lungs
 - Hypotension/overt signs of shock

Observe the Following:

- Medications are not always indicated. Weigh the benefits against the potential adverse effects to patient and mission.
- All medications have the potential for adverse effects and many patients have a history of adverse reactions to medications. For conscious patients, obtain a drug history; for unconscious patients, search for identification/medical warning tags/bracelets.
- Follow recommended doses.
- When using IV medication, have a reliable IV fluid line running and inject the medication into the rubber fitting in the IV line.
- When injecting through a saline lock, flush the lock with 10mL of normal saline after administering the medication.
- In addition to medication, the patient may require maintenance fluids, electrolytes, and nutritional balance.
- For pain meds and sedatives use incremental increase in doses to achieve the desired effect to avoid hypotension and respiratory depression when the situation permits.
- Give all IV medications by slow IV push.
- Give ertapenem by IV drip over 10 minutes, IV push from a 10mL syringe at rate of 1mL/on the minute over 10 minutes, or IM with 2mL lidocaine if responsive to pain.
- For medications that come in oral preparations, give them orally if the patient is alert and can swallow.

General Rules

CAUTION: Be prepared for anaphylactic reactions at all times; follow Anaphylaxis Protocol.

1. Use sterile technique: Alcohol cleaning of injection port or skin.
2. Always aspirate before injecting medication to make sure the needle is not intravascular if IM, or to insure proper placement in a vein for IV medication.
3. For IVs: Mark on tape the date, time, and needle size.

Routes of Administration:

1. Oral:

Give adequate fluids. Preferred route if med is available PO and patient is conscious, can swallow without choking/gagging, and does not have abdominal trauma.

2. Subcutaneous (SQ or SubQ) injection:

Gently grasp skin over injection site and pull skin away from underlying muscle, forming a mound. Insert the needle at a 45° angle. Aspirate before injection.

3. Intramuscular (IM) injection:

Hold needle at 90° to the skin, insert deep into the muscle, aspirate to make sure the needle is not intravascular, and inject.

Avoid when able in patients with low blood pressure/shock due to variable absorption. However, immediately battlefield post injury it is often appropriate to give an IM injection of ketamine for patients with severe pain, if a fentanyl lozenge appears inadequate.

4. Intravenous (IV) injection:

Inject slowly into the tubing of an actively running, reliable IV. It's acceptable to infuse one IV into another ("piggy back") if the substances (medications, fluids, blood products) are compatible. IV injection through the port of a saline lock should be followed by a saline flush of 5–10mL.

5. Intraosseous (IO) injection:

Reference Surgical and Medical Procedures chapter for intraosseous injection TTPs.

6. Intranasal (IN):

Intranasal typically absorbs more efficiently and quicker than IM and transmucosally and should be considered if IV/IO is not available or desired. IN administration is limited in scope by the maximum volume of the drug that can be pushed at one time: **2mL max (1mL per nostril)**. This limits medication delivery to only high concentration drugs such as:

- Ketamine
- Fentanyl
- Versed
- Narcan
- Toradol
- Zofran
- Benadryl
- Dexamethasone
- Pepcid

Other routes of administration may include:

- Endotracheal (e.g., via ETT – NAVEL meds)
- Transdermal
- Transmucosal (e.g., OTFC – oral transmucosal fentanyl citrate)
- Ocular instillation (e.g., drops or ointment)
- Rectal (e.g., suppositories)

Brand Name to Generic Quick Reference

NOTE: All drugs in the PJ Med Handbook formulary are listed alphabetically by their generic name. Reference the conversion guide below for common brand to generic name assistance.

Adenocard = adenosine

Afrin = oxymetazoline

Augmentin = amoxicillin/
clavulanic acid

Avelox = moxifloxacin

Benadryl = diphenhydramine

Cipro = ciprofloxacin

Cortaid = 1% hydrocortisone
cream

Decadron = dexamethasone

Diamox = acetazolamide

Dilaudid = hydromorphone

Doxy = doxycycline

Flagyl = metronidazole

Imodium = loperamide

Invanz = ertapenem

Keppra = levetiracetam

Ketalar = ketamine

Malarone = atovaquone
250mg/proguanil 100mg

Mobic = meloxicam

Motrin = ibuprofen

Narcan = naloxone

Pepcid = famotidine

Sudafed = pseudoephedrine

Toradol = ketorolac

Tylenol = acetaminophen


Versed = midazolam

Verticalm = meclizine

Zithromax, Z-Pak =
azithromycin

Zofran = ondansetron

Acetaminophen – PO (Tylenol®), IV (Ofirmev®)

- **Description:** non-narcotic analgesic and antipyretic, blocks generation of pain impulses in the CNS by preventing sensitization of pain receptors
- **Indications:** mild pain or fever, febrile reactions from blood transfusions
- **Dose:** 325–650mg PO q4–6hr; or 1g PO/IV q6–8hr
-  **Contraindications:** Individuals with hypersensitivity to drug or chronic liver damage. Caution in use with patients diagnosed with a history of excess alcohol use.
- **Side-effects:** rash, urticaria
- **Adverse reactions:** hemolytic anemia, liver damage


Acetazolamide (Diamox)



GROUNDING medication for personnel on flight status



Waiver: If approved by MAJCOM protocol – Combat Rescue Officers, Pararescue, Combat Control, and TAC-P are waived (No DNIF) upon completion of 3 day ground test.

- **Description:** non-diuretic antihypertensive (carbonic anhydrase inhibitor)
- **Indications:** Prevention and/or amelioration of symptoms associated with acute mountain sickness in climbers attempting rapid ascent and/or those who are very susceptible to acute mountain sickness despite gradual ascent. For maximum benefit begin regimen 7 days prior to ascent. Of minimal benefit in Rx of AMS, HACE, or HAPE. Treatment of acute high altitude illness.
- **Dose (Human):**
 - 125mg bid: prevention of Acute Mountain Sickness, 24 hours prior to ascent, continuing for 48 hours after ascent. Prevention and/or amelioration benefits are nominal once ascent has commenced. If the 500mg sustained release tablet is used, dose is 500mg q24hr.
 - 250mg bid: treatment of existing Acute Mountain Sickness
-  **K9 dose:** 250mg bid 24 hours prior to ascent, continuing for 48 hours after ascent. If the 500mg sustained release tablet is used, dose is 500mg q24hr.




- **Contraindications:** sulfa allergy, pregnancy
- **Side-effects:** paresthesias in extremities (very common in fingers/toes); hearing dysfunction/tinnitus; loss of appetite; taste alterations; polyuria; drowsiness; confusion; increased fluid intake is required with use of diamox: although diamox is not in the general drug class of “diuretics”; it has diuretic effects and can result in serious dehydration unless great care is taken to maintain proper hydration.
- **Adverse reactions:** transient myopia; urticaria; melena; photosensitivity; convulsions

Adenosine (Adenocard)



GROUNDING medication for personnel on flight status.


- **Description:** antiarrhythmic agent
- **Indications:** Used to convert PSVT, WILL NOT convert atrial flutter, atrial fibrillation, or VT.
- **Adult dose:** 6mg rapid IV bolus (1–3 sec) followed by 10mL flush. Two additional doses of 12mg can be administered following the same rapid push sequence.
- **Pediatric dose:** 0.1–0.2mg/kg IV rapid push, if IO up to 6mg
-  **Contraindications:** 2nd/3rd degree AV block, sick sinus syndrome, pregnancy

- **Side-effects:** transient dysrhythmias, syncope, flushing, dyspnea, chest pressure, hypotension, headache, bronchospasm
- **Adverse reactions:** adenosine is blocked by methylxanthines; adenosine is potentiated by dipyridamole and carbamazepine

Albuterol Inhaler (Ventolin®, Proventil®)



Aviation personnel are **grounded** until medical condition no longer interferes with safely performing aviation duties and the patient is free of side-effects.

- **Description:** inhaled beta-adrenergic agonist; relaxes bronchial smooth muscle
- **Indications:** relief of bronchospasm including asthma, anaphylaxis; prevention/treatment of exercise-induced bronchospasm; smoke inhalation with wheezing and shortness of breath; as an adjunct in the management of CRUSH syndrome to manage hyperkalemia; as an adjunct for the management of HAPE (works best with a spacer).
- **Adult dose:** 2 inhalations q4–6hr; May be used more frequently in acute need
- **Pediatric dose:** If >4yrs old, 1 inhalation q4–6hr may be sufficient
-  **Contraindications:** known hypersensitivity to albuterol, pregnancy
- **Side-effects:** tremor; nausea; nervousness; palpitations
- **Adverse reactions:** hypertension; angina; vertigo

Amoxicillin/Clavulanic Acid (Augmentin®)



Aviation personnel are grounded for the initial 24 hours of antibiotic therapy and until the medical condition no longer interferes with safely performing aviation duties and the patient is free of side-effects.

- **Description:** Oral antibacterial combination consisting of the semisynthetic antibiotic amoxicillin and the β -lactamase inhibitor, clavulanate potassium (the potassium salt of clavulanic acid)
- **Indications:** lower respiratory tract infections, otitis media, sinusitis, skin and skin structure infections, urinary tract infections
- **Adult Dose:** The usual adult dose is one 875mg tablet q12hr
- **Pediatric Dose:** 30mg/kg/day in divided doses (q8–12hr) produces less nausea and diarrhea and is effective for most infections
 - Pediatric patients weighing 40kg or more should be dosed according to the adult recommendations




Contraindications: Hypersensitivity to penicillin, history of liver failure



SERIOUS AND OCCASIONALLY FATAL HYPERSENSITIVITY (ANAPHYLACTIC) REACTIONS CAN OCCUR IN INDIVIDUALS WITH A HISTORY OF PENICILLIN HYPERSENSITIVITY

- **Side-effects:** The majority of side-effects observed in clinical trials were of a mild and transient nature but can include: diarrhea/loose stools, nausea, skin rashes and urticarial, vomiting, vaginitis
- **Adverse Reactions:** hypersensitivity reactions, hepatic dysfunction, blood and lymphatic dysfunction (likely hypersensitivity-related)



Aspirin (ASA)

- **Description:** analgesic, antipyretic, anti-inflammatory, anti-platelet effect
- **Indications:** myocardial infarction treatment; transient ischemic attacks, blood clot, prevention of blood clots for patients immobilized for greater than 24 hours (per medical control only)
- **Adult dose:** 325mg × 2q3–4hr
-  **Contraindications:** hypersensitivity to aspirin or other NSAIDs, history of gastrointestinal bleeding, patients with bleeding disorders (e.g., hemophilia), patient age <16 years old, pregnancy
- **Side-effects:** gastrointestinal symptoms including pain and bleeding
- **Adverse reactions:** interacts with NSAIDs, coumadin, heparin

Atovaquone 250mg/Proguanil 100mg (Malarone®)



GROUNDING medication for personnel on flight status

- **Description:** Antimalarial
- **Indications:** prophylaxis and treatment of *Plasmodium falciparum* malaria
- **Adult Dose:**
 -  There are pediatric tablets as well as adult tablets
 - Prophylaxis:
 - Start treatment 1 or 2 days prior to entering malaria endemic area and continue daily during the stay and for 7 days after return
 - 1 tablet (adult strength) daily
 - Treatment:
 - 4 tablets (adult strength; total daily dose atovaquone 1g/400mg proguanil) as a single daily dose for 3 consecutive days
- **Pediatric Dose:**
 -  There are pediatric tablets as well as adult tablets
 - Tablets may be crushed and mixed with condensed milk just prior to administration for those having difficulty in swallowing tablets
 - Prophylaxis dosing based on body weight:
 - Safety and efficacy for prophylaxis have been established for children >11kg
 - Treatment dosing based on body weight:
 - Safety and efficacy for treatment have been established for children >5kg

Dosage of atovaquone/proguanil in prevention of malaria in pediatric patients

Weight (kg)	Total daily dose	Dosage regimen
11 to 20	62.5mg/25mg	1 pediatric tablet daily
21 to 30	125mg/50mg	2 pediatric tablets as a single daily dose
31 to 40	187.5mg/75mg	3 pediatric tablets as a single daily dose
>40	250mg/100mg	1 tablet (adult strength) as a single daily dose

Dosage of atovaquone/proguanil in treatment of malaria in pediatric patients		
Weight (kg)	Total daily dose	Dosage regimen
5 to 8	125mg/50mg	2 tablets (pediatric strength) daily for 3 consecutive days
9 to 10	187.5mg/75mg	3 tablets (pediatric strength) daily for 3 consecutive days
11 to 20	250mg/100mg	1 tablet (adult strength) daily for 3 consecutive days
21 to 30	500mg/200mg	2 tablets (adult strength) as single daily
31 to 40	750mg/300mg	3 tablets (adult strength) as single daily dose for 3 consecutive days
>40	1g/400mg	4 tablets (adult strength) as single daily dose for 3 consecutive days



Contraindications: hypersensitivity to atovaquone, proguanil, prophylaxis in patients with severe renal impairment (CrCl <30mL/min) unless potential benefits outweigh risks of non-treatment (proguanil accumulates in severe renal failure)

- **Side-effects:** headache, abdominal pain, nausea/vomiting/diarrhea, dizziness, cough (pediatrics)
- **Adverse reactions:** liver transaminase elevations, possible association with seizures and psychotic events (e.g., hallucinations), cutaneous reactions, including photosensitivity, erythema multiforme and Stevens-Johnson syndrome
- **Other notes:**
 - Take daily dose at the same time every day with food or milk
 - If vomiting occurs within 1 hour of dosing, repeat the dose
 - Treatment has not been evaluated for treatment of cerebral malaria or other severe manifestations of complicated malaria
 - Absorption may be reduced in patients with diarrhea or vomiting. May need to add anti-emetic to prevent vomiting.
 - Include protective clothing, insect repellants, bed nets as important components of malaria prophylaxis
 - If a dose is skipped, take it as soon as possible, and then return to normal schedule. Do not double the next dose.

Atropine Sulfate



GROUNDING medication for personnel on flight status

- **Description:** vagolytic
- **Indications:** symptomatic bradycardia; initial therapy for patients with symptomatic bradycardia; Nerve Agent Antidote (positive SLUDGE signs/symptoms post chemical attack)
- **Adult dose:**
 - **Bradycardia:** 0.5–1.0mg IV q5min until desired response is achieved; 3mg max
 - **Nerve Agent:** mild symptoms – 2mg IM, repeat as needed q10min
Severe Symptoms – 6mg IM initial dose, repeat doses of 2mg q5min during resuscitation for max of 20mg
- **Pediatric dose:** 0.015mg/kg up to a max dose of 0.04mg/kg



Contraindications: atrial fibrillation, atrial flutter, glaucoma; use extreme caution in patients with Type II AV block and in 3rd degree block, pregnancy

- **Side-effects:** dilated pupils, increase heart rate, ventricular tachycardia, ventricular fibrillation, dry mouth
- **Adverse reactions:** hypotension, CNS anticholinergic effects

Azithromycin (Zithromax®, Z-Pak®)



Aviation personnel are grounded for the initial 24 hours of antibiotic therapy and until the medical condition no longer interferes with safely performing aviation duties and the patient is free of side-effects.

- **Description:** Macrolide antibiotic
- **Indications:** acute bacterial sinusitis, mild community-acquired pneumonia, chancroid (Genital ulcer disease), pharyngitis/tonsillitis as alternative drug choice to first line therapy, uncomplicated skin infections, urethritis.
- **Adult Dose:**
 - For most bacterial infections: 500mg as single dose on day 1, then 250mg daily on days 2 through 5.
 - For gonorrhea: 2g PO as a single dose
- **Pediatric Dose:** (6 months of age or older)
 - Z-Pak® is not indicated for children. The oral suspension is the only dose approved for use in children, and is dosed on a mg/kg basis.
 - 10mg/kg up to 500mg the first day; then 5mg/kg up to 250mg for the next 4 days



Contraindications: known allergy to azithromycin, pregnancy, Z-pak® in children, patients receiving:

- Astemizole (Hismanal®) - antihistamine taken off of the U.S. market)
- Cisapride (Propulsid®) - GI medication taken off of the U.S. market)
- **Side-effects:** nausea, vomiting, diarrhea, abdominal pain
 - Generally mild and reversible upon discontinuation of therapy
- **Adverse Reactions:** Hypersensitivity
 - Rare: Angioedema (swelling of the larynx), Cholestatic jaundice
- **Other Notes:**
 - Can be taken with or without food
 - Continue regimen for duration of prescription

Calcium Gluconate



GROUNDING medication for Army personnel on flight status

- **Description:** Calcium salt
- **Action:** Increased calcium levels; has a role in the release of neurotransmitters and hormones; increased cardiac contractile state; may increase ventricular automaticity
- **Indications:** Acute hypocalcemia (possible complication from a fresh whole blood transfusion bag not fully filled); acute hyperkalemia (CRUSH syndrome, rhabdomyolysis, kidney failure in patients not receiving dialysis in time); calcium channel-blocker overdose.
- **Dose:** 1g (10mL of a 10% solution); 2.25–14mEq IV repeated in 1 to 2 minutes



Contraindications: hypercalcemia

- **Side-effects/precautions:** extravasation may cause tissue damage and necrosis; rapid injection may cause vasodilation, hypotension, bradycardia, cardiac dysrhythmia, syncope, and cardiac arrest.

Ciprofloxacin (Cipro®)



Aviation personnel are grounded for the initial 24 hours of antibiotic therapy and until the medical condition no longer interferes with safely performing aviation duties and the patient is free of side-effects.

- **Description:** 2nd generation gram negative antimicrobial – antibiotic; quinolone
- **Indications:** infections of lower respiratory tract, skin and skin structures, bone and joints, GI tract, urinary tract and prostate; nosocomial pneumonia; acute sinusitis; post-exposure prophylaxis for anthrax
- **Adult Dose:** 250–750mg PO bid or 200-400mg IV q8–12hr

Note: Not first line treatment



- **Contraindications:** quinolone hypersensitivity, syphilis, viral infection, tendon inflammation, tendon pain
- **Side-effects:** nausea, vomiting, diarrhea, cramps, gas
- **Adverse Reactions:** pseudomembranous colitis, tendon rupture, headache vertigo, malaise, peripheral neuropathy, seizures
- **Other Notes:**
 - May increase theophylline levels; antacids, sulcralfate, iron decreases absorption; may increase PT for patients on warfarin; may cause false positive on opiate screening tests

Dexamethasone (Decadron®)



GROUNDING medication for personnel on flight status

- **Description:** parenteral steroid (glucocorticoid)
- **Indications:** emergency treatment of AMS, HACE, when tactical conditions preclude descent or acclimatization; inflammatory conditions; allergic conditions and anaphylaxis
- **Dose (Human):** AMS 4mg PO q6hr, HACE 8mg IV/IM, then 4mg IV/IM q6hr, anaphylaxis 10mg IV/IM



- **K9 dose:** 4mg IV/IM/PO q6hr
- **Contraindications:** pregnancy, caution in patients with a Hx of: diabetes, hypertension, ulcers
- **Side-effects:** edema
- **Adverse effects usually dose related:** psychotic behavior, congestive heart failure; hypertension; hypokalemia; hyperglycemia

Diphenhydramine HCl (Benadryl®)



GROUNDING medication for personnel on flight status

- **Description:** antihistamine; prevents (but does not reverse) histamine-mediated responses, H1 blocker
- **Indications:** allergic symptoms and/or allergic reactions, sleeping aid in non-aircrew members
- **Adult dose:** 25–50mg IM/IV/PO q6hr; max dose 400mg/day
- **Pediatric dose:** (Children <12 years): 5mg/kg/day in divided doses qid PO/IM/IV



Contraindications: asthma, pregnant or lactating females, pregnancy

- **Side-effects:** sedation, blurred vision
- **Adverse reactions:** insomnia, vertigo, palpitations, dry mouth, constipation, dysuria, urine retention

Doxycycline (Doxy®)



WARNING Aviation personnel are grounded for the initial 24 hours of antibiotic therapy and until the medical condition no longer interferes with safely performing aviation duties and the patient is free of side-effects.

- **Description:** antimicrobial – antibiotic; tetracycline
- **Indications:** suppression and chemoprophylaxis of chloroquine-resistant malaria, short term prophylaxis and treatment of traveler's diarrhea caused by enterotoxigenic strains of *Escherichia Coli*, chlamydial and mycoplasmal infections, gonorrhea, syphilis in penicillin-allergic patients, rickettsial diseases, acute exacerbations of chronic bronchitis, treatment of acne
- **Adult Dose:**
 - As antimalarial: 100mg PO qd starting 1–2 days prior to 4 weeks after exposure
 - As antimicrobial: 100mg PO q12h on day 1, then 100mg qd
 - For traveler's diarrhea: 100mg PO qd during risk period
 - For gonorrhea: 200mg PO immediately, followed by 100mg bid × 3 days
 - For syphilis: 100mg PO tid x 10 days
 - For acne: 100mg PO qd-bid



Contraindications: tetracycline hypersensitivity, use during period of tooth development including last half of pregnancy (causes permanent yellow discoloration of teeth, enamel hypoplasia and retardation of bone growth)

- **Side-effects:** nausea, vomiting, diarrhea, anorexia
- **Adverse Reactions:** interference with color vision, enterocolitis, esophageal irritation, rashes, photosensitivity reaction, superinfections
- **Other Notes:**
 - Antacids (Pepto Bismol, Kaopectate, Mylanta, etc.), iron preparation, calcium, magnesium, zinc, kaolin-pectin and sodium bicarbonate can significantly decrease absorption
 - Effects of both doxycycline and desmopressin antagonized
 - Increases digoxin absorption and risk of toxicity
 - Methoxyflurane increases risk of renal failure

Epinephrine



WARNING **GROUNDING** medication for personnel on flight status

- **Description:** alpha and beta adrenergic sympathomimetic
- **Indications:** anaphylaxis, asthma, pressor for distributive shock not responding to fluids, ACLS
- **Adult dose (Epinephrine):**
 - 0.3–0.5mg (0.3–0.5mL of 1:1,000 dilution) IM
 - ACLS: 1mg (1:10,000)
 - Infusion: 1mg (1:1000 or 1:10,000) placed in 500mL NS (2mcg/mL) and administered at 2–10mL/min for septic/neurogenic/cardiogenic shock
- **Pediatric dose:** 0.01mg/kg SQ/IM. Not to exceed 0.5mg



Contraindications: Use caution in patients with a history of heart disease or over the age of 40. Do not inject epinephrine (or solutions containing Epi) into/near the fingers, toes, nose, ears or penis. Intense vasoconstriction may cause necrosis. Pregnancy.

- **Side-effects:** cardiac arrhythmias, angina, hypertension
- **Adverse reactions:** uncontrolled effects on myocardium and arterial system

Ertapenem IV (Invanz®)



WARNING Aviation personnel are **grounded** for the initial 24 hours of antibiotic therapy and until the medical condition no longer interferes with safely performing aviation duties and the patient is free of side-effects.

- **Description:** carbapenem antibiotic
- **Indications:** drug of choice for all significant open wounds, complicated intra-abdominal infections, complicated skin infections, pneumonia, complicated UTI, including pyelonephritis
- **Adult dose:** 1g IV/IM
 - For IV administration: Reconstitute with 10mL of .9% NS and infuse over 10 minutes in 100mL NS, or slow IV push in 1mL bumps over 10min (1mL/min, in 10mL syringe with 1g ertapenem).
 - For IM administration only: Reconstitute 1g vial of ertapenem with 3.2mL of 1% lidocaine (without Epi), shake. Administer by deep IM injection into large muscle mass (e.g., glute or lateral thigh).



Pediatric dose: 30mg/kg/day in 2 divided doses

Contraindications: hypersensitivity to ertapenem or other carbapenems, penicillin allergy with documented severe reaction to PCN

- **Side-effects:** infused vein phlebitis/thrombophlebitis
- **Adverse reactions:** seizures
- **Other notes:** Visually inspect any solution of ertapenem for particulate matter and discoloration prior to use when possible. Variations in color do not affect potency of the drug.
 - IV administration – must be reconstituted prior to administration
 - Do not mix or co-infuse with other medications
 - Do not use diluents containing dextrose
 - Reconstitute the contents of a 1g vial of ertapenem with 10mL of 0.9% NaCl, or bacteriostatic water for injection
 - Shake well to dissolve, and immediately transfer contents to 50mL of 0.9% NaCl
 - Complete infusion within 6 hours of reconstitution – (goal 30 minutes)
 - IM administration – must be reconstituted prior to administration



DO NOT ADMINISTER THE RECONSTITUTED IM SOLUTION VIA IV

- Reconstitute the contents of a 1g vial of ertapenem with 3.2mL of 1% lidocaine HCl injection (without epinephrine). Shake vial thoroughly to form solution.
- Immediately withdraw the contents of the vial, and administer by deep IM injection into a large muscle mass (such as the gluteal muscles or lateral part of the thigh).
- Use the reconstituted IM solution within 1 hour after preparation.

Famotidine (Pepcid)



Aviation personnel are **grounded** for 72 hours when taking an H2 blocker for the first time. No grounding period if aviation personnel have taken before without side-effects.

- **Description:** histamine 2 blocker, ↓ secretion of stomach acid
- **Indications:** antacid, prevention of stress ulcers in burn victims or patients on steroid treatment, anaphylaxis, adjunct in treatment of urticaria
- **Adult dose:** 20mg IV q12hr for ulcers, burns, steroid use, upper GI bleeds, urticaria, or anaphylaxis
- **Pediatric dose:** 0.5mg/kg IV q12hr (q24 if under 2 mos old)



- **Contraindications:** known/suspected liver disease
- **Side-effects:** muscle aches, vertigo
- **Adverse reactions:** thrombocytopenia; liver toxicity

Fentanyl



Grounding for personnel on flight status

- **Description:** opioid analgesic
- **Indications:** moderate to severe pain from medical etiology (non-trauma pain) and burns; second line to ketamine for moderate to severe trauma pain, as a second line sedative
- **Dose:**
 - 50–100mcg IV/IO/IM
 - 400–1600mcg oral transmucosal fentanyl citrate (OTFC) aka fentanyl lozenge
 - The patient should place the ACTIQ unit in his or her mouth between the cheek and gum, occasionally moving the drug matrix from one side to the other using the handle. **The ACTIQ unit should NOT be sucked, bitten or swallowed.** Tape the lozenge to the patient's finger to help prevent accidental overdose.
 - The ACTIQ unit should be consumed over a 15-minute period. Longer or shorter consumption times may produce less efficacy than reported in ACTIQ clinical trials. If signs of excessive opioid effects appear before the unit is consumed, the drug matrix should be removed from the patient's mouth immediately and future doses should be decreased.
- **Treatment of overdose:**
 - Narcan for respiratory depression, but beware of possibility of precipitating an acute withdrawal syndrome
 - Ventilatory support
 - IV/IO access and fluids for hypotension




- **Contraindications:** known allergy to fentanyl or other opioid, pregnancy
- **Side-effects:** respiratory depression or arrest, suppression of gag reflex, and hypotension

Gatifloxacin 0.3% Ophthalmic Liquid (Zymar)




Aviation personnel are **grounded** for the initial 24 hours of antibiotic therapy and until the medical condition no longer interferes with safely performing aviation duties and the patient is free of side-effects.


- **Description:** ocular fluoroquinolone antibiotic
- **Indications:** eye infections, for use after performing lateral canthotomy
- **Adult dose:** 1 drop q2–3hr for 2 days then 1 drop qid

- **Pediatric dose:** same for children over 1
-  **Contraindications:** hypersensitivity, penetrating eye trauma, pregnancy
- **Side-effects:** stinging or blurring in eye
- **Adverse reactions:** corneal staining; tearing and photophobia
- **Other notes:** To instill in eye, tilt head back, place medication in conjunctival sac and close eye(s). Apply light finger pressure on lacrimal sac for 1 minute following instillation. To avoid bottle contamination, do not touch tip of container to any surface.

Glucose (Glucose®) or an energy gel

- **Description:** carbohydrate
- **Indications:** hypoglycemia <60mg/dL BGL, altered mental status caused by hypoglycemia, hyperthermia, unexplained loss of consciousness, unexplained seizures
- **Adult dose:** full tube given in small doses (25–50g) oral
- **Pediatric dose:** 0.5g/kg in small doses
- **Drug action:** increases blood glucose level
- **Onset:** 1 minute
- **Duration:** depends on the degree of hypoglycemia
- **Precautions:** assure gag reflex is present
-  **Contraindications:** patients who are unable to protect their own airway or swallow, pregnancy

1% Hydrocortisone Cream (Cortaid®)

- **Description:** Skin and mucous membrane agent – synthetic hormone; adrenal corticosteroid, glucocorticoid, mineralocorticoid, anti-inflammatory
- **Indications:** reduce inflammation in various skin conditions
- **Adult Dose:** topically AAA qd-qid
- **Pediatric Dose:** same for children over 2
-  **Contraindications:** steroid hypersensitivity, viral or bacterial diseases of the skin, varicella or vaccinia on surfaces with compromised circulation
- **Side-effects:** acne, impaired wound healing, petechiae, easy bruising, hypo/hyperpigmentation, increased sweating
- **Adverse Reactions:** anaphylactoid reaction, aggravation or masking of infections, skin thinning and atrophy, ecchymosis, hirsutism, acneiform eruptions, subcutaneous fat atrophy, allergic dermatitis, urticarial, angioneurotic edema
- **Other Notes:**
 - Estrogens potentiate effects
 - Immune response to vaccines may be decreased

Hydromorphone (Dilaudid®)



Grounding for personnel on flight status

- **Description:** Opioid analgesic
- **Indications:** Moderate to severe pain from medical etiology (non-trauma pain) and burns, alternative to ketamine for moderate to severe trauma pain
- **Dose:** 1mg IV/IO/IM; may repeat with 0.5mg q15–30min PRN

- **Treatment of overdose:** Narcan for respiratory depression, ventilatory support, IV/IO access and fluids for hypotension



Contraindications: known allergy to hydromorphone or other opioid, pregnancy

- **Side-effects:** respiratory depression or arrest, altered mental status, suppression of gag reflex, and hypotension

Ibuprofen (Motrin®)

- **Description:** NSAID, analgesic, antipyretic. COX-1 inhibitor
- **Indications:** mild to moderate pain, fever, acute mountain sickness treatment and prevention, pain reduction during frost bite rewarming



• **Dose:** 200–800mg PO tid or qid WF. Not to exceed 2400mg/day (800mg tid)

Contraindications: aspirin allergy, history of severe asthma, history of bleeding, not to be used chronically in combat zone due to risk of worsening bleeding, **ACTIVE COMBATANTS/OPERATORS**, pregnancy

- **Side-effects:** gastric upset
- **Adverse reactions:** prolonged bleeding time, tinnitus, edema, peptic ulcer, gastritis

Ketamine (Ketalar®)



GROUNDING medication for personnel on flight status

- **Description:** rapid-acting general sedative and analgesic
- **Indications:** severe pain primarily due to trauma, sedation for procedures, and combat agitation
- **Adult Dose:**
 - Acute Pain
 - 25mg IV/IO – slow push over 1min, may repeat q15min until pain is controlled or nystagmus occurs
 - 50mg IM/IN – may repeat q30min until pain control or nystagmus. It is preferred to establish vascular access if able and provide repeat doses IV/IO (20mg)
 - Sedation (dissociation)
 - Bolus:
 - Ketamine 150mg IV/IO slow IV push (1–2mg/kg) – repeat as needed to maintain dissociation (q15–30min)
 - Ketamine 300mg IM (2–3mg/kg) – repeat q30min PRN
 - Continuous Sedation (1–2mg/kg/hr)
 - 1,000mg/250mL NS (4mg/mL) infused at 25–50mL/hr – titrated to adequate response
 - Drip concentrations can be varied to meet overall fluid requirement



Contraindications: hypersensitivity

NOTE: It is acceptable to use ketamine for pain in casualties who have had head or eye trauma.

- **Adverse Effects:**
 - Apnea – support breathing; typically transient and not clinically significant
 - Incomplete dissociation – administer additional ketamine (50% of previous dose)
 - Emergence reaction – administer midazolam (Versed) 1–2mg IV/IO/IN
 - Nausea/vomiting – ondansetron 4mg ODT/IV/IM – repeat q4hr PRN

Ketamine Drip Dosing Tables

Mix 1,000mg (2 vials of 500mg/5mL) in 250mL of saline (4mg/mL solution)					
Dose		Patient's Weight (kg)			
		40	60	80	100
mg/kg/hr	µg/kg/min	Infusion Rate, mL/hr			
Ketamine drip rate for dial flow or IV pump (starting dose highlighted)					
0.75	13	10	15	20	25
1.0	17	13	20	27	33
1.25	21	17	25	34	42
1.5	25	20	30	40	50
1.75	29	24	35	47	59
2.0	33	27	40	53	67
Ketamine drip count for 15 drips/mL tubing (starting dose highlighted)					
mg/kg/hr	µg/kg/min	Infusion Rate, 1 drip/X seconds			
0.5	8	1/35	1/24	1/18	1/9
0.75	13	1/27	1/18	1/14	1/8
1.0	17	1/18	1/12	1/9	1/7
1.25	21	1/15	1/10	1/8	1/6
1.5	25	1/12	1/8	1/6	1/5
1.75	29	1/11	1/7	1/6	1/5
2.0	33	1/9	1/6	1/5	1/4
Ketamine drip count for 10 drips/mL tubing (starting dose highlighted)					
mg/kg/hr	µg/kg/min	Infusion Rate, 1 drip/X seconds			
0.5	8	1/53	1/36	1/27	1/14
0.75	13	1/41	1/27	1/21	1/12
1.0	17	1/27	1/18	1/14	1/11
1.25	21	1/23	1/15	1/12	1/9
1.5	25	1/18	1/12	1/9	1/8
1.75	29	1/17	1/11	1/9	1/8
2.0	33	1/14	1/9	1/8	1/6

Procedural Sedation

Step 1: Bolus (1.0–2.0mg/kg) 80–160mg ketamine IV/IO over 60 seconds (250–400mg IM if necessary).

Step 2: Consider adding (start low, give more):

- 25–100µg fentanyl IV/IO
- 1–4mg midazolam IV/IO

Step 3: May need to repeat doses as below if procedure lasts longer than 10–15 minutes.

- Ketamine every 10–15 minutes
- Fentanyl every 15–30 minutes
- Midazolam every 30–60 minutes

(REFERENCE: Joint Trauma System CPG- Analgesia and Sedation Management During Prolonged Field Care, May 2017 (CPG ID: 61))


- **Other Notes:**

- Ketamine should not be injected intravenously without proper dilution. It is recommended the drug be diluted with an equal volume of normal saline.
- If pre-loading ketamine in syringe for care under fire or CASEVAC missions, ensure to label syringe with time/date and dosage and ensure to discard any unused medications after 24 hours.
- Ketamine is not compatible with Lactated Ringers. For infusion, mix with normal saline or PlasmaLyte A.


Ketorolac (Toradol®)



GROUNDING medication for Air Force personnel on flight status

- **Description:** analgesic, non-steroidal anti-inflammatory drug (NSAID), inhibits platelet function
- **Indications:** mild to moderate pain due to musculoskeletal injury (most common during patrol); as a base-line pain med during prolonged field care for patients with no active bleeding.
- **Adult dose:** 15mg IV/IM. May be repeated q6hr for up to 72 hours.
- **Pediatric dose:** adolescents 13–16 years and children 2–12 years: 1mg/kg IM to a maximum of 15mg or 0.5mg/kg IV to a maximum of 15mg
-  **Contraindications:** aspirin allergy, history of severe asthma, history of bleeding, not to be used chronically in combat zone due to anti-coagulant effects, **ACTIVE COMBATANTS/OPERATORS**, kidney failure, pregnancy
- **Side-effects:** prolonged bleeding time, tinnitus, edema, peptic ulcer, gastritis

Levetiracetam (Keppra®)

- **Description:** antiseizure (antiepileptic)
- **Indications:** Treatment of persistent or recurrent seizure in conjunction with midazolam. Prophylaxis for casualties with depressed skull fracture or penetrating brain injury.
- **Dose:**
 - Loading: 2g for standard adult dose (or 20mg/kg) IV or IM loading dose over 10 minutes
 - Maintenance: 1g IV q12hr over 15 minutes
-  **Contraindications:** pregnancy
- **Side-effects:** weakness, suicidal tendencies, pancreatitis, diplopia, anxiety, amnesia, cough
- **Adverse Reactions:** 13% of adults report psychiatric reactions

Lidocaine HCl (Xylocaine®)




Aviation personnel are **grounded** for 12 hours after the use of local anesthesia and until symptoms have resolved enough to allow safe performance of duties.

- **Description:** local anesthetic

CAUTION: PJs are supplied lidocaine without epinephrine. In some theaters, lidocaine solutions contain 1:10,000 epinephrine may be supplied. This causes intense vasoconstriction and prolongs the duration of the anesthesia. These solutions are identified by a red label or red lettering on the label.




DO NOT use solutions containing epinephrine on or near the fingers, toes, nose, ears, or penis.

- **Indications:** local anesthetic: minor surgical procedures, fracture hematoma block; duration of anesthesia is 30 to 60 minutes
- **Dose (Local anesthesia):** To desired effect. Maximum single adult dose is 4.5mg/kg or 300mg (30mL of 1% or 15mL of the 2% solution contains 300mg lidocaine)
-  **Contraindications:** 2nd or 3rd degree AV block, hypotension
- **Side-effects:** tinnitus; edema
- **Adverse Reactions:** dermatologic reactions, anaphylaxis, seizures, cardiac arrhythmia

Loperamide HCl (Imodium®)




Aviation personnel are **grounded** until medical condition is not a factor and free of side-effects for 24 hours.

- **Description:** antidiarrheal (opioid)
- **Indications:** for use in acute, non-invasive diarrhea only
- **Dose:** 2 capsules (4mg) first dose, then 1 capsule (2mg) after every unformed stool, not to exceed 16mg (8 capsules) in 24 hours
-  **Contraindications:** bloody diarrhea in children under 12
- **Side-effects:** abdominal pain/distention, severe constipation
- **Adverse reactions:** hypersensitivity


Melizine (Vertalm)



GROUNDING medication for personnel on flight status

- **Description:** antiemetic
- **Indications:** vertigo, prevent motion sickness
- **Dose:** 25–50mg PO
-  **Contraindications:** allergy
- **Side-effects:** cough, difficulty swallowing, dizziness, drowsiness, fast heartbeat, skin rash, malaise, hives, itching

Meloxicam (Mobic®)

- **Description:** NSAID
- **Indications:** mild to moderate pain relief, inflammation, fever
- **Dose:** 7.5mg or 15mg daily, maximum daily oral dose is 15mg
-  **Contraindications:** allergy to NSAID class of drugs or aspirin, pregnancy
- **Side-effects:** anaphylactic reactions including shock; face edema, fatigue, fever, hot flushes, malaise, syncope, weight decrease, weight increase, dyspepsia, gastric upset

NOTE: Meloxicam is the only approved anti-inflammatory med on deployment and operations because it does not interfere with platelet function like other NSAIDs.

Metronidazole (Flagyl®)



Aviation personnel are grounded for the initial 24 hours of antibiotic therapy and until the medical condition no longer interferes with safely performing aviation duties and the patient is free of side-effects.

- **Description:** Nitroimidazole antibiotic
- **Indications:** gastroenteritis presumed due to Giardia
- **Adult Dose:**
 - Amebic Dysentery – 750mg PO tid × 5–10 days
 - Trichomoniasis – 2g PO × 1 dose; OR 250mg PO tid × 7 days
 - Giardia – 250mg PO tid × 5–7 days
 - Severe anaerobic infections – 1g IV, the 500mg IV q6hr
- **Pediatric Dose:**
 - Safety and efficacy have not been established, except for amebiasis. 35-50mg/kg tid for 10 days. Newborns exhibit a reduced capacity to eliminate the drug.
- **Contraindications:** hypersensitivity to any component of product, or other nitroimidazole derivatives, pregnancy (first trimester in patients with Trichomoniasis), administer with caution to patients with CNS diseases, use with caution in patients with history of blood dyscrasias
- **Side-effects:** disulfiram-like reaction including flushing, palpitations, tachycardia, nausea, vomiting may occur with concomitant ethanol ingestion. Refrain from ethanol during therapy and ≥1 to 3 days afterward.
- **Adverse Reactions:** seizures, peripheral neuropathy (numbness or paresthesia of extremity), patients with undiagnosed candidiasis may present more prominent symptoms during therapy; treat with candidal agent

Midazolam (Versed®)



GROUNDING medication for personnel on flight status

- **Class:** benzodiazepine
- **Indications:** sedation for medical procedures, active seizures, sedation for agitation, psychiatric symptoms, battlefield anxiety, anxiety induced by exfil platform/method, severe muscle spasms, sedation for TBI with combative behavior
- **Dose:**
 - Adult:
 - Sedation and anxiety: 2mg IV/IO, 5mg IM/IN used in increments up to 10mg
 - Seizures: 5mg IV/IO/IM
 - Pediatric:
 - IV: 0.1mg/kg, may titrate to effect
 - IM: 0.2mg/kg
 - Intranasal: 0.3mg/kg
 - PO: 0.5mg/kg
- **Side-effects:** laryngospasm, bronchospasm, wheezing, shallow respirations
- **Contraindications:** known sensitivity to midazolam or other benzodiazepine, injectable midazolam should not be administered to adult or pediatric patients in shock or coma, or in acute alcohol intoxication with depression of vital signs, pregnancy



Warnings:

- Use with caution when other medications capable of producing central nervous system depression are used.
- Prior to the intravenous administration of midazolam be sure that the immediate availability of oxygen, resuscitative drugs, age and size-appropriate equipment for bag/valve/mask ventilation and intubation, and skilled personnel for the maintenance of a patent airway and support of ventilation are available.
- Monitor patients continuously for early signs of hypoventilation, airway obstruction, or apnea.
- Use with caution in patients with severe fluid or electrolyte disturbances.
- Oxygen is desirable, but not absolutely required.

Morphine Sulfate (Opioid)

NOTE: This is not a medication that Pararescue forces should be utilizing. It may be seen when working with partner forces and in 3rd world situations.



GROUNDING medication for personnel on flight status.

- **Description:** Narcotic analgesic – alters perception of pain and emotional response to pain. Have naloxone HCl (Narcan) available when using morphine.
- **Indications:** severe pain, pain from cardiac ischemia
- **Contraindications:** respiratory depression, hypotension, head injury
- **Adult Dose:** 4–15mg IV/IM slow push (titrate to response)
- **Pediatric Dose:** 0.1–0.2mg/kg IM/IV (Do not exceed 15mg)
- **Side-effects:** lower respiratory drive, hypotension, bradycardia, nausea, vomiting, dizziness, pruritus, skin flushing
- **Adverse reactions:** seizures with large doses, constipation, ileus, urinary retention


Moxifloxacin (Avelox®)



Aviation personnel are **grounded** for the initial 24 hours of antibiotic therapy and until the medical condition no longer interferes with safely performing aviation duties and the patient is free of side-effects.

- **Description:** 4th generation quinolone
- **Indications:** open wounds, penetrating eye injury, other infections when specific antibiotics are not available
- **Dose:** 400mg/day PO
- **Contraindications:** allergy, pediatrics, pregnancy
- **Side-effects:** photosensitivity, insomnia, vertigo
- **Adverse reactions:** tendinopathy, abnormal dreams
- **Other notes:**
 - Oral antacids decrease absorption of the moxifloxacin when taken orally. Visually inspect any solution of moxifloxacin for particulate matter and discoloration prior to use. Solution must be clear.
 - IV administration – must be reconstituted prior to administration
 - Do not mix or co-infuse with other medications
 - At cool temperatures precipitation may occur, which will re-dissolve at room temperature

Mupirocin Ointment 2% (Bactroban®), other antibiotic ointment


- **Description:** topical antibacterial
- **Indications:** topical skin infection
- **Adult dose:** apply small amount of antibiotic on the area 1 to 3 times/day
- **Pediatric dose:** same
-  **Contraindications:** open wounds
- **Side-effects:** burning, stinging, pain, itching at application site

OTHER NOTES: For external use only, avoid eyes and mucous membranes.

Naloxone HCl (Narcan®)



GROUNDING medication for personnel on flight status

- **Description:** narcotic antagonist
- **Indications:** known or suspected (pinpoint pupils) narcotic induced respiratory depression
- **Adult dose:** 0.4–2mg IV/IM
- **Pediatric dose:** 0.01mg/kg dose IM/IV/SQ q2–3min
-  **Contraindications:** known allergy to medication
- **Side-effects:** return of pain in trauma patients
- **Adverse reactions:** In narcotic dependent patient, withdrawal symptoms may be precipitated

NOTE: Duration is 20 to 40 minutes (< duration of action of morphine).

Repeat doses of may be necessary after 20 to 30 minutes.

Nifedipine (Procardia®)



GROUNDING medication for personnel on flight status

- **Description:** an anti-anginal drug, calcium channel blocker, works by relaxing blood vessels so blood can flow more easily
- **Indications:** HAPE prophylaxis/treatment
- **Contraindications:** known allergy to medication, pregnancy
- **Dose:** 30mg (extended release) 1 tablet PO daily
- **Side-effects:** primarily vasodilatory in nature (hypotension), peripheral edema



When able, utilize under the guidance of medical control – although, in most patients, the hypotensive effect of nifedipine is modest and well tolerated, occasional patients have had excessive and poorly tolerated hypotension.

- Only administer to patients with a strong radial pulse/not hypotensive

Nitroglycerin



GROUNDING for personnel on flying status

- **Description:** vasodilator
- **Indications:** cardiac chest pain (angina or MI)
- **Dose:** 0.4mg tablet sublingual (SL)



Contraindications: absence of radial pulse, obtunded, patient is taking erectile dysfunction drugs, pregnancy

- **Adverse reactions:** severe hypotension, nitrate tolerance (excessive or continuous use), bradycardia (paradoxical), anaphylaxis, methemoglobinemia
- **Side-effects:** headache, lightheadedness, dizziness, flushing, orthostatic hypotension, reflex tachycardia, edema

Ondansetron (Zofran®)



GROUNDING medication for personnel on flight status



Waiver: Combat Rescue Officer, Pararescue, and Combat Control following ground test

- **Description:** antiemetic
- **Indications:** nausea and vomiting
- **Adult dose:** 4–8mg PO/IV/IM q4hr PRN
- **Pediatric dose:** 2mg PO/IV/IM



Contraindications: allergy, history of congenital QT prolongation

- **Side-effects:** minimal and rare
- **Caution:** patients with history of underlying cardiac disease
- **Adverse reactions:** rare

Oxymetazline HCl (Afrin® Nasal Spray)



GROUNDING for Air Force personnel on flight status prior to flight; however it can be used as a “get me down” drug for unexpected ear/sinus blocks during flight/decompressive dive duty.

- **Description:** vasoconstrictor (decongestant)
- **Indications:** Use as an adjunct to Valsalva maneuver to clear ears and sinuses during compression and decompression. Sinus and nasal congestion. Adjunct for treatment for barotrauma to the ears (blast and dive medicine).
- **Dose:** spray into each nostril 2 times, twice daily; not to exceed 3 consecutive days due to rebound congestion



Contraindications: severe damage to tympanic membrane/sinuses from barotrauma, pregnancy


- **Side-effects:** sneezing and stinging of nasal mucosa
- **Adverse reactions:** rebound congestion

Pseudoephedrine (Sudafed®)




GROUNDING medication for personnel on flight status.

- **Description:** Adrenergic class. Primary activity though α -effects on respiratory mucosal membranes reducing congestion, hyperemia, edema, and minimal bronchodilation secondary to β -effects.
- **Indications:** nasal decongestant and adjunct in otitis media with antihistamines, adjunct for barotrauma to the ears
- **Adult Dose:** 30–60mg q4–6hr PO

- **Pediatric dose:**
 - 6–12 yrs: 30mg/dose PO q4–6hr
 - 2–5 yrs: 15mg/dose PO q4–6hr
-  **Contraindications:** hypersensitivity, narrow angle glaucoma, pregnancy
- **Precautions:** pregnancy, cardiac disorders, hyperthyroidism, diabetes mellitus, prostatic hypertrophy, lactation, hypertension
- **Side-effects:**
 - CNS – Tremors, anxiety, insomnia, headache, dizziness, hallucinations, seizures
 - CV – Palpitations, tachycardia, hypertension, chest pain, dysrhythmias
 - EENT – Dry nose, irritation of the nose and throat
 - GI – Nausea, vomiting, anorexia, dry mouth
 - GU – dysuria

CAUTION: Do not use continuously, or more than recommended dose. Rebound congestion may occur. Avoid taking at bedtime, stimulation may occur.

Rocuronium (Zemuron)

- **Description:** non-depolarizing paralytic agent
- **Indications:** skeletal muscle relaxant for RSI and mechanical ventilation, facilitate tracheal intubation
- **Dose:**
 - Intubation: 1mg/kg IV/IO (Usual dose 100mg)
 - Maintenance: 0.1–0.2mg/kg IV/IO (usual dose 10mg) q20–30min PRN
 - Onset of 4–6 minutes and duration: 30–45 minutes
-  **Contraindications:** allergy, pregnancy
- **Adverse reactions:** Apnea, hypotension, hypertension, tachycardia, allergic reaction
- **Note:**
 - Onset of flaccid paralysis approx. 90 seconds
 - Duration 30–40 minutes
- **Side-effects:** residual muscular weakness
- **Special Information:**
 - Rocuronium has no effect on consciousness, pain threshold, or cerebation
 - Must be used after adequate sedation
 - In elderly patients, time of onset may be delayed due to slower circulation time
 - Good for 60 days after out of refrigerator

Sodium Bicarbonate



GROUNDING medication for personnel on flight status.

- **Description:** alkalinizing agent, electrolyte
- **Action:** Sodium bicarbonate combines with hydrogen ions to form water and carbon dioxide. Buffers metabolic acidosis and forces an intracellular shift of excess potassium in hyperkalemia and increases pH.
- **Indications:** Severe metabolic acidosis in cardiac arrest, tricyclic antidepressant overdose, hyperkalemia (crush and rhabdomyolysis), alkalization agent for specific toxins (salicylates, phenobarbital)




Dose: 1mEq/kg IV

Contraindications: none in setting of crush injury, metabolic or respiratory alkalosis, hypocalcemia, hypokalemia, hypernatremia, pregnancy

- **Side-effects/precautions:** metabolic alkalosis may occur, may increase intracellular acidosis, may cause imbalance, may deactivate catecholamine, large solute load may lead to fluid overload; precipitates when mixed with calcium chloride or gluconate.

23.4% Sodium Chloride

- **Description:** Hypertonic saline
- **Indications:** increased intracranial pressure (ICP)/brain stem herniation associated with moderate to severe TBI
- **Adult Dose:** 30mL IV/IO over 10 minutes q3h prn
- **Pediatric Dose:**
-  **Contraindications:** hypernatremia, fluid retention
- **Side-effects:** hypernatremia, acidosis
- **Adverse Reactions:** cardiovascular shock, central nervous system disorders, osmotic demyelination syndrome, extensive hemolysis, cortical necrosis of the kidneys, severe local tissue necrosis if administered extravascularly
- **Other Notes:**
 - Excessive administration of potassium-free solutions may result in significant hypokalemia

Succinylcholine Chloride (Anectine)



- **Description:** depolarizing paralytic agent; secondary choice for paralytic (primary rocuronium)
- **Indications:** skeletal muscle relaxant during RSI and mechanical ventilation, facilitate tracheal intubation
- **Contraindications:** Hypersensitivity to succinylcholine, history of malignant hyperthermia, skeletal muscle myopathies
- **Adverse reactions:** Apnea, cardiac arrhythmias, increased intraocular pressure and intracranial pressure, muscular fasciculations
- **Note:**
 - Onset of flaccid paralysis is rapid (<1 minute)
 - Duration of 4–6 minutes.
- **Adult Dosage:** 1.5mg/kg (maximum of 150mg)
- **Approved Drug Route:** IV/IO
- **Special Information:**
 - Succinylcholine has no effect on consciousness, pain threshold, or cerebation
 - Must be used after adequate sedation
 - In elderly patients, time of onset may be delayed due to slower circulation time
 - Good for 14 days after out of refrigerator

Tetracaine 0.5% Drops



Aviation personnel are **grounded** for 12 hours after the use of local anesthesia and until symptoms have resolved enough to allow safe performance of duties.

- **Description:** local anesthetic
- **Indications:** as a topical optic anesthetic (may aid in ocular exam to relieve blepharospasm); removal of foreign bodies

- **Dose:** 1 or 2 drops – 2–3 minutes before procedure
- **Contraindications:** not for prolonged use – do not discharge with medicine, pregnancy
- **Side-effects:** stinging, tearing
- **Adverse reactions:** conjunctival redness, hypersensitivity reactions

NOTE: Plan to place rigid shield after placement of tetracaine for 12 hours.

Tranexamic Acid (Cyklokapron®) – TXA

- **Class:** antifibrinolytic agent
- **Action:** competitive inhibitor of plasminogen activation, stabilizes clots
- **Indications:** If a casualty will likely need a blood transfusion (for example: presents with hemorrhagic shock, one or more major amputations, penetrating torso trauma, or evidence of severe bleeding) or If the casualty has signs or symptoms of significant TBI or has altered mental status associated with blast injury or blunt trauma
- **Dose:** Administer 2g of tranexamic acid via slow IV or IO push as soon as possible but NOT later than 3 hours after injury
- **Contraindications:** subarachnoid hemorrhage, active intravascular clotting
- **Side-effects:** angina pectoris, chest pain, hypotension, myocardial infarction, postural hypotension, tachycardia



WARNING: Rapid administration may result in hypotension.

Vecuronium Bromide (Norcuron)

- **Description:** non-depolarizing paralytic agent, secondary choice for RSI (primary rocuronium)
- **Indications:** facilitates ET intubation by paralyzing skeletal muscle, skeletal muscle relaxation during RSI and mechanical ventilation
- **Adult Dosage:**
 - Intubation: 0.1mg/kg over 30–60 seconds IV/IO
 - Usual dose 10mg
 - Onset of 2–3 minutes, duration of 25–30 minutes
- **Maintenance:** 0.01mg/kg IV/IO q20–45min PRN
- **Contraindications:** hypersensitivity to vecuronium
- **Adverse reactions:** apnea, allergy, rare cardiovascular
- **Special Information:**
 - Paralysis may be prolonged by succinylcholine, quinidine, and beta blockers
 - Refrigeration not required
 - Must be used after adequate sedation

10. Pediatric Care and OB-GYN

Pediatrics

Anatomic Differences:

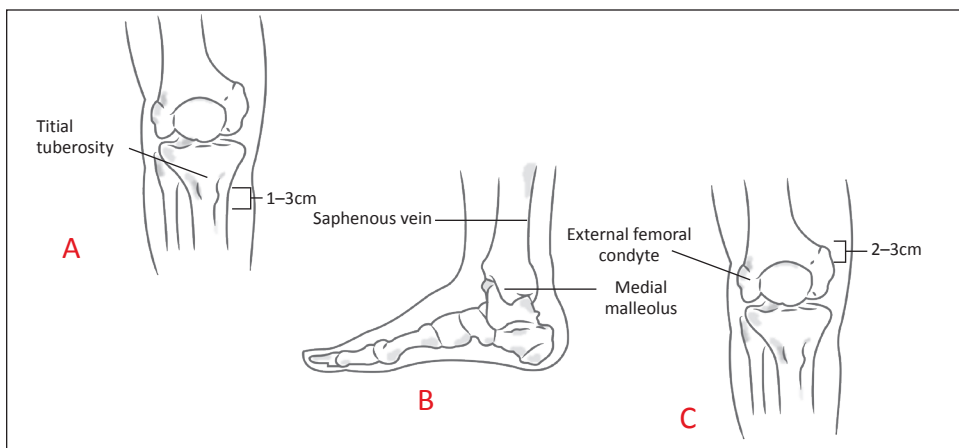
- Airway:
 - Large head – may obstruct airway if child is supine → elevate shoulders/thorax
 - Smaller oropharyngeal space due to larger tongue to mouth ratio
 - Epiglottis is long/narrow and cords are anterior and cephalad
 - Subglottic area narrows so tube that will pass thru cords may encounter resistance before entering bronchus
 - <12 years old have small/pliable larynx, do not perform surgical airway on child less than 8 years old
- Head and Spine:
 - Risk of head injury increased:
 - Larger head to body ratio
 - Open fontanelles and mobile sutures allow for massive intracranial bleeding
 - Decreased risk of spinal injury due to more flexible spinal ligaments
- Skeleton and Physiology:
 - More pliable skeleton → increased risk of internal organ injury without overlying physical findings (ex. no rib fractures over lung contusion)
 - Increased metabolic activity → more maintenance fluids
 - Higher risk for hypoglycemia so feed if able to take oral or give dextrose in fluids
 - Meds: refer to HB sections and Broselow tape for dose adjustments
 - Require more frequent redosing due to increased metabolism

TRAUMA

- M:** – Direct pressure with hemostatic bandage
- Tissues are more compressible → Can achieve tourniquet effect with hand tightened cravat
 - Rubber tubing tourniquet is appropriate for children
- A:** – Immediately reposition to open airway → elevate shoulders if supine to avoid obstruction
- Perform back blows/Heimlich for foreign body
 - Tip: if Broselow bag unavailable, ET tube should be approximately the diameter of the outer rim of the child's nares (nose)
 - Estimating ETT size:
$$\frac{16 + \text{age in years}}{4}$$
 - **DO NOT PERFORM CRICOTHYROIDOTOMY IN CHILDREN UNDER 8 YEARS OF AGE.**
- R:** – “Normal” vital signs change with age – refer to below chart when assessing breathing:
- Avoid hyperventilation
 - Smaller lung volumes so use peds ambubag
 - Decreased oxygen reserve → rapid desaturation so keep on O2 if available

Age	Weight	Respiratory Rate	Pulse
Less than 1	3	40 to 60	130 to 159
1 to 5	10 to 20	20 to 40	110 to 130
6 to 10	20 to 35	12 to 20	75 to 100
11 to 18	35 to 70	12 to 20	70

- C:** – Evaluate femoral/brachial pulses, heart rate, blood pressure, skin color, skin temperature, capillary refill time
- Intraosseous access typically required for shock:
 - Primary – Proximal tibia
 - Secondary – Proximal humerus or distal femur



- IO should be changed to peripheral IV within 24 hours
 - Weight based resuscitation with fluids or blood products – use Broselow for weight follow this algorithm: 1–3 boluses of crystalloid fluid @ 20mL/kg → if not improved by 3rd bolus, use blood product if available in 5mL/kg boluses
- H:** – Increased risk of intracranial bleed → act quickly – follow *TBI Protocol*
- 3% saline for sudden change in mental status, abnormal respirations, asymmetric pupils, or posturing → 5mL/kg bolus over 10–15min then start 50mL/hr
 - Document serial neuro exams: GCS (see chart), pupil size/reactivity, and motor function
 - Children are at higher risk of hypothermia due to their increased metabolic rate and decreased reserve → keep covered and actively rewarm as needed
- P:** – Remember ketamine increases oral secretion – monitor use in supine patient to avoid aspiration

	GCS	Pediatric GCS	Infant FACE Scale
Eyes			
1	No opening	No opening	No opening
2	Open to pain	Open to pain	Open to pain
3	Open to voice	Open to voice	Open to voice
4	Spontaneous	Spontaneous	Spontaneous
Verbal			
1	No response	No response	No facial expression to pain
2	Incomplete sounds	Inconsolable, agitated	Grimaces to pain
3	Inappropriate words	Inconsistently inconsolable	Cries to deep pain only
4	Confused	Cries, consolable	Cries to minor pain, alternating with sleep
5	Oriented	Smiles, tracks appropriately	Cries to minor pain, alternating with wakefulness
Motor			
1	No response	No response	Flaccid
2	Decerebrate	Decerebrate	Decerebrate
3	Decorticate	Decorticate	Abnormal rhythmic movements (seizure-like)
4	Flexion withdrawal	Withdrawals to pain	Nonspecific movements to deep pain
5	Localization	Withdrawals to touch	Hypoactive spontaneous movements
6	Follows commands	Purposeful	Normal spontaneous movements

Pediatric Pain Regimen Doses

Fentanyl: 0.5–2mcg/kg IV/IO q30–60min

Morphine: 0.5–1.0mg/kg IV/IO (**Max dose 10mg**)

Versed: 0.1mg/kg IV/IO (**Max 0.5mg/kg**)

Ketamine: 0.15mg/kg IV/IO
4–5mg/kg IM (recommend atropine 0.01mg/kg for ↑ salivation)

A: – Adjust medication dose per med protocols

Pediatric Invanz Dose: 15mg/kg IV/IO twice daily (not to exceed 1g daily)

W: – Keep clean/dry/warm. Change dressings q12hr

S: – It is more difficult to diagnose a fracture in peds → splint/immobilize any limb suspected for fracture (especially if child is refusing to use the limb)

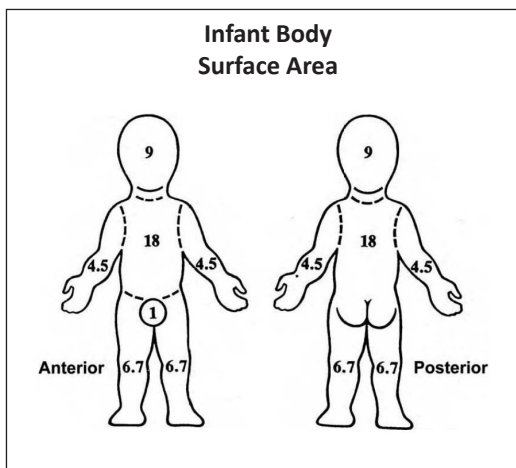
PALS:

- Have rhythm cards
- 100 compressions/12 breaths per minute

- Epi 0.1mg/kg for asystole or PEA
- Defib 2 joules/kg then 4 joules/kg for each following for VT/VF

Burn:

- Body surface area percentages differ for children:



- Airway patency can be lost early in small children with facial or extensive burns
- → Carefully secure the ETT and provide adequate sedation is important to prevent unplanned extubation
- Burn resuscitation in children uses the Modified Brooke formula:
 - 2mL/kg/%TBSA divided over 24hr
 - One-half given during the first 8hr
 - Consider using D5LR if patient is unable to eat/drink
- Children presenting for care 24–48hr following burns injury generally do not require a formal fluid resuscitation, rather fluid should be administered based on clinical need
- Monitoring of resuscitation should be based on physical examination, input and output measurement, and analysis of laboratory data
 - Physical evidence of effective resuscitation includes: an alert sensorium, full peripheral pulses, warm distal extremities; urine output target should be a glucose-negative urine output of 1mL/kg/hr
- Children with burns over 20% should have a Foley catheter placed using size 6 Fr for infants and 8 Fr for most small children
- Children with burns under 20% usually do not need a calculated resuscitation. They can be given 1.5x calculated maintenance fluid rate and have diapers weighed for urine output. If they can eat, they should be allowed access to bottle feeds PRN.
- Children may rapidly develop tolerance to analgesics and sedatives, dose escalation is commonly required

Obstetrics Trauma

NOTE: The pregnant patient has several anatomic and physiologic differences that make assessment more challenging. Frequently the developing fetus will show distress before the mother does.

A detailed history (including *blood type* or any *medical problems* or *known problems with the pregnancy*) is a **must!**

The best way to treat the fetus is to treat the mother and call for medical support A.S.A.P.

A trimester is 3 months = roughly 13 weeks.

- 0–13 weeks = first trimester
- 13–26 weeks = second trimester
- 26–40 weeks = third trimester

Any significant vaginal bleeding in a pregnant female less than 24 weeks gestation should be managed symptomatically, or as appropriate for level of injury sustained. At less than 24 weeks, the likelihood of a viable fetus being delivered is extremely low, so urgent CSAR assets for immediate CASEVAC should be weighed appropriately.

Anatomic Differences:

- The uterus remains within the pelvis until approximately 12 weeks.
- By 20 weeks, the uterus is at level of the umbilicus.
- By 34 weeks the uterus reaches the costal margin.
- As the uterus enlarges, it displaces the abdominal contents cephalad. This can protect the intestines from blunt injury, though increases the risk of complex injury to abdominal structures in penetrating trauma.

NOTE: In the 3rd trimester, the fetus' head is normally within the pelvis. Pelvic fracture in late gestation may result in serious intracranial injury to the fetus, as well as massive hemorrhage into the pelvic cavity.

Trauma Primary Survey:

Primary Survey in the Pregnant patient will follow standard **MARCH PAWS** algorithm, however, certain differences apply. *Any female patient should ALWAYS be asked if they are/could be pregnant, when their last menstrual period was, and if they are sexually active. In the unconscious female patient, assume they ARE pregnant until proven otherwise.*

- M:** – Standard blood sweep, direct pressure with hemostatic bandage/TQ
- **MUST** examine the vagina for presence of bleeding. Vaginal bleeding with abdominal/pelvic pain resulting from blunt trauma in a pregnant patient is a **MEDICAL EMERGENCY. Treat for shock/hemorrhage. Transport immediately.**
 - Be suspicious for Uterine Rupture: Acute Abdomen with rigidity. This is an **Emergency. Treat for shock/hemorrhage. Immediate transport.**

- By 28 weeks, the pubic symphysis widens up to 8mm, and the pelvic blood vessels are engorged, supplying the uterus. This can contribute to **massive hemorrhage** with blunt trauma associated with pelvic fracture.
- Follow the *Hemorrhage Protocol!* **TXA** is considered **relatively safe** for use in the pregnant patient.
- A:** – Assess airway as in any normal, healthy adult.
- Gastric emptying is delayed in pregnancy and abdominal contents are compressed by late 2nd trimester. Early NG tube decompression may be important to avoid aspiration of gastric contents.
- R:** – Decreased functional lung volume and increased oxygen demand dictate immediate use of supplemental O₂ as soon as possible. Assess oxygenation with pulse oximeter.
- C:** – HR is increased 10–15 BPM by early 3rd trimester. *Take into account when assessing for hypovolemia.*
- BP is decreased 5–15mmHg by second trimester. This should normalize in 3rd trimester. *Take into account when assessing for hypovolemia.*
- Standard IV/IO access does not change from normal, healthy adult.
- H:** – Assess for head trauma.

In absence of significant head trauma: headache, hypertension, blurry vision (with or without seizure) should be considered **eclampsia** until proven otherwise. This is a **Medical Emergency**. Administer **4g IV/IO magnesium sulfate** (available in the *ACLS Kit*), and **transport immediately**.

- Assess/Treat/Prevent hypothermia

NOTE: Because of their increased intravascular volume, pregnant patients can lose a significant amount of blood before tachycardia, hypotension, and other signs of hypovolemia occur. This means the fetus may be in distress/deprived of oxygen while the mother's VS appear stable.

Secondary Survey:

- The maternal secondary survey should follow the same pattern as a non-pregnant patient. Pay careful attention to presence of uterine contractions, which may suggest injury to the uterus/placenta. The vagina and perineum **MUST BE VISUALLY EXAMINED**.
- **Immediate transport to Hospital** is mandatory in the presence of vaginal bleeding, presence of amniotic fluid, uterine contraction, abdominal pain/tenderness/cramping, or evidence of hypovolemia.
- If delayed transport is expected, initiate antibiotic treatment with 1g Ertepenem IV/IO/IM.
- **Avoid repeated vaginal examination.**
- In the setting of hypotension when the patient is laying SUPINE, and no other significant signs or injuries present, consider manually displacing the uterus to the patient's **left side**, or rolling the patient to the left. If the patient is spine-boarded, place a 4–5" bolster under the right edge of the board to facilitate this.

Blunt Injury Considerations:

- The abdominal wall, uterus and amniotic fluid act as buffers to direct fetal injury; however, direct, forceful impact may still induce fetal injuries. Treating the mother is the best way to treat the fetus.
- Unrestrained women in MVA have a higher risk of fetal injury/death, and premature delivery. It is imperative to document if the female was a restrained passenger, or unrestrained.
- If possible, try and determine the type of restraint used (e.g., lap belt vs lap and shoulder belt; was lap belt worn properly, below the pregnant abdomen? Or was it across the belly?). Airbags do not appear to increase risk of injury pregnant mothers or the fetus.

Penetrating Injury Considerations:

- As the pregnancy progresses, the uterus increases in size. This helps protect abdominal organs from penetrating injury, but increases likelihood of uterine injury.
- The end result is generally excellent outcome for the mother; however the fetus usually does poorly with penetrating uterine trauma.
- Be aware that compression/elevation of the abdominal organs as pregnancy progresses may pre-dispose to more complex organ injury. Particularly in the high abdomen/low chest region.

Special Considerations:

- Blood Type is of **HIGH importance** in the pregnant patient when considering transfusion of blood products, BUT it is MORE IMPORTANT to remember that for ANY pregnant trauma patient, they MUST be seen in the hospital right away. Remember, *even relatively minor trauma may lead to fetal loss.*
- Amniotic Fluid Embolism, while relatively rare, can occur in trauma of the pregnant female. Be alert for anaphylaxis type reaction, particularly involving the airway, following trauma. Treat as if Anaphylaxis with IM/SC Epinephrine and **transport immediately.**

In the RARE, *extenuating circumstance* of having to deliver a baby in austere environment:

- *Immediately* call for **medical support** – Delivery is **NOT** recommended if at all avoidable in the field.
 - If **water has broken and contractions are present but NO perineum bulging or head crowning is present, consider immediate transport.**

11. Palliative Care

1. Identify critically ill patients by appearance, vital signs or both. Examples may include:
 - a. GCS 3 due to TBI (not non-TBI hemorrhage!)
 - b. Signs of impending herniation (Cushing's triad)
 - c. Development of bradycardia in setting of hemorrhage despite resuscitation attempt
 - d. "Dismemberment" injuries (high amputations not amenable to TQ, significant torso tissue loss, etc.)
 - e. Severe hypoxia despite secure airway and positive pressure ventilation (persistent sats <80%)
 - f. CPR >15min in the setting of unwitnessed cardiac arrest
2. In some instances, it will be obvious that the patient is dying and beyond your ability to save them.
3. In other instances, it will not be clear if the patient is dying. Therefore, it may be safer to continue active treatment. Sometimes time, tactics and logistics will influence this decision.
4. Use experience and judgment to determine if the ability to save a patient is beyond your experience, capability or scope of practice.
5. In either case, it is helpful and important to get telecon support, and usually with a medical known and trusted provider. This will make the discussion and decision-making easier.
6. When deciding to institute palliative care, discontinue active treatments and continue comfort care only.
7. Provide analgesia and keep patient pain free if able.
8. Use Zofran for nausea.
9. Treat fever with meds or wet compresses.
10. Keep patient clean and comfortable.
11. Touching the patient on a shoulder, arm or hand can be reassuring and comforting.
12. Talking in soothing tones may be helpful. Reassure patients you are well trained for this and will take good care of them.
13. Use your judgment to tell a patient he/she is dying or not. Many times you do not need to discuss this if not asked.
14. Stay with the patient as much as feasible. Even if they sleep and wake intermittently it can alleviate fear of being alone.
15. Professionally manage other people involved in the situation (e.g., fellow crewmembers or family). Ask questions about what they understand is going on. Tell them you are trained and doing your best but that resources and time are limited. Explain that we generally intervene to save a life but if that is not possible, the main thing is to reduce suffering. Develop a therapeutic alliance with the crew/team/family so they feel they are part of the decision and trying to help (can help with nursing, comforting, etc.). Avoid adversarial situations and try to build trust up front before you announce a palliative care decision.
16. If you go through an experience like this, make sure to debrief with a mental health provider or flight surgeon. Discuss it with your teammates.
17. The best preparation to reduce mental health concerns from these events is to be optimally trained and know that you did everything you were capable of.

12. Recovery Operations

General

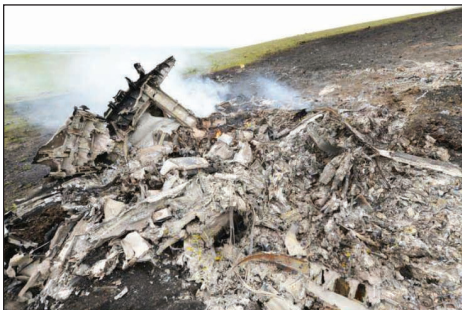
- Do not remove any medical interventions from the remains.
- Explain the situation openly to family or bystanders.

Aircraft Crash Response

- Ensure scenes are safe to enter. Aircraft metals have the capacity to burn for days at extremely hot temperatures.
 - Toxic gases are likely to be present – PAPRS masks are recommended.
 - Ammunition can cook off and fire randomly for hours after incident.
- If the operational environment allows, wait for mortuary affairs/medical examiner/safety investigation team to assess crash site prior to moving wreckage or removing remains.
 - The additional teams provide vital support for determining cause of death, cause of the crash, preservation of remains. Distorting the crash site by any means impedes these vital investigations.
 - If the operational environment does not allow additional teams to be present, ensure plenty of video and pictures are taken prior to and during the distorting or removing any wreckage or remains. Provide media to all investigative agencies.
- Seek additional manpower and equipment if available. Crash sites may be spread out over miles (mid-air explosions) or confined to a few feet wide (high speed ground impact).
 - Be prepared to conduct methodical searches to identify remains. Maps, GPSs and compasses may be required for large search areas.
 - Remains and debris can regularly impact several feet into the ground. Digging equipment may be necessary.
 - Recovery equipment may include:
 - Body Bags
 - Skedco
 - Fire fighter gloves
 - PAPRS mask
 - High heat boots
 - Fire extinguishers
 - Large Sifters
 - Shovels
 - Small plastic bags
 - Camera
- Remains may be easy to identify when fully intact or extremely difficult with only teeth or hairs remaining.
 - Teeth will resist heat better than bones and may be the only remains left.
 - Bone fragments will appear white and with holes in them, similar to pumice.
 - Rings and personal effects may be found amongst the debris. Include with the remains in a baggie if able.
 - Attempt to assess and separate remains that belong to different individuals.

- If needed, work through the unit Flight Surgeon to get access to the USAF Medical Examiner for guidance. Send images directly for guidance on the minimum amount of remains needed to identify someone.
- Do not share information outside of the Operation, the Chain of Command, and the appropriate investigators.

Crash site examples



Remains examples





Critical Incident Stress Debrief

- Disaster and rescue workers report 22% PTSD and 13% depression rates.
- Provide and participate in critical incident debriefs with mental health providers.
- If experiencing recurring symptoms related to the event, feeling sad/depressed, or have lost interest in normally enjoyable activities, obtain a mental health consultation through the unit Flight Surgeon.

13. Packaging and Splinting

Packaging

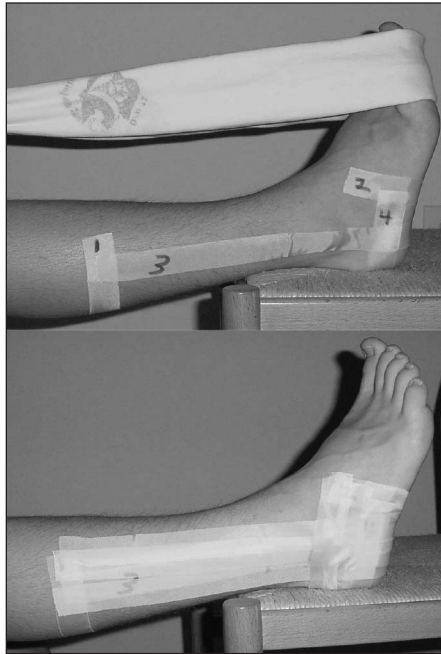
1. C-spine control when indicated. Options:
 - a. C-collar
 - b. SAM splint if trained
 - c. Boots, rolled clothes, or other objects on side of head, duct tape or cravats around board and across forehead, never across chin
 - d. Pad mastoid, chin, other bony prominences
 - e. Assure patient is comfortable, if not and time and tactics permit, fix it
 - f. Watch for anxiety, avoid pressure of the cervical collar on the larynx
2. Back board – pad bony prominences (occiput, elbows, hips, heels) or use a pad such as a sleeping pad or blanket.
3. Ensure patients are warm and dry.
4. If patient is in blanket, survival blanket or other wrap, duct tape/secure blanket so it does not get blown away or open under rotor wash.
5. Cover all wounds, amputations if not dressed to protect from contamination from rotor wash.
6. If patient is stable and anxious, consider 2mg midazolam (Versed) IV/IM/IO/IN.
7. Ensure stability of lines and tubes prior to movement and hoisting.
8. Place eye and ear protection on patient.
9. Double check rigging for hoist preparations, if possible, have second PJ check prior to signaling for hoist.
10. When arriving at a facility or in transport, always move the patient off the stretcher/backboard and on to a bed or well-padded surface as soon as possible.
11. Roll/prop patient differently every 20 minutes to reduce pressure sores when in facility or on long transport.

Splinting and Orthopedic Issues

1. When using the SAM splint always utilize the C curve or T to create rigidity.
2. Pad bony prominences.
3. Learn the specific configurations for each body site and be able to execute quickly.
4. Use cravats, duct tape, Kerlex, ACE wraps etc., to secure the splint.
5. Check distal pulse-motorsensory before and after applying splints and periodically, and document.
6. If attempting to reduce a fracture prior to immobilization, use procedural sedation if possible, use gentle continuous traction to attempt to reduce it, and feel it slip into place or feel the step off reduce.
7. Refer to the SAM Splint Channel on youtube.com to learn how to splint each site. This should be practiced so it can be done correctly and in the minimum amount of time.

Sprained Ankle

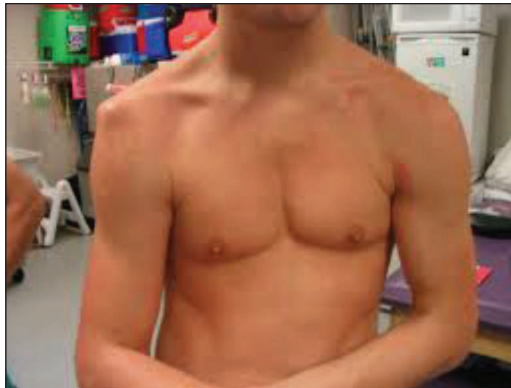
1. Usually caused from everting or inverting the ankle. Pain, swelling, ecchymosis. Difficult to bear weight.
2. A sprained ankle is best managed with taping (1 inch surgical tape, or duct tape) so the Operator can put his/her boot back on.
3. When possible, rest, ice and elevation are important.
4. If trying to continue patrol, tape the ankle as shown below using 4 layers of tape and following the number sequentially:



Shoulder Dislocations

1. In general, the patient will not move their upper extremity and a step off at the shoulder joint is usually visible and/or palpable.
2. Provide procedural sedation unless present when it happens since spasm may take time to develop. Midazolam acts as a muscle relaxant. Be patient for decreased spasm.
3. By massaging the shoulder to relax the deltoid, and gently abducting (moving the arm off the body) to 90°, and externally rotating the shoulder the humeral head should relocate.
4. Scapular manipulation is an alternate method.
5. Sling and swathe the upper extremity after relocation.
6. Note that is important to palpate the shaft of the humerus and rule out step off or point tenderness. If there is a suspicion of fracture (more common in the elderly or high speed vehicular trauma) do not relocate the shoulder, sling and swathe only.

Appearance of Dislocated Shoulder



Scapular Manipulation Reduction Method



Have the patient sit upright or lay face down. If sitting, support the affected arm straight out from the body. If lying prone on a table allow the arm to dangle straight down. Apply 5–10 pounds of long-axis traction to the arm. Stand behind the patient, grasp the tip (inferior portion) of the scapula and rotate it inward (towards the spine) and superior (towards the head) with a slow, gentle and continuous motion.

14. Triage and Mass Casualty Management

Mass casualty management focuses on:

1. security
2. accountability
3. triage and patient movement
4. CCP with or without treatment based on time and to tactics
5. exfil

An immediate determination should be made by the leadership if the MCI is a scenario with multiple casualties well within the scope of the team and resources, if it is a mass casualty scenario and is safe for which traditional triage and CCP management and treatment can occur, or if it is an overwhelming or non-secure situation where you simply need to move the live patients and have them set for exfil and then later collect the dead patients and move them.

In some instances, survival management (shelter, warmth, food, water) take precedence over medicine as medicine is impractical in certain environments and situations.

Triage, French for sorting, is the screening and classification of sick, wounded or injured persons during combat or other disasters. The goal is to determine the priority of needs and direct medical treatment where it will do the most good for the greatest number of patients. Triage is a dynamic process that is conducted whenever the number of patients exceeds the available medical resources (i.e., medical materials and/or number of providers), and/or the capacity for evacuation. Each patient is initially triaged and categorized, then re-triaged at each level of care. Individual patients are re-evaluated periodically and may be re-categorized as their condition changes and/or resource availability changes. Pararescuemen dealing with personnel recovery utilize **3 basic types of staging**:

1. Initial Patient Contact
2. Patient Transfer Points
3. Casualty Collection Points

When a Team Commander is present on an MCI, his interaction with the Team Leader is key to the successful mission prosecution. A good Team Commander/Lead working relationship provides a synergistic mission leadership function.

Team Commander (TC) Responsibilities and Considerations:

The TC provides command and control for the overall mission, the TC's 'Up-and-out' interface for the team with outside forces, ensuring security, air traffic flow, reach-back, resupply, and comms with higher headquarters is key to keeping the TL and Team focused 'down and in'.

Team Leader (TL) Responsibilities and Considerations:

The ultimate success of a MCI is determined by the proper actions of the TL. During a MCI the TL provides all command and control to include on-scene medical direction. When a TC is present, the TL handles all the 'down-and-in' control functions. The TL is the "center of authority and direction," to whom all team members report their findings and requirements. The team leader then determines which patients have priority for transportation and allocates further resources to areas of greatest need. Responsibilities and considerations include, but are not limited to:

1. Dividing the MCI into sectors and assign team members to specific areas of coverage.
2. Insure no patient is missed and duplication of effort is avoided.
3. Establish the CCP and determine patient priority.
4. Limits of medical supplies and equipment and best location for backup supplies to allow general access.
5. Extent of means of transportation to definitive medical care.
6. Number of available medical facilities, their proximity to scene, and capability of each facility for handling patients.
7. Number of non-medical personnel available and how they can be best organized to function the most efficiently as litter bearers and prevented from interfering with proper medical treatment.
8. Communication control so that reports of the situation and requests for supplies, personnel and transportation are coordinated and consistent to avoid confusion and inefficiency.
9. Establishment of a central point for carrying out ongoing essential care and loading for transportation.
10. Track patients from first contact through to hand-off to higher care.

Retrieval team member responsibilities:

1. Determine extent of covered area (scan for number of patients, where patients may be hidden).
2. Direct ambulatory patients to come to you. Accompany or send them to CCP for accountability, and additional duty assignment by TL or TC – security, litter bearer, etc.
3. Set pattern for finding and evaluating patients so none are missed.

NOTE: Patients with obvious life-threatening conditions should be approached first (e.g., respiratory distress, active bleeding).

4. Patient triage assessment should be completed in less than 60 seconds.
5. Limit treatment to: tourniquets, NPAs, and put patients in recovery position. Utilize judgment if needle decompression is emergently needed.
6. Count them and report number to TL as able.

CCP Medic responsibilities:

1. Gather and place med gear centrally from patients and other PJs.
2. Direct retrieval team members to place patients in predetermined locations.
3. Treat red patients as they arrive. Control life threatening hemorrhage (M) in all patients first. Use helpers to apply direct pressure. If there are too many patients, use pressure dressings with cravats. DO NOT stay with one patient if many reds are there.
4. Address airway and respiration (A,R) in each patient sequentially.
5. Start lines and treat for shock (C) if possible – blood products, TXA, 2 lines if possible.
6. As other PJs become available from the retrieval team, the CCP Medic is primary and should delegate work.
7. Provide the remainder of tactical field care (PAWS) and package patients for exfil. Instruct patients to take their pill pack if they have one.
8. Document care on patient treatment card.

Triage Categories

Each Patients Triage Assessment Should Be Completed In Less Than 60 Seconds

Category I: Immediate (red chemlite)	<i>Examples:</i> <ul style="list-style-type: none"> (Any MARCH issue) Airway obstruction Flail/open chest wound Tension pneumothorax/hemothorax Massive hemorrhage 20–70% burns Unstable vital signs Severe TBI (unconscious, alive patient)
Category II: Delayed (green chemlite)	<i>Examples:</i> <ul style="list-style-type: none"> Open fractures with PMS intact Soft tissue injuries Moderate TBI (stable vital signs) Open abdominal wounds
Category III: Minimal (no chemlite) remain armed continue to engage.^a	<i>Examples:</i> <ul style="list-style-type: none"> Minor abrasions, burns, sprains lacerations Moderate/Mild anxiety Fractures/dislocations with PMS Mild TBI
Category IV: Expectant or Hero (blue chemlite)^b	<i>Examples:</i> <ul style="list-style-type: none"> Massive head or spinal injury Third degree burns >70% BSA Injuries incompatible with life

^aIn combat, it is assumed that minimal patients will continue to stay armed/engaged if no mental status altering pharmaceuticals are given for pain.

^bExpectant category is ONLY used in combat operations and/or when the requirements to adequately treat these patients exceed the available resources. In peacetime, it is generally assumed that all patients have a chance of survival.

Category Immediate	Combat – chemlite Cat A-Red	Civil category – tag color Immediate-Red
<i>Examples:</i> any unstable casualty. This includes any MARCH issue, massive bleeding, airway obstruction, flail chest, pneumothorax, hemothorax, open chest wound, unconscious/alive patient (severe TBI), 20–70% burns, unstable VS		
Delayed	Cat B-Green	Delayed-Yellow
<i>Examples:</i> any stable but non-ambulatory casualty. This includes any open fractures with PMS intact, evisceration, moderate TBI, stable VS, open eye trauma (penetrating, impaled object)		
Minimal	Cat C-no chemlite	Minimal-Green
<i>Examples:</i> any ambulatory casualty. This includes closed fractures/sprains/dislocations with good PMS, soft tissue injuries, mild TBI, anxiety, corneal abrasions		
Expectant/Dead	Hero-Blue chemlite	Expectant-Black
<i>Examples:</i> obvious death, massive head/spine trauma, other injuries incompatible with life, >70% burns		

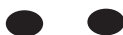
NOTES:

- Categories can be fluid, be prepared to re-assign.
- Constant reassessment in CCP is mandatory.
- Expectant patients in combat include patients who may be alive. In peacetime/civil SAR/HA ops: all live patients can be red if severe injuries. If resources allow in combat – treat live patients as red.
- In combat, assume all minimal patients will stay armed and engaged if no narcotics given.
- Time lines for exfil of 1 hour, 2–4 hours and 24 hours correspond to the categories.

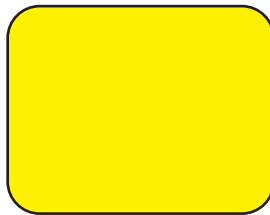
To MCI



Choke



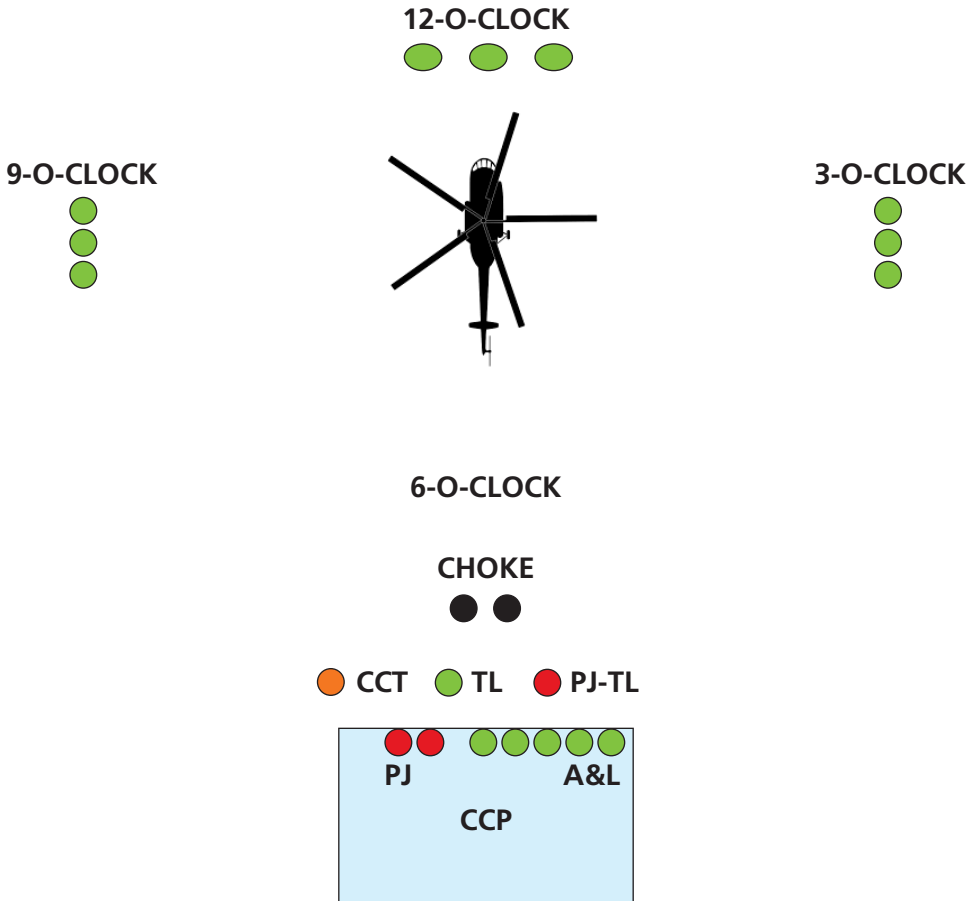
PJ-TL ●



CCP



Basic SAR Security Team Setup Diagram



15. Flight Operations

AE Concerns, Flight Stressors

1. Reduced partial pressure of oxygen – can worsen all aspects of pathophysiology.
2. Barometric pressure change – allows all air filled body cavities and medical devices to expand on ascent (e.g., pneumothorax can worsen). Gastric distension can worsen and impact ventilation.
3. Decreasing temperature – contributes to hypothermia, patient discomfort, and energy loss from shivering.
4. Reduced humidity – contributes to dehydration, thickened secretions, dry lips, and dry eyes.
5. Noise – contributes to difficulty communicating and is annoying to the patient.
6. Vibration and banking – may impact performing medical procedures, may increase pain from injuries, motion sickness, one of the stresses that contributes to increased patient fatigue.
7. G-forces – increase intracranial pressure, decrease venous return to heart, increase pain from fractures and severe soft tissue injuries.
8. Cumulative detrimental effect of the above stressors in conscious and unconscious patients is an important intangible, especially on a prolonged flight (e.g., may need to adjust maintenance pain med doses).
9. Vibration and movement affect reliability of monitors, especially BP and EKG. Finger pulse oximetry devices are often better for pulse oximetry than most market monitors.

Preparation:

1. Configure and load HH-60 cabin ensuring each team member knows where every item of gear is located.
2. Assign routines for exit and re-entry.
3. Assign and define roles of PJs depending on 1, 2 or 3 Cat A patients.
4. Do drills on these roles 1–2 × per week during deployments.
5. Re-check all electric and battery operated gear.
6. Have a checklist to use at the beginning of each alert.
7. Prep IV/blood lines/bags for missions based on Intel. Have IV and IO gear in immediately accessible locations, as well as emergency airway gear.
8. Have sharps shuttle in same place always.
9. Pre-load ketamine or other meds as operations dictate only when anticipated use is near. Consider for direct action, POI, CASEVAC scenarios. Put tape on syringe with sharpie noting time, day and medication dosage. **Discard unused medication at 24 hours.** Document with IDMT or logistics.

Loading patients:

1. If possible, assess VS and all prior interventions on ground outside rotor disc. Apply second Tq's as needed.
2. Consider having all patients who are not US or coalition “trauma naked”, must check for explosives and weapons, remove all blankets and clothes to replace with our blankets.
3. Search PUCs for weapons, cell phones (trauma naked if any questions prior to boarding aircraft). Examine oral cavity, skin folds, etc. There has been one case of a PUC who kept a phone sim card in his mouth and tried to spit it out at some point later in flight.

4. Secure blankets and loose items (duct tape, Velcro-straps) prior to entering rotor wash.
5. Re-check ear and eye protection.
6. Pre-arrange direction of loading patients so it is coordinated with location of gear/workspace.
7. If prolonged ground time, perform comm check with helo, update crew on number of patients: stretcher, ambulatory, category.

Communicating with aircrew:

1. Avoid unnecessary evasive maneuvers when possible with very sick patients.
2. Let the aircrew know that you are performing a critical procedure so they can try to fly steady.
3. If it is cold, or concerns for hypothermia, ask aircrew to put on heaters and if windows can be closed depending on threat.
4. Direct pilots to hospital you want to go to from a medical perspective.
5. Provide in-flight updates to aircrew of patient status on regular basis.

NOTE: Ensure proper medical planning has been conducted to include identifying the theater validating flight surgeon point of contact for any clarifying requirements for conducting patient movement throughout theater.

Fixed Wing Operations

1. Load gear first.
2. If present, load healthy evacuees first.
3. Category C patients second, closest to front, then Cat B. Load Category A last so they are closest to ramp and will not be delayed in off-loading to ambulances on landing.
4. Load masters are responsible for securing litters to the floor. PJs are responsible for securing the patients to the litters.
5. Make sure vents, monitors, O2, IV/IO lines, etc. are secured.
6. If one PJ is responsible for more than one Cat A patient, configurations while flying which keep the patients head to head either long ways or sideways allow favorable management.
7. Set up monitors, etc. at the patient's feet/lower extremities or along the side of the litter or airframe to facilitate monitoring and to enable access to the patient's head and torso.
8. When possible: load patients in shock feet first for take-off and head first for landing.
9. When possible: load patients with TBI head first for take-off and feet first for landing.
10. For trans-continental and long flights, refer to the extended flight pack outs for the C-130 to provide sufficient comfort items for evacuation missions of large groups (10–30 personnel).
11. Plan on 8–14 hour flights and have gear and contingency plans if the plane has to land and stay down unexpectedly. Have 3 days of emergency food and water.
12. Ensure all gear is charged and have power sources compatible with aircraft power sources.
13. Use sleeping pads or other padding on the stretchers.
14. Roll the patient on to their side every 30 minutes to prevent pressure ulcers.
15. Maintain personal hydration on long flights, ensure adequate urination. Use electrolyte drinks for warm weather ops/flights when no air conditioning is present. This will replace potassium and glucose lost with perspiration.
16. Manning permitted, assign work rest cycles.

17. Assign a PJ to monitor the Cat B and A patients.
18. Use aircrew and other evacuees/patients to help as needed to bag, etc. Train them to watch monitors and identify triggers for which they will alert you.
19. Lean towards chest tubes when able for patients who have had a pneumothorax decompressed. Otherwise be vigilant on watching the patient for increasing heart rate, decreasing blood pressure, and O2 saturation.
20. ET Tubes and some supraglottic airway devices will expand and contract with significant changes in altitude. Upon insertion fill the cuff with air to sense of balloon contact with tracheal wall, do not overinflate. If flight proceeds >1000 feet above take-off altitude, re-check to tactile feedback every 15 minutes and avoid over pressurization of the balloon.

CAUTION: Under no circumstances should the cuff be filled with saline, this has been proven to exceed the pressure associated with tracheal mucosal blood flow occlusion.

16. Diving Emergencies

Guidelines and Considerations

- Transport rapidly to nearest hyperbaric chamber at or below the pressure altitude of the point of departure/injury. If possible administer 100% oxygen by demand-valve mask during transport.

CAUTION: Transportation by air at an altitude up to **200** feet above the point of departure/injury may be done without major risk of worsening the patient's symptoms, but should **NOT** be considered when ground transportation is readily available and would not take much longer.

- When in doubt consult the unit DMO/HMO/DMT or transport to chamber.
- Have evac plan before dive. Know where hyperbaric oxygen chambers are.
- Every member of the team should have the telephone number of both the dive chamber and the trauma center or emergency room pre-programmed into their phones, along with the addresses.

BLUF:

- Diagnose dive emergencies immediately: perform full history, physical exam, and neuro exam.
- Provide supportive care (ABCs, prevent hypothermia)/100% O₂.
- Transport to dive chamber.
- Any loss of consciousness during the dive or within 10 minutes of surfacing should be assumed to be an arterial gas embolism (AGE).

Non-Traumatic Dive Injuries:

1. Perform a physical/neurological assessment to determine if treatment is required.
2. If deficit is found during exam, place diver on 100% O₂.
3. Transport diver and dive buddy to recompression chamber per dive med plan.
4. Treat symptoms en route.
5. Collect dive profile and patient history from both diver and dive buddy.
6. IF DIVER IS PULSELESS/APNEIC, ACCESS TO ACLS CARE TAKES PRIORITY OVER RECOMPRESSION TREATMENT.

Traumatic Dive Injuries:

Treat traumatic injuries per appropriate protocol. If there is **any** suspicion of a non-trauma injury, treat as-if and transport to a recompression chamber.

Open Circuit Diving Emergencies

Pulmonary Overinflation Syndromes (including A.G.E.)

Characterized by a sudden onset occurring during or immediately after ascent (unconsciousness or other neurological symptoms usually developing within **10 minutes** of coming to the surface). Injuries include subcutaneous emphysema, mediastinal emphysema, pneumothorax, arterial gas embolism (AGE) or respiratory arrest.

Signs and Symptoms:

- Altered mental status
- Crepitus and swelling of the neck
- Voice change
- Dyspnea
- Difficulty swallowing
- Syncope
- Shock
- Shortness of breath
- Dizziness
- Blurred vision
- Vertigo
- Paralysis or weakness of extremities
- Loss of sensation
- Chest pain

NOTE: Some patients with AGE may exhibit a 'lucid interval', where the symptoms will improve for a short time after initial onset. Do not delay evacuation in such cases.

Treatment:

1. ABCs/High flow O₂/IV NS/LR KVO/Hypothermia prevention.
2. Begin resuscitation if required.
3. 100% O₂ (or highest % avail) via tight fitting aviator's mask with a demand valve.
4. If symptomatic pneumothorax identified, treat accordingly.
5. Arrange for immediate evacuation and recompression.

Decompression Sickness (DCS)

DCS is usually seen after surfacing, with the majority of cases occurring within 3 hours after completion of dive. Signs and symptoms can occur immediately or after a sustained period; however, onset of symptoms after 24 hours is highly unusual.

NOTE: Previously DCS was divided into Type 1 and Type II. This is still in use by divers. The medical community classifies DCS by the organ system affected.

DCS Type I (musculoskeletal):

Type I decompression sickness includes joint pain (musculoskeletal or pain-only symptoms) and symptoms involving the skin (cutaneous symptoms), or swelling and pain in lymph nodes.

DCS Type II (nervous system):

Type II DCS symptoms are divided into three categories:

1. Neurological
2. Inner Ear (staggers)
3. Cardiopulmonary (chokes)

CAUTION: Chokes in the presence of DCS is a rare but grave sign. Most commonly seen in aviators from rapid decompression or from emergency ascents during saturation dives.

Treatment (DCS):

1. ABCs/High flow O₂/IV NS/LR KVO; Begin resuscitation if required.
2. 100% O₂ (or highest % available) via tight fitting aviator's mask with a demand valve.
3. Perform a complete neurological exam.
4. Evacuate ASAP for recompression.

Barotrauma

Ear Squeeze, Middle Ear Squeeze, Sinus Barotrauma, Reverse Squeeze, Dental Barotrauma

Ear Squeeze Signs and Symptoms:

1. Pain not relieved by Valsalva
2. Hemorrhage and/or edema in ear canal
3. In severe cases, the tympanic membrane (TM) may rupture
4. Vertigo

Treatment:

Conduct visual exam of TM. Keep ear canal dry. No diving until ear is healed. No ear drops if TM ruptured. Consider antibiotics if damage to TM is moderate to severe.

Sinus Barotrauma Signs and Symptoms:

1. Pain over affected sinus on descent (pain will subside with equalization)
2. Blood or mucus from the nose on ascent

Treatment:

1. Symptomatic pain relief
2. Decongestants
3. Antibiotics if infected

Dental Barotrauma Signs and Symptoms:

1. **Gum Abscess:** Dull pain on ascent
2. **Root Abscess:** Dull pain on descent

Treatment:

1. Analgesics PRN
2. Dental repair

Reverse Squeeze:

May be external ear, sinus, or dental

Signs and Symptoms:

1. Sharp pain on ascent (pain is relieved by descending a few feet [bouncing])
2. Bloody discharge in mask

Treatment:

Decongestants. No ear drops if TM ruptured
Consider antibiotics if damage to TM is moderate to severe

Oxygen Toxicity: Pulmonary and CNS

Pulmonary: Results from long exposures to elevated O₂ partial pressures and is characterized by lung irritation with coughing and painful breathing. Symptoms become increasingly worse as long as elevated levels of O₂ are breathed.

CNS:

1. May occur suddenly and dramatically. May have a gradual onset.

Think **VENTID-C**:

- **V**isual: Tunnel vision (a decrease in peripheral vision) or blurred vision
- **E**ar symptoms: Tinnitus
- **N**ausea and/or vomiting
- **T**witching: Generally involves the facial muscles, but can involve arms/legs.
- **I**rritability: Change in diver's mental status
- **D**isability: Sudden neurological deficit
- **C**onvulsions

Treatment:

1. Remove O₂ source, allow diver to breath fresh air and symptoms to subside
2. Perform physical/neuro exam to rule out other injury

Hypercarbia (CO₂ Buildup)

1. Generally results from inadequate ventilation or failure of absorbent canister to remove CO₂ from exhaled gas
2. May also result from flooding of the canister

Signs and Symptoms (Hypercarbia):

1. Increased respiratory rate and depth of breathing, labored breathing
2. Headache
3. Confusion, lethargy, sleepy, declining level of consciousness
4. Unconsciousness

NOTE: High partial pressures of O₂ may reduce the early symptoms of CO₂ buildup. Elevated CO₂ levels may cause an episode of CNS toxicity on a normally safe dive profile.

Treatment:

1. Increase ventilation (if skip breathing is a cause) and decrease exertion level.
2. Abort dive, return to surface and breathe air.
3. **During Ascent:** While maintaining a vertical position the diver should activate the bypass valve to add fresh gas to his UBA. If related to canister flood-out the vertical position will reduce chance of caustic cocktail.
4. **IF UNCONSCIOUS**, follow procedure for underwater convulsion.

CAUTION: If CO₂ toxicity is suspected the dive should be aborted even if symptoms dissipate at the surface. The decrease in symptoms may be a result of the reduction of partial pressure of CO₂ as the diver ascends and will reappear upon return to depth.

Hypoxia

Caused by the partial pressure O₂ being too low to meet metabolic needs. In closed circuit diving, cause is too much nitrogen in the circuit due to an inadequate purge.

Signs and Symptoms:

1. Frequently no warnings signs prior to loss of consciousness.
2. Other symptoms include confusion, agitation, incoordination, dizziness and convulsions.

NOTE: If symptoms of unconsciousness or convulsions occur at the beginning of a closed circuit dive, hypoxia, not O₂ toxicity, is the most likely cause.

Treatment:

Remove mouthpiece, allow diver to breathe fresh air. If unconscious, check breathing and circulation, maintain open airway, provide 100% O₂.

Chemical Injury

The introduction of a caustic alkaline solution into the upper airway is the result of water leaking into the canister and coming in contact with CO₂ absorbent ("caustic cocktail"). Generally occurs when diver is in a horizontal or head down position.

Signs and Symptoms:

1. Rapid breathing or headache related to buildup of CO₂.
2. Choking, gagging, foul taste, and burning of the mouth and throat, will begin immediately.

Treatment:

Rinse mouth out several times with fresh water. Several mouthfuls should then be swallowed. If only seawater is available, rinse mouth, do not swallow.

NOTE: Do not use acid solutions or induce vomiting. Uncontrolled ascent common. Monitor for AGE.

Neurologic Exam:

This examination is designed to detect CNS problems and serves as a method to monitor for changes in neurological function resulting from DCS or POI. The exam should be conducted on any diver who experiences pain, discomfort, alteration in sensation or body function, or any other symptom within 24 hours of completion of a dive. The exam should be repeated every 30-45 minutes or more frequently if the diver's condition is deteriorating.

Perform a Dive Medical History:

- Patient name
- Date/Time
- Symptoms
- Past history
- Allergies
- Type of dive last performed (equipment, profile, etc.)
- Number of dives in last 24 hours
- Was symptom noted before, during, or after dive?
- If during, was it while descending, on the bottom, or ascending?
- Has symptom increased, decreased, or stayed the same?
- Other symptoms? When?
- Has patient had similar symptoms before? When?
- Has patient had DCS or AGE before? When?

Perform the PJ Neuro Exam – see Chapter 19**Additional Notes (Diving):**

- U.S. Navy Dive Manual
 - <http://www.supsalv.org>
- Diving Alert Network (Duke University): (919) 684-9111
 - <http://www.diversalertnetwork.org/>

17. Aerospace Accident and Injuries

As PJ first responders, it is very helpful to understand mechanism of injuries (MOI) and patterns of associated injuries. An understanding of MOI helps to identify what injuries to look for and to anticipate those that might be life threatening. This is especially important in circumstances when verbal communication with the patient is limited, as in the back of any type of aircraft.

Pilot Ejection Injuries

1. Basic principles when treating ejection injury patients
 - a. Be prepared above all for penetrating trauma – the “golden hour” is when lives are saved.
 - b. Be prepared for airway injury, head trauma, and non-ambulatory pilots.
 - c. Pilots surviving aircraft ejection frequently sustain vertebral and extremity fractures. Proper packaging of such patients may result in salvage of neurologic function in severe cases.
 - d. If such packaging requires any kind of risk to the Medic or pilot, abandon attempts at spinal immobilization in favor of a prompt return to safety.
 - e. If there is injury by ground fire, rapid hemorrhage control will make the difference between life and death.
2. Factors affecting pilot ejection injuries
 - a. Aircraft
 - i) speed
 - ii) altitude
 - iii) attitude
 - b. Pilot
 - i) Extraneous or poor fitting gear, harness, helmet
 - ii) Body position in ejection seat
 - c. All of the above are affected by the pilot’s level of consciousness
3. Causes of known combat ejection injuries
 - a. Body Part Flail 33%
 - b. Enemy inflicted 17%
 - c. Ejection seat G forces 14%
 - d. Struck object 13%
 - e. Parachute landing 11%
 - f. Fire 10%
 - g. Parachute opening shock 2%
 - h. Vertebral injury
4. Pre-ejection injuries – time from initial aircraft emergency until ejection is initiated
 - a. Fire
 - i) burns
 - ii) smoke inhalation
 - iii) blindness
 - iv) loss of consciousness
 - b. Explosion
 - i) wide range from lacerations to multiple extreme injuries
 - ii) shrapnel wounds
 - 1) “Pilots sustaining shrapnel wounds from primary or secondary projectiles usually die.”

- c. Negative Gs
 - i) head or neck strain
 - ii) cervical fracture
 - iii) loss of consciousness
 - 5. Ejection injuries
 - a. Ejection seat forces
 - i) pelvis fracture
 - ii) spinal compression fracture
 - b. Struck by seat or cockpit object or canopy
 - i) concussion/TBI
 - ii) head and neck lacerations/strains/compression fractures
 - iii) extremity fractures and lacerations
 - 1) especially legs and feet
 - iv) internal organ injuries due to catapult forces from ejection seat
 - c. Airstream entry injuries
 - i) Windblast injuries
 - 1) Petechial/conjunctival/retinal hemorrhage
 - 2) Flail injuries
 - i. Unconsciousness
 - ii. Neck strain or fracture from helmet/head rotation
 - iii. Extremity fractures
 - a. Especially humerus and tibia/fibula
 - iv. Joint dislocations
 - a. Especially shoulder and knee
 - 3) "Windblast erosion" causing exposure injuries
 - i. Torn clothes, boots pulled off, helmet visor shattered, helmet lost
 - ii. Temperature exposure
 - 4) Low temp exposure is of little significance if protective equipment is properly fitted and worn and not lost during the ejection
 - 5) 3rd degree burns can result from the ejection seat launch
 - ii) Tumbling/rotational stress injuries/"flat spin"
 - 1) Tearing and rupture of thoracic and abdominal organs
 - i. Cardiac injury is especially critical
 - 2) Unconsciousness
 - 3) Hemorrhage and edema in eyes, ears, sinuses, lungs, brain
 - iii) Strikes from aircraft debris causing blunt or penetrating injury
6. Parachute related injuries (see parachute injury section for further details)
 - a. Deployment
 - b. Descent
 - c. Landing
7. Generalized shock from the trauma of the aircraft escape event

Parachute Injuries

1. Most common injuries
 - a. Closed head injury/concussion 30%
 - b. Fractures – ankle/back 15%
 - c. Sprains – ankle/back 15%
2. Factors that increase risk of parachute injury
 - a. Extrinsic factors (not related to the individual parachutist)
 - i) High wind speeds
 - ii) Night jumps
 - iii) Heavy loads
 - 1) Significant increase in injury rates and severity when jumpers wore combat equipment
 - iv) Rough landing zones
 - v) Smaller diameter canopies
 - vi) Fixed-wing aircraft exits (vs rotary-wing)
 - 1) Higher rate of injury with side-door vs tailgate exits
 - vii) Extra equipment
 - viii) More jumpers in the air lead to entanglements
 - ix) Higher temperatures cause less dense air and faster descent velocities
 - b. Intrinsic factors (related to the individual parachutist)
 - i) Female gender
 - ii) Greater body weight
 - iii) Older age
 - iv) Less upper body muscular endurance
 - v) Lower aerobic fitness
 - vi) Prior injuries
3. Altitude Injuries
 - a. Upper and lower extremity injuries accounted for 66% of injuries at altitude
 - i) UE injuries are more common than LE injuries
 - ii) LE injuries are more severe than UE injuries
 - b. Exit from aircraft:
 - i) Aircraft strike
 - ii) Towed parachutist
 - 1) trauma from hitting plane repeatedly
 - iii) Static line entanglement extremity injuries
 - 1) fractures
 - 2) dislocations
 - 3) intrasubstance biceps muscle tears
 - 4) de-gloving injuries
 - 5) compartment syndrome
 - c. Parachute deployment:
 - i) Parachute “opening shock” deceleration
 - 1) cervical fractures/sprains
 - 2) cervical vertebral dislocations
 - 3) shoulder trauma including dislocation and soft tissue trauma to ligaments and the rotator cuff
 - 4) upper extremity muscle strains and biceps tendon ruptures

- ii) Riser slap
 - 1) facial fractures
 - 2) contusions
 - 3) lacerations
 - iii) Suspension line entanglement extremity injuries
 - 1) 63% of severe injuries
 - 2) fractures
 - 3) shoulder and hip dislocations
 - 4) intrasubstance biceps muscle tears
 - 5) de-gloving injuries
 - 6) compartment syndrome
 - 7) knee ligament injuries 37%
 - iv) Strikes from unsecured equipment
 - v) Midair collisions with other parachutists
- d. Parachute descent
 - i) High altitude
 - 1) frostbite
 - 2) hypoxia
 - 3) hypothermia
 - ii) High speed rotation and spinning (see also section 5ciii [page 192] in Pilot Ejection Injuries)
 - 1) severe pain
 - 2) hemorrhages
 - 3) unconsciousness
 - 4) suspension line entanglement injuries
- 4. Parachute landing
 - a. Ground impact and inability to execute a proper PLF account for 49% of injuries
 - b. Concussion/TBI
 - c. Fractures of the ankle, tibia/fibula, femur, pelvis, spine
 - d. Knee ligament injuries
 - e. Tree landing
 - i) lacerations
 - ii) fractures
 - iii) impalement of tree limbs
 - iv) Parachute suspension for prolonged period (aka “Suspension Trauma” and “Hanging Harness Syndrome”):
 - 1) Poorly defined but related to anyone in a harness and is stationary and vertical, tourniquet effect from leg loops on back of thighs
 - 2) Third spacing in the lower extremities resulting in hypotension and shock
 - 3) Possible reperfusion injury: treat per *CRUSH Protocol* for hyperkalemia, acidosis and myoglobinuria
 - 4) Can have onset in short time (~10 minutes) and result in loss of consciousness and death
 - 5) Swift action must be undertaken
 - f. Water landing
 - i) entanglement in equipment
 - ii) water in lungs and stomach
 - g. Burns from descent into or near aircraft fireball/wreckage

Rotary Wing Injuries

1. The article referenced includes a review of 84 autopsies of pilots killed in helo accidents.
2. Contact injuries/blunt traumas are a greater concern than deceleration forces.
3. Use of head protection and shoulder restraint can significantly influence injury patterns.
 - a. 50% of fatalities in survivable US Army helo accidents were caused by head strikes.
 - b. Head injury can be fatal or severely impair the ability to escape the post-crash environment and the associated hazards.
 - c. Statistically significant injury patterns:
 - i) Facial bone fractures are associated with brain lacerations and rib fractures
 - ii) Rib fx's are associated with lung/heart lacerations, injury to liver, aorta, spleen
4. Primary Cause of Death
 - a. Blunt trauma 88%
 - b. Thermal (Burns) 4–5%
 - c. Drowning
 - d. Exsanguination
 - e. Inhalation of smoke and toxic gases
 - f. Hypothermia
 - g. Asphyxia
5. Traumatic Injury by body region
 - a. Head
 - i) Skull fractures 51%
 - ii) Facial bone fractures 47%
 - iii) Brain injuries 67%
 - b. Thorax
 - i) Lung injury 60%
 - ii) Heart 41%
 - iii) Aorta 38%
 - iv) Sternum fracture 25%
 - c. Abdomen
 - i) Lower incidence of injury than other body regions
 - ii) Spleen 32%
 - iii) Liver 47%
 - iv) Pelvis fracture 30%
 - d. Fractures
 - i) Upper extremity
 - 1) Clavicle 21%
 - 2) Humerus 25%
 - 3) Radius/ulna 16%
 - ii) Lower extremity
 - 1) Femur 27%
 - 2) Tibia 34%
 - 3) Fibula 31%
 - iii) Pelvis 30%
 - iv) Spine
 - 1) Thoracic 30%
 - 2) Cervical 25%
 - 3) Lumbar

Human Space Flight Medical Considerations

1. Kinetics of Trauma & Mechanisms of Injury

- a. Significant G forces can occur during ascent aborts, re-entry anomalies and hard landing. Injuries depend on the level, axis and duration of G force. Some test have shown up to 20G for a few seconds.
- b. Potential injuries can include, but are not limited to:
 - i) Head, neck, and spine injury
 - ii) Bit tongue
 - iii) Blunt trauma
 - iv) Internal organ collision
 - v) Musculoskeletal trauma
 - vi) Underlying causes of the abort can also expose crew to toxic gases or fire

2. Hazardous Gas Exposure

- a. All of the space craft use hazardous gases as propellants and coolants for their vehicles. Exposure risk includes:
 - i) Inhalation injury
 - ii) Skin contact
 - iii) Eye contact
- b. Possible Progression of Signs and Symptoms
 - i) Eye/nasal irritation
 - ii) Salivation, rapid breathing, cough, sore throat
 - iii) Emesis
 - iv) Diarrhea, pupil dilation, ataxia
 - v) Impaired memory/alertness
 - vi) Pulmonary edema
 - vii) Tremors, convulsions
 - viii) Loss of consciousness
- c. Assessment and Treatment
 - i) Follow standard PJ patient assessment checklist
 - ii) Scene size-up and decontamination
 - 1) Don PPE and immediately move from the contaminated environment.
NOTE: all of the gases are water soluble
 - 2) Remove all contaminated clothing
 - 3) If the patient is stable, begin copious skin and eye irrigation immediately
 - 4) Continue irrigation for at least 20 minutes
 - iii) Airway & Breathing
 - 1) Consider use of warm humidified O2 if able
 - 2) If SI/Sx of inhalation injury, be prepared for early intubation or RSI
 - 3) If SI/Sx of pulmonary edema, be prepared to use the vent with PEEP
 - 4) PEEP must be added manually on the SAVE II vent
 - iv) Treat cutaneous irritations and burns IAW with standard chemical burn protocols
 - v) Continue to monitor and reassess
 - 1) Vitals to include EtCO2 and SpO2 if able

- 2) Watch for hypotension and dysrhythmias
- 3) Maintain high suspicion for methemoglobinemia
 - i. SpO2 may appear normal but patient appears cyanotic and dyspneic – chocolate brown blood

vi) Medications

- 1) Establish IV
- 2) Consider antibiotics for prophylaxis with airway and ingestion burns
- 3) Consider corticosteroids for airway edema
- 4) Consider aerosolized bronchodilators
- 5) Consider antihistamines
- 6) Consider 1% methylene blue for methemoglobinemia
 - i. Accelerates the reduction of methemoglobin to hemoglobin indicated for the treatment of patients with methemoglobinemia
 - ii. Dose: 1mg/kg intravenously over 5 minutes. Repeat in 1 hour if needed
- 7) Consider pyridoxine (B6) for pulmonary edema, seizures
 - i. Hydrazine effects the CNS in a way that may prevent benzodiazepines from being effective
 - ii. Consider use when inhalation of vapors has produced pulmonary edema and seizures
 - iii. Dose: 25mg/kg, slow IV over 30-60 minutes if seizing

3. Decompression Sickness

- a. The crew members wear pressurized suits. Suit pressure and flow of air is controlled by an Environmental Controls and Life Support System (ECLSS). Each vehicle has its own unique suit design. Individual suit removal and associated hands on training is covered in a separate lesson
- b. If the rescue team suspects DCS, they need to treat accordingly and coordinate transport to MTF's with chamber capabilities

4. Long-Duration Space Flight Physiology

a. *Musculoskeletal System*

- i) Bone density decreases by 1.3–1.5% per month. Mitigated by exercise
 - 1) Theoretical risk of kidney stones secondary to calcium excretion. Risk greatest in 6–12 months post-landing
- ii) Muscle atrophy by 10–20% on short missions or as high as 50% on long missions without exercise. Peak power decreases by 30–35%
- iii) There is a 2–6cm increase in spinal length
- iv) Signs/Symptoms:
 - 1) Weakness, fatigue, poor coordination
 - 2) Impaired physical ability
 - 3) “Everything feels so heavy”
 - 4) Movements are very slow and very deliberate
 - 5) Soft tissue bumps and bruises
 - 6) Risk of long bone fractures
 - 7) Risk of herniated disks/spine injuries and pelvic fractures
- v) Treatment:
 - 1) Always provide assistance with ambulation

- 2) Treat specific traumatic injuries IAW PJ handbook or local protocols
- 3) Rest

b. Cardiovascular System

- i) On earth: Gravity exerts a downward force, sets up a vertical hydrostatic gradient. When standing, some 'excess' fluid resides in vessels/tissues of the legs
- ii) In space: Loss of the hydrostatic gradient. Some fluid quickly redistributes toward the chest and upper body. Sensed as 'overload' of circulating blood volume. The newly sensed 'excess blood volume' is adjusted by reducing volume 12–15%. Red blood cells are adjusted downward to maintain a normal concentration (relative anemia)
- iii) Upon return to Earth: Gravity again pulls the fluid downward. Now there is a relative 2–3L deficit in both circulating fluid and red blood cells
- iv) Signs/Symptoms:
 - 1) Orthostatic intolerance
 - 2) Decreased BP
 - 3) Increased HR
 - 4) Nystagmus and/or blurry vision
 - 5) Weakness
 - 6) Syncope
 - 7) Confusion
 - 8) Nausea
- v) Time course: from landing up a few days
- vi) Treatment:
 - 1) Oral fluids if tolerating
 - 2) 1L NS fluid bolus challenge, titrate as needed
 - 3) Consider medications for nausea – caution for urinary retention and dose adjustment
 - 4) Rest
 - 5) Monitor vitals
 - 6) With trauma, may need blood sooner than stage 3 shock

c. Neurosensory System

- i) Inputs are immediately and radically altered in weightlessness because the gravitational orientation is absent. Eventually there is adaptation to position sense and motion in three dimensions without gravity. Upon returning to earth, the neurovestibular system is still adapted to micro or zero gravity.
- ii) Signs/Symptoms:
 - 1) Vertigo
 - 2) Unstable gait
 - 3) Nausea and vomiting – can be difficult to control the first few hours
- iii) Time course: Time of landing up to 72 hours post-landing
- iv) Treatment:
 - 1) Avoid rapid head movements, Slow but progressive increase in activity
 - 2) Meclizine 25mg PO (pre-treatment and second dose)
 - 3) Lower dose of promethazine (Phenergan) 6.25–12.5mg IM
- v) Special considerations
 - 1) Patient may have been pre-treated with meclizine, scopolamine or Phenergan
 - 2) They may also have performed fluid loading with salt tablets
 - 3) Be careful with double-dosing a patient who was pre-treated

d. **Urinary System**

- i) Spaceflight is associated with many factors which may promote urinary retention. Females 4x more likely to develop retention than males. An astronaut with urinary retention is 25x more likely to have a UTI.
- ii) Anticholinergic and antihistamines affect bladder muscle function which increases the risk of developing urinary retention in spaceflight. Phenergan increases risk 3x.
- iii) Signs/symptoms:
 - 1) Inability to urinate
 - 2) Painful urination
 - 3) Catheterization inflight
- iv) Treatment:
 - 1) If patient can't urinate and has severe distention of the bladder consider using straight catheters (red robin)
 - 2) If the issue persist during extended field care consider indwelling Foley catheter
 - 3) Antibiotics prophylactically or for suspected UTI

e. **Spaceflight Associated Neuro-Ocular Syndrome (SANS)**

- i) US astronauts have developed some or all of the following findings either during or following a six month spaceflight the main hypotheses is due to fluid shift
 - 1) Optic disk edema (papilledema)
 - 2) Cotton wool spots
 - 3) Degradation in near vision
 - 4) Choroidal folds
 - 5) Optic nerve sheath distention
 - 6) Optic nerve kinking
 - 7) Globe flattening
 - 8) ↑ CSF pressure post flight 5/6 subjects: 21.0–28.5 cmH2O
- ii) Incidence: ~ 60% of crew members have at least one sign SANS
- iii) Symptoms: Decreased near vision
- iv) Time course: Landing to years post landing
- v) Treatment:
 - 1) No treatment in the field
 - 2) Document PERRLA and subjective information given from patient
 - 3) **NOTE:** SANS does not cause headaches. If astronaut complains of headache and vision changes, look for cause of headache. Call med control if unsure.

f. **Altered Immune Function**

- i) Possible causes of space flight-induced immunosuppression are:
 - 1) Micro or Zero gravity
 - 2) Stress
 - 3) Exposure to radiation
- ii) Use higher index of suspicion when considering infection as possible cause of illness
- iii) Use proper sterile, aseptic techniques and infection control during procedures
- iv) During an extended field care phase, use proper field hygiene and sanitation techniques
- v) Communicate potential altered immune function to receiving MTF
- vi) Consider early prophylaxis

g. *Post-Landing Psychological Issues*

- i) The crew usually works hard to keep sleep nominal up until the “sleep shift” for undock and landing, to mitigate sleep deficit going into landing ops. Very long work day from wake to sleep (can be 24+ hours).
- ii) Physical toll on the body from re-entry and landing as well as with experiencing gravity again can lead to a profound exhaustion
- iii) In their increased fatigue state, Astronauts appreciate direction and Rescue personnel should expect them to follow directions
- iv) Failure to follow directions may be a red flag of some other underlying condition

5. *Death of Crew*

- a. Confirm no vital signs present or definitive signs of death
- b. Report MED CODE BLACK
- c. Make best effort to preserve any evidence
 - i) Do not remove the suit, gloves, boots or helmet
 - ii) Cut seat belt straps leaving connections closed
 - iii) If able film or photograph ECLSS connections before removing
- d. If expired during patient care
 - i) Do not remove any treatments
 - ii) Separate and preserve personal belongings that may have been removed during treatment
 - iii) Preserve the suit, gloves, boots and helmet they were in
- d. Place in body bag
- e. Isolate from view if able
- f. Await instructions from higher headquarters regarding actions at port of entry
- g. Armed Forces Medical Examiner will coordinate pick up with NASA and DoD Human Space Flight Support Office

18. Weapons of Mass Destruction (WMD)

Guidelines and Considerations:

The potential to cause physical destruction and death varies with each type of WMD. Conventional explosives can cause serious damage to a limited area, but rarely effect more than a city block or two. Nuclear bombs can cause utter destruction of property and very high death and injury rates in the area of the blast. Chemical weapons, at least in theory, can kill even more people because a small amount of agent can be spread over a wide area such as a densely populated metropolitan region. Physical destruction of property is minimal but environmental contamination can be serious and prolonged. Biological weapons, because of their insidious nature and ability to spread initially unnoticed, can potentially cause huge numbers of deaths. The table below provides a perspective on the comparative lethality of the various forms of WMD.

NOTE: The antidotes named in this section are not part of the standard PJ packing list. Prior coordination will be required to ensure they are carried if a WMD threat is anticipated.

Likelihood of Risk and Potential Overall Destructive Power		
Weapon	Likelihood	Destructive power
Conventional explosive	Highest	Lowest
Chemical agent	Moderate	Moderate
Biological agent	Moderate	Moderate-high
Nuclear weapons	Lowest	Highest

Pre-hospital Approach:

The general pre-hospital approach to dealing with WMD is similar to that of any disaster. The principles of disaster response remain the same, with few additions. Local regional and state disaster plans should consider the possibility of WMD attacks. Consider the following in the approach to WMD response:

- Personal and public safety
- Contain the hazard
- Control access
- Implement appropriate Incident Command System
- Triage and treat casualties
- Protect the crime scene.

The current state of society and technology makes incidents more likely both at home and overseas. The PJ role in the face of this threat is to:

- plan and prepare for the event
- respond safely (to include utilizing PPE)
- provide the triage needed
- provide decontamination
- perform assessment
- perform patient care
- provide transport

Five forms of mass destruction weapons – typically the acronym used for these weapons is **B-NICE**:

1. **B**iological contamination
2. **N**uclear detonation
3. **I**ncendiary fires
4. toxic **C**hemical release
5. conventional **E**xplosives

Care of Explosive and Incendiary Injuries:

Bombs and incendiary devices remain the weapon of choice for terrorists. The most common is the Improvised Explosive Device (IED). IEDs often inflict multiple injuries upon a patient, making individualized treatment for each wound difficult, if not impossible in certain settings. Primary focus remains on the airway, control of bleeding, resuscitation, immobilization, and splinting.

CBRNE Casualty Assessment

CRESS is the NATO method for CBRN Casualty Assessment to quickly determine the agent of concern, conduct triage and recognize symptoms.

- C** – Consciousness (unconscious, convulsing or altered?)
- R** – Respirations (present, labored or absent?)
- E** – Eyes (pupil size, PERRLA?)
- S** – Secretions (absent, normal, increased?)
- S** – Skin (diaphoretic, cyanotic, dry or hot?)

Example: a severe nerve agent casualty would present as unconscious and seizing; absent respirations; miosis and dim vision; excessive secretions; diaphoretic and cyanotic.

Compared to a Mustard casualty presenting as conscious; labored (delayed); gritty eye sensation progressing to redness, severe swelling, and blindness; normal secretions, normal skin progressing to redness with delayed onset blisters and pain.

NOTE: Remember to take into account the effects of associated trauma with poisoning may mask or confuse the CRESS assessment.

CBRNE Casualty Approach

Goals: Limit and minimize exposure and contamination; treat the immediate life threat and administer appropriate antidotes, countermeasures.

Utilize “MARCH Squared” written $(MARCH)^2$ or $M^2A^2R^2C^2H^2$

POI actions:

- **M**assive Hemorrhage, **M**ask/Air Check
- **A**irway, Administer **A**ntidotes (ATNAA, CANA)
- **R**espirations, **R**apid Spot Decontamination (RSDL)

Dirty CCP as able:

- **C**irculation, Administer **C**ountermeasures
- **H**ypothermia, **H**ead Wound
- **E**xtraction, **E**vacuation

NOTE: CBRN Casualties take twice as long to treat as conventional wartime casualties. Reasons for this are the added complexity of working in PPE and the complexity of CBRN Trauma and Poisoning.

Limiting exposure and the catastrophic impacts of hypothermia will be some of the medic's biggest hurdles.

Care of Chemical Agent Injuries

There are five major types of chemical agents:

1. Nerve Agents
2. Vesicants
3. Cyanide
4. Pulmonary agents
5. Riot control agents

Nerve agents:

The signs and symptoms of nerve agent poisoning will depend on the dose and route of the exposure. In general, larger doses and direct inhalation of nerve agent vapor result in quicker onset and greater severity of effects. The most important effects of nerve agents are on the lungs, airway and the nervous system. Nerve agents exert their toxic effects by inhibiting or blocking the action of acetylcholinesterase (AChE), a critical enzyme. AChE is found in the plasma, red blood cells and nervous tissue. Although nerve agents will affect the enzyme in all three areas, it is the neurological effects which are the most important.

The mnemonic **SLUDGE** helps identify some of these findings:

- **S**alivation
- **L**acrimation
- **U**rination
- **D**efecation
- **G**astric
- **E**emptying

Key Measures in Resuscitating Nerve Agent Patients

- Secure the airway and provide positive pressure ventilation
- Administer atropine and 2-Pam-Chloride
- Administer Valium if supplied. Otherwise utilize Versed
- Repeat atropine as needed

Guidelines for Initial Antidote Dosing in Nerve Agent Exposure for Adults			
Symptoms	Who administers	Drug	Route
MILD miosis, blurry vision, mild dyspnea, runny nose or mydriasis and tachycardia	Self/Medic	Atropine 2mg plus 2-PAM-chloride 600mg (one Mark I). Repeat in 10 minutes.	autoinjector
SEVERE above plus severe dyspnea, generalized fasciculations, convulsions, unconscious	Medic	Atropine 6mg plus 2-PAM-chloride 1800mg (three Mark I's). Valium 10mg	autoinjector IV, IM
Continued resuscitation	Medic	Above plus, atropine 2mg every 5 minutes up to 20mg total, plus Valium 5mg every 5 minutes up to 20mg total.	IV, IM, ET or autoinjector

Vesicants:

Vesicants are a group of chemical agents that cause damage to exposed skin, lungs, and eyes and can also cause generalized illness if a significant amount is absorbed. They have been traditionally called “blister agents”. These agents will cause localized blistering, burning and tissue damage on contact. All vesicants except phosgene oxime (also known as CX) are thick, oily liquids.

Assessment:

Vesicant agents cause:

- Burning
- Erythema
- Blistering
- Necrosis of exposed skin
- Eye contact results in:
 - Stinging
 - Tearing
 - Ulcer formation
 - Blindness
- Inhalation of vesicant vapors causes:
 - Shortness of breath
 - Cough
 - Wheezing
 - Pulmonary edema
- Other nonspecific symptoms include:
 - Nausea
 - Vomiting
 - Fatigue
 - Lethargy

Emergency Care:

The most important action when caring for a vesicant-exposed patient is immediate removal of the agent. Immediate irrigation with water or a chemical decontamination kit is crucial. Medical treatment includes continuing irrigation and decontamination. The type and amount of irrigation used is dependent on the available water supply. Ideally a hose (low pressure) provides plenty of water, when necessary a canteen can be used because small amounts of irrigation are better than none. Saline from an IV bag is also useful and particularly suited for eye irrigation. Never delay irrigation of the eyes while searching for sterile solutions. Use plain, uncontaminated water instead.

Once blistering or other damage occurs, emergency care is the same as for ordinary chemical burns. The fluid within the blisters caused by vesicants is sterile and exposure to this fluid will not cause further injury. Dry sterile dressings are applied loosely. Severe eye injuries should be patched. Most patients will experience significant pain and should receive 20mg IV or 50mg IM ketamine q15–30min PRN. Unlike thermal burns, most serious vesicant patients do not require fluid resuscitation.

Cyanide:

Cyanide is a rapidly acting lethal agent that directly poisons the body’s cellular metabolism. Related chemicals with similar toxicities include hydrogen cyanide (AC), cyanogen chloride (CK) and cyanogen bromide. Although it is a potent poison, cyanide is 25–50 times less toxic by inhalation route than the nerve agent sarin.

Signs and Symptoms of Cyanide Poisoning		
High Concentration Inhaled	<ul style="list-style-type: none">• 30–60 sec loss of consciousness• Convulsions	<ul style="list-style-type: none">• 2–3 min apnea• 6–8 min cardiac arrest
Ingestion or Low Concentration Inhaled	<ul style="list-style-type: none">• Tachycardia• Tachypnea• Dizziness	<ul style="list-style-type: none">• Nausea• Weakness• May progress to LOC, apnea and death

Adult Dose and Administration of Cyanide Antidotes			
Antidote	Dose	Route	Comments
Oxygen	High flow	NRB/BVM	Ventilatory support may be needed
Cyanokit (Hydroxycobalimin)	5mg/15min	IV	Reconstitute in 100mL NS per vial
Sodium thiosulfate	25% 12.5g	IV	Alternative/second line treatment
Activated charcoal	50g (1g/kg ped)	PO	cyanide or organophosphate ingestion

Pulmonary agents:

Pulmonary agents include phosgene (CG), other halogen compounds and various nitrogen–oxygen compounds. These agents act primarily to cause lung injury, hence the obsolete term “choking agents”.

Assessment:

Relatively low concentrations of phosgene irritate the mucous membranes so initial symptoms will reflect:

- Tearing
- Runny nose
- Throat irritation

If the patient is exposed to a higher concentration, airway and lung damage may also occur. However symptoms of pulmonary edema will take several hours to develop. Thus a key point in treatment is realizing that the initially mild symptoms may lead to a serious condition within a few hours.

NOTE: Exertion can worsen symptoms.

Treatment of Pulmonary Agent Exposure

Mild Symptoms

- Mild dyspnea
- Wheezing
- Cough

Beta-agonist nebulizer (albuterol)
Oxygen
Rest

Severe Symptoms

- Pulmonary edema
- Severe dyspnea
- Stridor
- Airway obstruction

Above plus,
Airway management positive pressure
ventilation

Riot Control Agents:

Riot control agents include the common terms “tear gas” and “mace”. Specific agents include CS, CN, CA, CR and pepper spray (OC). Their common effect is intense irritation to the eyes, nose, and other mucous membranes. In the concentrations employed for field use, these agents are all considered non-lethal. Under most field conditions, emergency care is limited to removal of the patient to fresh air. The effects of riot control agents are self-limited and no further treatment is usually needed. On occasion, a patient may experience severe shortness of breath and wheezing. This should be treated with a beta-2 agonist.

Biological Agent Illnesses

Biological weapons are living organisms or toxins produced by living organisms. They are deliberately used to cause disease in the target populations. Biological weapons are generally no different than naturally occurring disease except that they are concentrated and delivered with the intent to cause harm. There are about a dozen biological agents which are militarily significant. They can be roughly divided into four groups:

1. Pneumonia-like agents
2. Encephalitis-like agents
3. Biological toxins
4. Miscellaneous biological agents

Pneumonia-like Agents:

- Anthrax
- Plague
- Tularemia
- Q-fever

Encephalitis-like Agents:

- Smallpox
- Venezuelan Equine Encephalitis (VEE)

Biological Toxins:

- Botulinum
- Staphylococcal Enterotoxin B (SEB)
- Ricin
- Trichothecene Mycotoxins (T2)

Miscellaneous Biological Agents:

- Cholera
- Brucellosis
- Viral Hemorrhagic Fevers (VHF)

Emergency Care:

A number of principles are important when faced with patients exposed to biological agents. Recognition is crucial to the successful management of these patients and a top priority is self-protection. Physicians or trained health care personnel will be needed to prescribe the proper antibiotic and antitoxin treatment crucial in treating biological agent exposure. Infectious disease and biological agent experts plus laboratory support will also be needed to help positively identify the agent and recommend further treatment. As much as practical in the field, isolate biological patients from unaffected individuals. The usual principles of emergency care apply to the care of these patients. Priority goes to securing and maintaining an airway and ensuring adequate ventilation. A mainstay of treatment for many biological agents is use of specific antibiotics or antitoxins. These treatments require the expertise of a physician or PA in selecting the right drug, dose, and route. It is beyond the scope of practice and beyond the expectations of PJs to initiate this therapy. The PJ does play a crucial role in summoning the assistance of a physician when necessary, and can assist the physician's treatment of biological patients with antibiotics or antitoxins.

Nuclear Injuries

Nuclear detonation energy is released as light and thermal energy, a shock wave with severe wind blast, and direct radiation, followed by fallout. Potential injuries include light damage to the eye, burns to the skin, blast injury and radiation exposure. These injury mechanisms often combine during nuclear detonation, presenting an assessment and care challenge. The role of the PJ at the disaster is to provide search and rescue, triage, evacuation, decontamination, and limited emergency care. Nuclear detonation yields injury or death through three mechanisms. They are:

1. Radiation
2. Blast
3. Thermal burns

Nuclear/radiation exposure can be divided into several different categories. In all cases, it is important to recognize that the patient themselves DO NOT become radioactive from exposure to radiation (only neutron bombardment can do this, which is highly unlikely outside the core of a nuclear reactor).

NOTE: In some cases, patients can become contaminated with dust or other material that is radioactive. Once this is removed, the patient is cared for in the normal manner.

Radiation Protection for the Paramedic:

Prevention of exposure depends on the type of threat in the area. In all cases, remember that radiation protection is dependent on:

1. **TIME OF EXPOSURE**
2. **DISTANCE FROM THE SOURCE**
3. **SHIELDING**

To minimize personal risk, spend the shortest time in the contaminated area and stay as far from the radiation source as possible. If able, keep some shielding (dirt, rocks, etc.) between you and the radiation source. When working in an area contaminated with radioactive material in dust or particulate form, wear the chemical protective mask to prevent inhalation of dust, and wear a disposable over garment (MOPP suit works well) with hood and gloves. Discard this equipment in the decontamination area.

- **For a fixed radiation source that is not in particulate form:**
 - It is best to limit exposure during rescue. Move the patient as rapidly as possible, keeping as far away from the radiation source as possible.
- **For a particulate radiation source with external contamination (dust/debris containing radioactive material is on the patient):**
 - Wear a chemical protective mask with war filters in place to prevent inhalation of dust. Wear an over garment that can be discarded after leaving the contaminated area. Decontaminate the patient by removing all clothing and washing off any dust.
- **For a patient with internal contamination (radioactive material either ingested or driven into wounds):**
 - Wear protective clothing as noted above. Once out of the contaminated area, decontaminate the patient as above. Debride the wounds to remove any particulate matter, if possible. Cover the wounds and evac the patient, making sure the next echelon of medical care knows that an internally contaminated patient is on the way. Patients who have inhaled, or ingested radioactive material should be evacuated to the next echelon of care.

NOTE: Illness and death from radiation exposure occur based on dose. High radiation dose will result in death from brain swelling with CNS injury, a lower dose will affect the G.I. system and result in bloody diarrhea which can result in death, finally bone marrow suppression which would result in longer-term complications over days to weeks to include infection, bleeding and anemia.

19. Pararescue Neurological Exam

Components and Format

- Mental Status
- Cranial Nerves
- Motor
- Sensory
- Coordination

NOTE: Be familiar with this exam before administering it in the field. Do not rush the exam but go at a reasonable pace to avoid error. The goal is to identify obvious abnormalities, trust your instincts, and be as descriptive in the deficits identified as possible (i.e., instead of saying left 3rd nerve palsy, say droopy left eyelid).

Performing the Exam

- **Begin with patient seated if appropriate.**
- **Mental Status:**
 - **A/O:** What is your name, where are you, when – day/date/year, what happened – this also answers speech and comprehension
 - **3 words (immediate recall):** Give the patient three unrelated words to remember. (e.g., car, watch, pen). Tell them to repeat back immediately and remember them.
 - **Logic:** “count backwards from 100 by 7s”
- **Cranial Nerves:**
 - **Visual acuity (2):** Read something (printed text on a uniform or print on paper, count fingers, detect hand motion, detect light, no light perception)
 - **Pupillary response (2):** check one eye at a time for response to light
 - **Follow my finger (3, 4, 6):** Instruct patient to look up, down, right, left; looking for twitching for lack of movement.
 - **Facial sensation (5):** close your eyes, tell me when I touch you – touch with finger side of face at 3 levels – above eye, cheek, jaw. One side then the other. Clench jaw. Blink.
 - **Smile, then look up and wrinkle your forehead (7):** have patient perform
 - **Hearing (8):** have patient close eyes, rub your fingers together next to ear and have patient identify which ear it is. Repeat for other ear. If they cannot hear rubbing fingers, snap your fingers.
 - **Say “aaahhh” (9, 10, 12):** open your mouth, stick out your tongue and say “ah”. Tongue should protrude midline, normal voice (vs hoarse), both sides of palate go up symmetrically and uvula is midline.
 - **Shrug (11):** using your hands for resistance have patient turn their head left and right then shrug their shoulders.
- **Motor:**
 - While providing resistance, have patient move each extremity (push and pull). Perform each area on both sides (L/R) before moving to next area to provide comparison.

- Put patient's arms at side parallel to ground and bent at elbows
- **Shoulder:** Put your hands on the forearms and instruct patient to push up, pull down (movement from shoulder)
- **Elbow:** Hold the forearms and have them pull (biceps) and push (triceps) (movement from the elbow)
- **Hand:** "Squeeze my fingers" (grip strength)
- **Hip:** Push up/Pull down (patient seated, resist from thigh)
- **Knee:** Kick out, pull back (patient seated, resist from calf/shin)
- **Ankle:** have patient stand and stand on heels and stand on toes. Otherwise have patient pull foot back and step on the gas (push down)
- **Sensory:**
 - Have patient close their eyes and tell you when you start touching and when you stop by saying when you touch them with your finger
 - Touch each forearm and leg, chest and belly in front
- **Coordination:**
 - **NOTE:** If possible, have an assistant shadow the patient during movements to catch them if needed
 - **Gait:** have patient take 5–10 steps away from you
 - **Heel/Toe:** have patient return to you drunk driver style heel to toe
 - **Romberg:** With eyes closed, the patient stands with feet together and arms extended to the front, palms up. Note whether the patient can maintain their balance or if they immediately fall to one side.
 - **Finger to nose:** eyes closed, head back, arms out at sides, have patient alternate touching nose with extended finger
- **Delayed recall (memory):** ask patient "what were the three words I told you?"

PJ PEARLS:

If a patient is walking and talking with a normal gait and normal arm swing, and their face seems normal, there's a 99% chance they have a normal neurologic exam.

Having a standard method of conducting the cranial nerve exam will help in simplifying and remembering how it is accomplished. A simple method is to look at the casualty's head. Note that they have ears, eyes, nose, mouth and face. Check the ears (8) for hearing on each side, the eyes (2,3,4,6) for seeing and eye movements, smell is not routinely checked, tell the patient to open their mouth and stick out their tongue and say "ahhh" (9,10,12). Remember their face and check for facial movement (7) and facial sensation(5), and lastly, have them shrug their shoulders (11).

In tactical situations the 20 second neuro exam when time permits will include:

1. Level of consciousness – AVPU
2. Patient moves all 4 extremities (or one side weak or paralyzed; or posturing; or isolated extremity weak or paralyzed)
3. PERL (are one or both pupils fixed and dilated)

The neuro exam is important for us to:

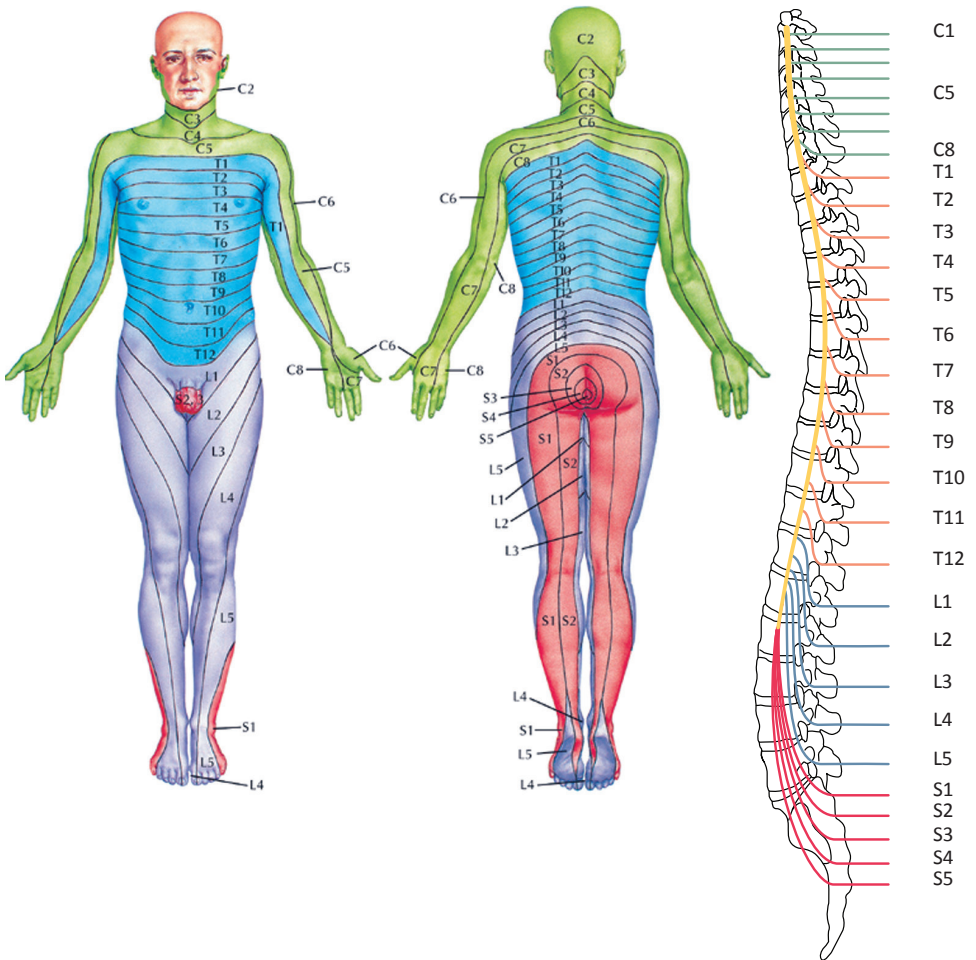
1. Diagnose a problem.
2. To establish a baseline with which to reassess clinical stability, deterioration and need for intervention, or response to an intervention.
3. To establish a baseline for the next level of caregiver to continue to monitor stability, and response to/or need for interventions.

All patients in every situation should always be noted to their level of consciousness (AVPU) since it is pertinent in all clinical situations. Do not write “LOC” in neuro exam since it can be confused with “loss of consciousness”.

The complete neuro exam should be performed in patients exposed to blast, blunt or penetrating head trauma, falls from heights, dive medicine scenario, possible stroke patients, and signs of skull base fracture. If time permits or in an extended care tactical situation, a complete exam on any patient with head or spine injury is appropriate.

(Anyone who is walking normally, talking and responding to you normally, moving their face and arms, and turning their head to listen to or look at you generally has a normal neuro exam.)

Dermatomes Quick Reference Chart



Military Acute Concussion Evaluation

MACE 2

Military Acute Concussion Evaluation



Use MACE 2 as close to time of injury as possible.

Service Member Name: _____

DoDI/EDIPI/SSN: _____ Branch of Service & Unit: _____

Date of Injury: _____ Time of Injury: _____

Examiner: _____

Date of Evaluation: _____ Time of Evaluation: _____

Purpose: MACE 2 is a multimodal tool that assists providers in the assessment and diagnosis of concussion. The scoring, coding and steps to take after completion are found at the end of the MACE 2.

Timing: MACE 2 is most effective when used as close to the time of injury as possible. The MACE 2 may be repeated to evaluate recovery.

RED FLAGS

Evaluate for red flags in patients with Glasgow Coma Scale (GCS) 13-15.

- ☐ Deteriorating level of consciousness
- ☐ Double vision
- ☐ Increased restlessness, combative or agitated behavior
- ☐ Repeat vomiting
- ☐ Results from a structural brain injury detection device (if available)
- ☐ Seizures
- ☐ Weakness or tingling in arms or legs
- ☐ Severe or worsening headache

Defer MACE 2 if any red flags are present. Immediately consult higher level of care and consider urgent evacuation according to evacuation precedence/Tactical Combat Casualty Care (TCCC).

- ☐ **Negative for all red flags**
Continue MACE 2, and observe for red flags throughout evaluation.

MILITARY ACUTE CONCUSSION SCREENING

Complete this section to determine if there was an injury event
AND an alteration of consciousness or memory.

1. Description of Incident**A. Record the event as described by the service member or witness.**

Use open-ended questions to get as much detail as possible.

Key questions:

- ☐ Can you tell me what you remember?
- ☐ What happened?
- ☐ Who were you last with?

B. Observable Signs

At the time of injury were any of these observable signs witnessed?

Visual clues that suggest a possible concussion include:

- ☐ Lying motionless on the ground
- ☐ Slow to get up after a direct or indirect blow to the head
- ☐ Disorientation, confusion, or an inability to respond appropriately to questions
- ☐ Blank or vacant look
- ☐ Balance difficulties, stumbling, or slow labored movements
- ☐ Facial injury after head trauma
- ☐ Negative for all observable signs

C. Record the type of event.

Check all that apply:

- | | | |
|---------------------------------------|--|---|
| <input type="checkbox"/> Blunt object | <input type="checkbox"/> Sports injury | <input type="checkbox"/> Gunshot wound |
| <input type="checkbox"/> Fall | <input type="checkbox"/> Assault | <input type="checkbox"/> Explosion/blast |
| <input type="checkbox"/> Fragment | <input type="checkbox"/> Motor vehicle crash | <input type="checkbox"/> Estimated distance _____ |
| | <input type="checkbox"/> Other _____ | |

D. Was there a blow or jolt to the head?

- ☐ Did your head hit any objects?
- ☐ Did any objects strike your head?
- ☐ Did you feel a blast wave? (A blast wave that is felt striking the body or head is considered a blow to the head.)
- ☐ Did you have a head acceleration or deceleration?

☐ YES ☐ NO ☐ UNKNOWN

2. Alteration of Consciousness or Memory

A. Was there alteration of consciousness (AOC)?

AOC is temporary confusion or "having your bell rung."

☐ YES ☐ NO

If yes, for how long? _____ seconds
_____ minutes

☐ UNKNOWN

Key questions:

- ☐ Were you dazed, confused, or did you "see stars" immediately after the event?
- ☐ Did you feel like you were in a fog, slowed down, or "something was not right"?

B. Was there loss of consciousness (LOC)?

LOC is temporarily passing out or blacking out.

☐ YES ☐ NO

If yes, for how long? _____ seconds
_____ minutes

☐ UNKNOWN

Key questions:

- ☐ Did you pass out or black out?
- ☐ Is there a period of time you cannot account for?

C. Was there any post traumatic amnesia (PTA)?

PTA is a problem remembering part or all of the injury events.

☐ YES ☐ NO

If yes, for how long? _____ seconds
_____ minutes

☐ UNKNOWN

Key questions:

- ☐ Is there a period of time you cannot account for?
- ☐ What is the last thing you remember before the event?
- ☐ What is the first thing you remember after the event?

D. Was the AOC, LOC or PTA witnessed?

☐ YES ☐ NO

If yes, for how long? _____ seconds
_____ minutes

☐ UNKNOWN

Tips for assessment:

- ☐ Ask witness to verify AOC, LOC or PTA and estimate duration.

3. Symptoms

Common symptoms after a concussion are listed below. For this event, check all that apply.

- ☐ Headache
- ☐ Dizziness
- ☐ Memory problems
- ☐ Balance problems
- ☐ Nausea/vomiting
- ☐ Difficulty concentrating
- ☐ Irritability
- ☐ Visual disturbances
- ☐ Ringing in the ears
- ☐ Other _____
- ☐ **Negative for all symptoms**

4. History

A. During the past 12 months, were you diagnosed with a concussion, not counting this event?

☐ YES ☐ NO

If yes, how many? ____

☐ UNKNOWN

B. History of diagnosed/treated headache disorder or migraine.

☐ YES ☐ NO

C. History of depression, anxiety, or other behavioral health concerns.

☐ YES ☐ NO

CONCUSSION SCREENING RESULTS (Possible Concussion?)

Was there a blow or jolt to the head (1D)

AND

ANY alteration of consciousness or memory? (2A, 2B, 2C, or 2D)

YES (to both)



NO (to either or both)



POSITIVE CONCUSSION SCREEN:

1. **Continue** MACE 2.
2. Complete evaluation before prescribing rest.
3. Communicate findings to line leadership.
4. Document and code findings in electronic health record (EHR).

NEGATIVE CONCUSSION SCREEN:

1. **Stop** MACE 2.
2. Initiate 24 hour-rest period, if deployed. During rest, avoid activities that worsen symptoms. Follow up with the service member after rest period per concussion management tool (CMT).
3. Communicate findings to line leadership.
4. Document and code findings in electronic health record (EHR).

COGNITIVE EXAM

5. Orientation

Score one point for each correct response.

Ask This Question	Incorrect	Correct
"What month is this?"	0	1
"What is the date or day of the month?"	0	1
"What day of the week is it?"	0	1
"What year is it?"	0	1
"What time do you think it is?"	0	1
Correct response must be within one hour of actual time.		

ORIENTATION TOTAL SCORE

5

6. Immediate Memory

Choose one list (A-F below) and use that list for the remainder of the MACE 2.

Read the script for each trial and then read all five words. Circle the response for each word for each trial. Repeat the trial three times, even if the service member scores perfectly on any of the trials.

Trial 1 script: Read the script exactly as written.

- "I am going to test your memory. I will read you a list of words and when I am done, repeat back to me as many words as you can remember, in any order."

Trials 2 and 3 script: Read the script exactly as written.

- "I am going to repeat that list again. Repeat back to me as many words as you can remember, in any order, even if you said them before."

	Trial 1		Trial 2		Trial 3	
List A	Incorrect	Correct	Incorrect	Correct	Incorrect	Correct
Jacket	0	1	0	1	0	1
Arrow	0	1	0	1	0	1
Pepper	0	1	0	1	0	1
Cotton	0	1	0	1	0	1
Movie	0	1	0	1	0	1

IMMEDIATE MEMORY TOTAL SCORE

15

Immediate Memory Alternate Word Lists

List B	List C	List D	List E	List F
Dollar	Finger	Baby	Candle	Elbow
Honey	Penny	Monkey	Paper	Apple
Mirror	Blanket	Perfume	Sugar	Carpet
Saddle	Lemon	Sunset	Sandwich	Saddle
Anchor	Insect	Iron	Wagon	Bubble

NEUROLOGICAL EXAM

7. Speech Fluency

☐ Normal☐ Abnormal

- Speech should be fluid and effortless
 - no pauses or unnatural breaks.
 - Stuttering or struggling to speak is abnormal.

8. Word Finding

☐ Normal☐ Abnormal

- Assess difficulties with word finding:
 - Difficulty in coming up with the name of an object or grasping to find words is abnormal.

9. Grip Strength

☐ Normal☐ Abnormal

- Assess grip strength. Grip strength should be strong and equal bilaterally.
 - Unequal or weak grip strength is abnormal.

10. Pronator Drift

☐ Normal☐ Abnormal

- Direct service member to stand with eyes closed and arms extended forward, parallel to the ground with palms up. Assess for five to 10 seconds:
 - Any arm or palm drift is abnormal.

11. Single Leg Stance

☐ Normal☐ Abnormal

- Remove shoes if possible. Have service member stand on one leg, arms across chest, hands touching shoulders, eyes open initially. Once service member is balanced, have them close their eyes and time for 15 seconds how long they can maintain their balance. Repeat test with opposite leg.
 - Loss of balance on either leg before eight seconds is abnormal.

NEUROLOGICAL EXAM - Continued

12. Tandem Gait

☐ Normal

☐ Abnormal

- Remove shoes if possible. Have service member take six steps one foot in front of the other, heel-to-toe, with arms at side
- Stumbling or shifting feet is abnormal.

13. Pupil Response

☐ Normal

☐ Abnormal

- Pupils should be round, equal in size and briskly constrict to a direct, bright light.
- Unequal pupil size, dilation or constriction delay is abnormal.

14. Eye Tracking

☐ Normal

☐ Abnormal

- Both eyes should smoothly track your finger side-to-side and up and down.
- Unequal, irregular or delayed eye tracking is abnormal.

NEUROLOGICAL EXAM RESULTS (Questions 7-14)

☐

All Normal

☐

Any Abnormal

COGNITIVE EXAM

15. Concentration

A. Reverse Digits

Read the script and begin the trial by reading the first string of numbers in Trial 1.

Circle the response for each string.

- If correct on string length of Trial 1, proceed to the next longer string length in the same column.
- If incorrect on string length of Trial 1, move to the same string length of Trial 2.
- If incorrect on both string lengths in Trials 1 and 2, **STOP** and record score as zero for that string length. Record total score as sum of previous correct trials.

COGNITIVE EXAM - Continued

15. Concentration - Continued

A. Reverse Digits

Script: Read the script exactly as written.

- “I am going to read you a string of numbers. When I am finished, repeat them back to me backward. That is, in reverse order of how I read them to you. For example, if I said 7 - 1 - 9, then you would say 9 - 1 - 7.”

List A		Incorrect	Correct
Trial 1	Trial 2 (if Trial 1 is incorrect)		
4-9-3	6-2-9	0	1
3-8-1-4	3-2-7-9	0	1
6-2-9-7-1	1-5-2-8-5	0	1
7-1-8-4-6-3	5-3-9-1-4-8	0	1

REVERSE DIGITS SCORE (16A)

Concentration Alternate Number Lists

Note: Use the same list (A-F) that was used in Question 6.

List B	
Trial 1	Trial 2
5-2-6	4-1-5
1-7-9-5	4-9-6-8
4-8-5-2-7	6-1-8-4-3
8-3-1-9-6-4	7-2-7-8-5-6

List C	
Trial 1	Trial 2
1-4-2	6-5-8
6-8-3-1	3-4-8-1
4-9-1-5-3	6-8-2-5-1
3-7-6-5-1-9	9-2-6-5-1-4

List D	
Trial 1	Trial 2
7-8-2	9-2-6
4-1-8-3	9-7-2-3
1-7-9-2-6	4-1-7-5-2
2-6-4-8-1-7	8-4-1-9-3-5

List E	
Trial 1	Trial 2
3-8-2	5-1-8
2-7-9-3	2-1-6-9
4-1-8-6-9	9-4-1-7-5
6-9-7-3-8-2	4-2-7-9-3-8

List F	
Trial 1	Trial 2
2-7-1	4-7-9
1-6-8-3	3-9-2-4
2-4-7-5-8	8-3-9-6-4
5-8-6-2-4-9	3-1-7-8-2-6

COGNITIVE EXAM - Continued

15. Concentration - Continued

B. Months in Reverse Order

Script: Read the script exactly as written.

- "Now tell me the months of the year in reverse order.
Start with the last month and go backward.
So you'll say: December, November...Go ahead."

Correct Response:

Dec – Nov – Oct – Sep – Aug – Jul –
Jun – May – Apr – Mar – Feb – Jan

	Incorrect	Correct
ALL months in reverse order	0	1

MONTHS IN REVERSE ORDER (16B)

CONCENTRATION TOTAL SCORE

Sum of scores:

15A (0-4 points) and 15B (0 or 1 point)

16. Delayed Recall

Read the script and circle the response for each word.

Do NOT repeat the word list.

Note: Use the same list (A-F) that was used in Question 6.

Script: Read the script exactly as written.

- "Do you remember that list of words I read a few minutes earlier?
I want you to tell me as many words from that list as you can remember. You can say them in any order."

List A	Incorrect	Correct
Jacket	0	1
Arrow	0	1
Pepper	0	1
Cotton	0	1
Movie	0	1

DELAYED RECALL TOTAL SCORE

Delayed Recall Alternate Word Lists

List B	List C	List D	List E	List F
Dollar	Finger	Baby	Candle	Elbow
Honey	Penny	Monkey	Paper	Apple
Mirror	Blanket	Perfume	Sugar	Carpet
Saddle	Lemon	Sunset	Sandwich	Saddle
Anchor	Insect	Iron	Wagon	Bubble

17. Vestibular/Ocular-Motor Screening (VOMS) for Concussion Instructions

VOMS Contraindication: Unstable Cervical Spine.

Consider deferring VOMS if patient is overtly symptomatic or a trained provider unavailable. VOMS should be completed before return to duty. Use comment section for any provider-observed difficulty with specific VOMS tasks.

A. Baseline symptoms. Record headache, dizziness, nausea and foggiess (HDNF), on zero to 10 scale prior to screening.

B. Smooth pursuits. Service member and examiner are seated. Hold fingertip three feet from patient. Service member focuses on fingertip target as examiner moves fingertip smoothly horizontally one and a half feet right and left of midline at rate requiring two seconds to go fully from left to right and right to left. Perform twice. Repeat in vertical direction one and a half feet above and one and a half feet below midline up and down, moving eyes two seconds fully up and two seconds down. Perform twice. Record HDNF on a zero to 10 scale.

C. Saccades. Service member and examiner are seated.

1) Horizontal saccades: Hold two fingertips horizontally at a distance of three feet from service member, and one and a half feet left and right of midline so service member gazes 30 degrees left and right. Service member moves eyes as quickly as possible from point to point. Perform 10 times. Record HDNF on a zero to 10 scale.

2) Vertical saccades: Repeat with two fingertips vertically three feet from service member, and one and a half feet above and below midline so service member gazes 30 degrees upward and downward. Service member moves eyes as quickly as possible from point to point. Perform 10 times. Record HDNF on a zero to 10 scale.

D. Convergence. Service member and provider are seated facing each other. Service member focuses on font target (page 14) at arm's length and slowly brings toward tip of nose. Service member stops target when two distinct images seen or when outward deviation of eye observed. Repeat and measure three times. Record centimeters between target and tip of nose for each trial. A near point of convergence \geq five centimeters from the tip of the nose is considered abnormal. Record HDNF on a zero to 10 scale.

17. Vestibular/Ocular-Motor Screening (VOMS) for Concussion Instructions (Continued)

E. Vestibular-ocular reflex (VOR) test. Service member and examiner are seated. Examiner holds font target (page 14) in front of service member in midline at three feet, rotation speed set with metronome.

1) Horizontal VOR test: Service member rotates head horizontally focusing on target at 20 degrees to each side. Rotation = 180 beats per minute (bpm). Perform 10 times. Record: HDNF 10 seconds after test.

2) Vertical VOR test: Repeat test moving head vertically 20 degrees up and down at 180 bpm. Perform 10 times. Record HDNF 10 seconds after test.

F. Visual motion sensitivity (VMS) test. Service member stands with feet shoulder width apart, facing a busy area. Examiner stands next to and slightly behind service member. Service member outstretches arm. Focusing on their thumb, the service member rotates head, eyes and trunk as unit 80 degrees right and left. Rotation = 50 bpm. Perform five times. Record HDNF on a zero to 10 scale.

17. VOMS Score Card

Vestibular/Ocular Motor Test:	Not Tested	Headache 0-10	Dizziness 0-10	Nausea 0-10	Fogginess 0-10	Comments
BASELINE SYMPTOMS:	N/A					
Smooth Pursuits						
Saccades – Horizontal						
Saccades – Vertical						
Convergence (Near Point)						(Near Point in cm): Measure 1: _____ Measure 2: _____ Measure 3: _____
VOR – Horizontal						
VOR – Vertical						
Visual Motion Sensitivity Test						
Total						

Any score above baseline is considered abnormal

VOMS RESULTS

☐ All Normal

☐ Any Abnormal

MACE 2 - Military Acute Concussion Evaluation

EXAM SUMMARY

Record the data for correct MACE 2 documentation.

Cognitive Summary

Orientation Total Score - Q5

Immediate Memory Total Score (all 3 trials) - Q6

Concentration Total Score (Sections A and B) - Q15

Delayed Recall Total Score - Q16

COGNITIVE RESULTS

≤ 25 is abnormal

NEUROLOGICAL RESULTS (Q 7-14)

☐

Abnormal (+)

☐

Normal (-)

SYMPTOM RESULTS (Q 3)

☐

1 or more symptoms (+)

☐

No symptoms (-)

HISTORY RESULTS (Q 4A-4C)

☐

Positive (+)

☐

Negative (-)

VOMS RESULTS (Q 17)

☐

Abnormal (+)

☐

Normal (-)

☐

Deferred

MACE 2 RESULTS

☐

Positive (+)

☐

Negative (-)

AFTER COMPLETING MACE 2:

- ☐ Document MACE 2 results in the EHR with coding instructions.
- ☐ Initiate 24-hour rest.
- ☐ Refer to concussion management tool for the management recommendations based on MACE 2 results.
- ☐ After 24-hour rest period, evaluate for initiation into the Progressive Return to Activity (PRA) following the guidance of the PRA Clinical Recommendation.

Refer to Progressive Return to Activity Clinical Tool at
dvbic.dcoe.mil/files/resources/2013_PRA_PCM_CST_FINAL.pdf

VOMS Equipment Sample 14 point font: **A**

TBI CODING INSTRUCTIONS

Initial TBI screening code*: Z13.850

TBI coding sequence:

- 1. Primary TBI diagnostic code: S06. E L S E****
- 2. Primary symptom code**, if applicable: (e.g., H53.2 - diplopia)
- 3. Deployment status code**, if applicable:*** (e.g., Z56.82 for deployed or Z91.82 for history of military deployment)
- 4. TBI external cause of morbidity code:** (For example, Y36.290A (A- use for initial visit) for war operations involving other explosions and fragments, military personnel, initial encounter)
- 5. Place of occurrence code**, if applicable
- 6. Activity code**, if applicable
- 7. Personal History of TBI code:** if applicable Z87.820

* MACE 2

** Etiology, Location, Severity, Encounter

*** Deployment code must fall within the first four codes when applicable

For more information, see DVBIC ICD-10 Coding Guidance Tool.

References available at <https://dvbic.dcoe.mil/material/military-acute-concussion-evaluation-2-mace-2-reference-list>.

We are authorized to collect the information on this form and any supporting documentation, including social security numbers, under the Patient Protection and Affordable Care Act (Public Law No. 111-148), as amended by the Health Care and Education Reconciliation Act of 2010 (Public Law No. 111-152), and the Social Security Act.

THIS TOOL MAY BE COPIED FOR CLINICAL USE.

PUID 4901

Released: February 2012 | Revised October 2018
by Defense and Veterans Brain Injury Center.

This product is reviewed annually and is current until superseded.

Centimeter Ruler

0 cm

5 cm

15 cm

20. Eye Injuries

The basic eye exam should include whether the pupils are reactive or not. Visual acuity in each eye, extraocular movements, integrity of the eye structures.

The field expedient visual acuity exam should be documented with best performance as reads print, counts fingers, detects hand motion only, detects light only, no light perception.

For penetrating eye trauma such as shrapnel, do a field expedient vision exam, cover the eye with a rigid eye shield, provide PO/IV/IM moxifloxacin. If only one is injured do not shield both eyes.

For impaled object, stabilize the object and protect the eye. Give antibiotics.

It is important that you do not put any pressure on the eyeball (Globe). No gauze or soft dressing should be directly on the eye.

Complicated lacerations of the eyelid should be closed by a specialist.

Refer to the procedure section for lateral canthotomy. The indication is progressive proptosis of the eye and loss of vision following trauma.

For chemical injuries irrigate the eye continually with water until they get to a specialist or for at least 30 minutes.

Laser Injuries

The rapid growth of laser technology has resulted in increased use of lasers by DoD, US Allies and unfriendly forces. This increased use has also increased the risk of laser eye injuries. Military applications include target designators, range finders and secure communications. Personnel must ensure proper laser eye protection because of the high susceptibility of the eye to damage. Directed weapons have the capability to cause ocular hemorrhages, corneal damage through thermal deposition, retinal damage and induced glare and flash blindness.

Signs and Symptoms:

Symptoms vary depending on distance from source, frequency of source, strength of source, length of exposure and whether any amplifying optics (binoculars, sighting scopes) were used.

Symptoms include:

1. Flash blindness
2. Loss of vision (immediate or delayed)
3. Blurred vision
4. Loss of visual field
5. Eye pain

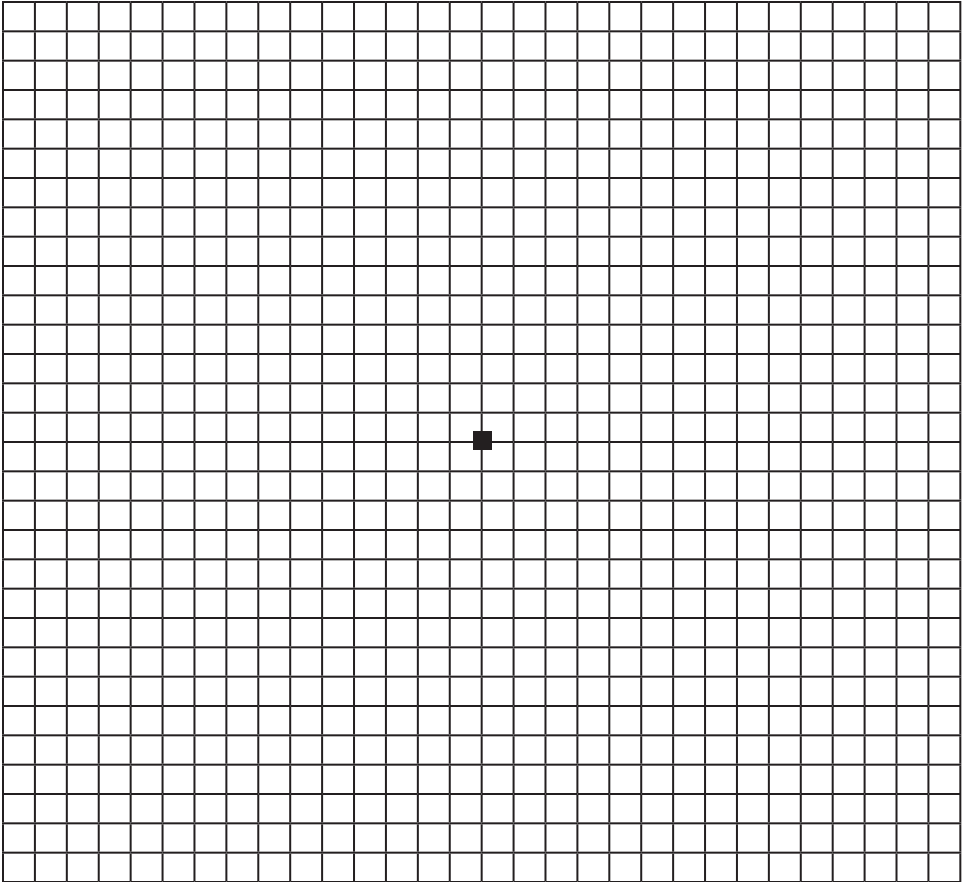
Treatment:

1. Assess visual acuity utilizing field expedient method of reading print/counting fingers/detect hand motion/light perception.
2. Assess visual fields with Amsler Grid Chart and record (see attached Amsler Grid).
3. If significant eye pain, apply ophthalmic ointment and fox eye shield.
4. Give pain medication as required.
5. If laser injury suspected, notify higher command.

CAUTION: An ocular hit from an IR laser may show no symptoms other than a visual field defect. Anyone who complains of 'funny vision', or 'seeing spots' in a laser environment should be examined and screened with an Amsler Grid and Visual Acuity check. Any person with a new defect on Amsler Grid testing should be evacuated at once.

Amsler Grid

Have the patient wear their glasses. Cover one eye. Hold the chart 18 inches from the patient, and have the patient look directly at the small black dot in the center of the grid. Record any areas of breaks in the lines or distortions of the lines. Repeat with the other eye. Normal is no breaks or distortions in the lines. Any new findings should be reported at once.



21. Tropical Disease Reference Guide

NOTE: This reference is provided to develop situational awareness. Expertise in infectious tropical diseases is beyond the scope of rescue medicine. Reliance on subject matter experts and telemedicine when needed should be used.

Brucellosis (undulating fever)	Mexico, Peru, Mongolia	Fever chills depression, neuropsychiatric, testicular pain, arthralgia, lower back pain, bone pain, lethargy	Doxy or Cipro with rifampin or gentamycin
Travelers' Diarrhea Bacterial, viral, parasitic	World wide	Passage of 3 or more unformed stools within 24hr, N/V abdominal pain, fever, blood or no blood in stools	Fluid replacement, Cipro, levofloxacin, azithromycin (except Asia) No improvement: Metronidazole
Bacterial Pharyngitis Group A, C, G strep Viral most common	World wide	Fever >38.3, tender anterior lymph nodes, exudates on tonsils	azithromycin
Cholera <i>Vibrio cholera</i>	Africa, Middle East	Abdominal discomfort, vomiting, diarrhea (rice water stool)	Oral hydration, azithromycin, or cipro
Giardia Flagellated protozoan	Central America, South America, Africa, Middle East, Asia	Diarrhea, cramping, abdominal distention, wt. loss, fatigue	metronidazole, tinidazole
Japanese Encephalitis Vector: Mosquito	South East Asia, Western Pacific	Acute encephalitis, fever, diarrhea, rigors, followed by headache, vomiting, generalized weakness. Mental status changes, focal neurologic deficiencies (cranial nerve palsies)	Supportive care, control of ICP, seizure control
TB	Africa, Asia	Commonly asymptomatic when infected. Primary TB: Fever, chest pain, retrosternal pain, dull intercostal pain, enlarged bronchial lymph	Isoniazid, rifampin, pyrazinamide, ethambutol

Disease	Region	Symptoms	Treatment
Malaria Vector: Mosquito	Central, South America, Africa, Middle East, South Asia	Undulating fever, chills, fatigue, tachycardia, tachypnea	Malarone, Coartem, quinine/doxycycline or for heavy resistance/last resort—chloroquine
Yellow Fever Vector: Mosquito	West Africa, Central Africa, East Africa, South America	Febrile, general malaise, headache, photophobia, lumbosacral pain, pain in lower extremities (knees), flushed skin, reddening of conjunctiva, tongue can be red at the tip and sides with white center	Supportive care Ribavirin – high dose, further study needed
Dengue Fever Vector: Mosquito	Central America, South America, West Africa, Central Africa, East Africa, Southeast Asia	Acute fever, headache, retroorbital pain, muscle and joint pain, “break-bone fever” Hemorrhagic – Life threatening, bleeding from skin, nose, GI system	Supportive care Symptoms typically resolve within 5–7 days
Lassa Fever Vector: Rodents Person to Person (PTP)	West Africa	Typically occur 1–3 weeks post exposure Fever, retrosternal pain, sore throat, back pain, vomiting, diarrhea	Supportive care Ribavirin
Leishmaniasis Vector: sand fly	Central America, South America, Africa	Sand fly bite pruritic, pink papule that progresses to Cutaneous lesions on exposed skin with painless ulceration	No treatment for uncomplicated infection
Chikungunya Fever Vector: Mosquito	Central America, South America, pockets of Africa, South East Asia	Abrupt fever, malaise, symmetric polyarthralgia (hands, wrist), maculopapular rash	Supportive care with anti-inflammatory and analgesia agents
Chagas Vector: protozoan parasite <i>Trypanosoma cruzi</i>	Southern US, South America	Mild nonspecific fever, asymptomatic, anorexia, lymphadenopathy, hepatosplenomegaly, romana sign	Benznidazole, nifurtimox – more effective in acute phase

22. Documentation

PJ Treatment Card

The PJ TCCC Card is similar to the joint DD 1380 TCCC Card. The PJ TCCC card utilizes the MIST and MARCH mnemonics to guide treatment priorities. All patients treated by Paramedics, whether in combat, civil or during training, will have a TCCC card with them. All efforts will be made to retain a copy of the card for the patient's medical records and for process improvement purposes. Digital versions of the PJ TCCC Card are available on the PJ Med Sharepoint: <https://cs2.eis.af.mil/sites/13306/medical/SitePages/Home.aspx>

PARARESCUE TCCC CARD					
Name: _____			Age: _____		
Date/Time of Injury: _____			Allergies: _____		
Mechanism of Injury: (X all that apply) <input type="checkbox"/> Blast <input type="checkbox"/> GSW <input type="checkbox"/> Frag <input type="checkbox"/> Fall <input type="checkbox"/> MVA <input type="checkbox"/> Non-Trauma <input type="checkbox"/> Other _____					
Injury: (Mark injuries w/ an 'X')					
TQ: R Arm TYPE: _____ TIME: _____		TQ: L Arm TYPE: _____ TIME: _____		TQ: R Leg TYPE: _____ TIME: _____	TQ: L Leg TYPE: _____ TIME: _____
Signs & Symptoms:					
<i>Time</i>					
<i>Pulse</i>					
<i>BP</i>	/	/	/	/	/
<i>Resp</i>					
<i>SP02</i>					
<i>AVPU</i>					
<i>Pain</i>					

AUG 2018

PJ TCCC CARD

Treatments: (X all that apply, and fill in the blank)

M: ☐ TQ ☐ Hemostatic ☐ Pressure ☐ Junct TQ

A: ☐ NPA ☐ SGA ☐ ET-Tube ☐ Cric

R: ☐ O2 ☐ Needle-D ☐ Chest Seal ☐ Chest Tube

C: ☐ IV / ☐ IO Location _____ TXA: ☐ 1st gm ☐ 2nd gm
☐ Whole Blood/RBC/Plasma/FDP: _____ Units
☐ LR/NS/Other: _____ Amt: _____ cc's

H: ☐ 3% saline ☐ Blanket/HPMK

P: **Drugs:** (Ketamine, Fentanyl, Mobic, Dilaudid, Versed)
Routes: (IM, IV, IO, IN, OTFC, PO)

<u>DRUG</u>	<u>ROUTE</u>	<u>DOSE</u>

A: ☐ Ertapenem ☐ Moxifloxacin

W: ☐ Irrigate ☐ Debride ☐ Dressing

S: ☐ Plvc Binder ☐ C-Spine ☐ Spine ☐ KTD ☐ SAM ☐ Eye Shld

Other Treatments / Notes:

PJ: _____

AUG 2018

PJ TCCC CARD

Canine Tactical Combat Casualty Care Card (cTCCC)

EVAC CAT: ☐ Urgent ☐ Priority ☐ Routine

EVAC TYPE: ☐ Fixed ☐ Rotary ☐ Ground ☐ MEDEVAC ☐ CASEVAC

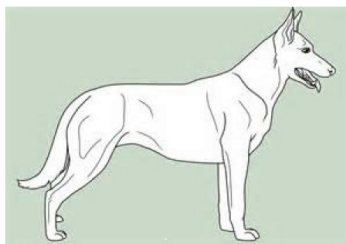
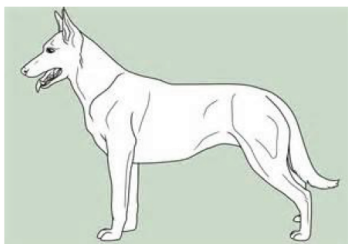
UNIT: _____ **NAME:** _____ **TATTOO:** _____

DATE: (DD-MM-YY) _____ **TIME:** _____ **GENDER:** ☐ M ☐ F

Mechanism of Injury: (Mark **X** all that apply)

☐ IED ☐ GSW ☐ MINE ☐ BURN ☐ GRENADE ☐ ARTILLERY ☐ FALL
☐ OTHER: _____

Injury: (Mark all injuries that apply with an **X**)



Signs and Symptoms: (fill in the blank)

<i>Time</i>					
Pain Score (0-10)					
Temperature (99-102.5)					
Pulse Rate/Location (60-80)					
Respirations (16-30)					
Blood Pressure (120/80)					
Pulse Ox% (> 95%)					
Capillary Refill (< 2 sec)					

NOTES: _____

Treatments: (Mark **X** all that apply) and fill in the blank)

Location:

M: Dressing - ☐ Hemostatic ☐ Pressure ☐ TQ Other: _____

A: ☐ Intact ☐ ET-Tube ☐ Tracheostomy _____

R: ☐ O² ☐ Needle-D ☐ Chest-Tube ☐ Chest-Seal _____

C:

Total Crystalloid Shock Volume of fluids is 90 mls/kg:
Administer 20ml/kg over 10-20 min. Reassess (as with human casualty):
If lack of response after 2-3 boluses consider adjunct therapy (HES/HTS.)

CRYSTALLOID	Volume	Route	Time
HYDROXYETHYL STARCH (HES): 5mls/kg over 5 - 10 min. After ½ shock crystalloid not effective.			
HYPERTONIC SALINE (HTS): 4mls/kg (If two or three ¼ shock boluses and 1-2 boluses of HES not effective)			
TXA: 10 mg/kg IV in 100ml NaCl or LRS given in first 3hrs. Followed by a 10-15 mg/kg CRI over 8 hours.			

C: ☐ Splint ☐ Other Bandage _____

H: ☐ Hypothermia-Prevention ☐ Hypothermia-External Cooling

H: ☐ Head Injury

Pain Meds and Antibiotics (Circle if given and write the time in the notes.)

DRUG (conc)	DOSE	RTE	60lb/ 27.3kg	70lb/32kg	80lb/36.4kg
Ketamine (100mg/ml)	2-5mg/kg	IV/IM	1 ml	1.5 mls	2 mls
Midazolam (5mg/ml)	0.1-0.3mg/kg	IV/IM	3 mls	4 mls	5 mls
Morphine (10mg auto inj.)	0.2-0.5 mg/kg	IM	1 <i>auto</i>	1 <i>auto</i>	2 <i>auto</i>
Meloxicam	0.1-0.2mg/kg	IV/SQ/PO	5 <i>mg</i>	6 <i>mg</i>	7 <i>mg</i>
Cefazolin/Ceftriaxone	25 mg/kg	IV/IM	600 <i>mg</i>	800 <i>mg</i>	900 <i>mg</i>
Cefotaxime	25 mg/kg	IV/IM/SQ	600 <i>mg</i>	800 <i>mg</i>	900 <i>mg</i>
Ertapenem (100mg/ml)	15mg/kg	IV/SQ	4 mls	5 mls	6 mls

NOTES: _____

FIRST RESPONDER:

Name (Last, First): _____ **AOC/MOS:** _____

PJ Prolonged Field Care Nursing Chart

Date:

Diagnosis:

[illegible]

PJ: _____

Joint Trauma System TACEVAC PCR and POI AAR

The Joint Trauma System TACEVAC PCR and POI AAR are required to be completed within 72 hours post battlefield mission. The info contained in the documents, along with the PJ TCCC card, enables the Joint Trauma System to conduct cutting edge study analysis and produce effective process improvement guidance; directly effecting TCCC protocols, TMEPs and PJ Med protocols. Digital forms of the TACEVAC PCR and POI AAR are available at: http://jts.amedd.army.mil/index.cfm/documents/forms_after_action and forms will be submitted to: usarmy.jbsa.medcom-aisr.list.jts-prehospital@mail.mil or the PJ Medical Program Manager.

TACEVAC PCRF

MEDICAL RECORD-SUPPLEMENTAL MEDICAL DATA									
For use of this form, see AR 40-66, the proponent agency is the Office of the Surgeon General								Reset Form	
REPORT TITLE Tactical Evacuation After Action Report & Patient Care Record, Page 1 JTS APPROVED (Date) (12 Jul 2018) -v4.1									
Event: Date _____ Time _____ Time Zone <input type="radio"/> L <input type="radio"/> Z MM () _____ Pt # _____ of _____ Tail to Tail <input type="radio"/> Y <input type="radio"/> N Leg # _____ of _____									
9-Line: Time _____ Platform _____ Dispatch Cat _____ Assessed Cat _____									
Trauma MIST Report: M=Mechanism of Injury, I=Injury, S=Signs & Symptoms, T=Treatments / Disease Diagnosis: _____ M _____ I _____ S _____ T _____									
Comments _____									
Pickup: Time _____ Role _____ Other _____ Region _____ Other _____ Location _____									
Dropoff: Time _____ Role _____ Other _____ Region _____ Other _____ Location _____									
Capability: <input type="checkbox"/> EMT-B <input type="checkbox"/> EMT-I <input type="checkbox"/> EMT-P <input type="checkbox"/> EMT-FPC <input type="checkbox"/> RN <input type="checkbox"/> CRNA <input type="checkbox"/> PA <input type="checkbox"/> MD/DO Other _____									
Circulation-Hemorrhage Control									
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <input type="checkbox"/> Direct Pressure <input type="checkbox"/> Hemostatic Dressing <input type="checkbox"/> Kerlix Dressing <input type="checkbox"/> Pressure Dressing Other _____ </div> <div style="width: 45%;"> Tourniquet Prior TQ: Reassess/lighten <input type="radio"/> Y <input type="radio"/> N <input type="radio"/> N/A Time On _____ CAT _____ SOFTT _____ Other _____ Time On _____ CAT _____ SOFTT _____ Other _____ Time On _____ CAT _____ SOFTT _____ Other _____ Time On _____ CAT _____ SOFTT _____ Other _____ TQ Comments _____ </div> </div>									
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> Airway <input type="checkbox"/> Self <input type="checkbox"/> NPA <input type="checkbox"/> OPA <input type="checkbox"/> Cric <input type="checkbox"/> Trach <input type="checkbox"/> ETT <input type="checkbox"/> SGA Type _____ Tube Size _____ Pos _____ @ _____ Confirmed <input type="checkbox"/> BS <input type="checkbox"/> Vis <input type="checkbox"/> ETCO₂ _____ O₂ Source <input type="checkbox"/> NC <input type="checkbox"/> NRB <input type="checkbox"/> BVM <input type="checkbox"/> Vent <input type="checkbox"/> LPM Intubated <input type="checkbox"/> Prior to transport <input type="checkbox"/> By transport crew Suction <input type="checkbox"/> ETT <input type="checkbox"/> Yauker </div> <div style="width: 45%;"> Annotate Injuries (AM)Plutition (B)leeding (Burn) % TBSA _____ (C)reptus (D)eformity (D)egloving (E)cchymosis (F)racture (G)SWGunshot Wound (H)ematoma (I)M)Impaled Object (L)aceration (P)ain (P)P)Peppering (P)W)Puncture Wound (S)O)Subcutaneous Air (T)B)Suspect Other _____ </div> </div>									
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> Breathing Needle Decompression Time _____ R _____ L _____ Mid-ax _____ Mid-clav _____ Time _____ R _____ L _____ Mid-ax _____ Mid-clav _____ Time _____ R _____ L _____ Mid-ax _____ Mid-clav _____ Time _____ R _____ L _____ Mid-ax _____ Mid-clav _____ Chest Tube Time _____ R _____ L _____ Vent Settings Time _____ Mode _____ Rate _____ TV _____ FIO₂ _____ PEEP _____ PIP _____ ETCO₂ _____ Initial _____ Change _____ Change _____ Change _____ </div> <div style="width: 45%;"> Chest Equal Rise and Fall <input type="radio"/> Y <input type="radio"/> N <input type="radio"/> N/A Respiratory Effort <input type="checkbox"/> Unlabored <input type="checkbox"/> Labored <input type="checkbox"/> Agonal <input type="checkbox"/> Assisted </div> </div>									
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> Circulation - Assessment Rhythm/ECG <input type="checkbox"/> NSR <input type="checkbox"/> SVT <input type="checkbox"/> A.D. +1, +2, +3 <input type="checkbox"/> ST <input type="checkbox"/> VT <input type="checkbox"/> RAD <input type="checkbox"/> BRAC <input type="checkbox"/> SB <input type="checkbox"/> VF <input type="checkbox"/> CAR <input type="checkbox"/> PEA <input type="checkbox"/> FEM <input type="checkbox"/> Paced <input type="checkbox"/> PED <input type="checkbox"/> Asystole <input type="checkbox"/> TEMP <input type="checkbox"/> A-FIB <input type="checkbox"/> A-FLUT </div> <div style="width: 45%;"> Circulation - Resuscitation Transfusion Indication <input type="checkbox"/> Amputation <input type="checkbox"/> HR > 120 <input type="checkbox"/> SBP < 90 Blood Infusion Time _____ Component _____ ABO/RH _____ Unit Number _____ Exp. Date _____ Blood Age _____ IV Lines Peripheral Hand <input type="checkbox"/> R <input type="checkbox"/> L ga _____ Arm <input type="checkbox"/> R <input type="checkbox"/> L ga _____ EJ <input type="checkbox"/> R <input type="checkbox"/> L ga _____ IO Type / Site <input type="checkbox"/> Fast-I <input type="checkbox"/> EZ IO Other _____ Humerus <input type="checkbox"/> R <input type="checkbox"/> L Tibia <input type="checkbox"/> R <input type="checkbox"/> L <input type="checkbox"/> Sternum Central Line Location _____ <input type="checkbox"/> Triple lumen <input type="checkbox"/> Cordis Arterial Line Wrist <input type="checkbox"/> R <input type="checkbox"/> L Groin <input type="checkbox"/> R <input type="checkbox"/> L </div> </div>									
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> PREPARED BY (Name, Rank & Title) _____ </div> <div style="width: 45%;"> DEPARTMENT/SERVICE/CLINIC (Treating Unit) _____ DATE _____ </div> </div>									
PATIENT'S IDENTIFICATION (Name: last, first, middle; grade; date; hospital or medical facility) Last Name _____ First Name _____ MI _____ BR# _____ Rank _____ Unit _____ Pt Cat _____ SSN _____ DOB _____ Gender <input type="radio"/> M <input type="radio"/> F Allergy _____ Other _____									
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <input type="checkbox"/> HISTORY/PHYSICAL <input checked="" type="checkbox"/> TREATMENT <input type="checkbox"/> DIAGNOSTIC STUDIES <input type="checkbox"/> FLOW CHART <input type="checkbox"/> OTHER EXAMINATION OR EVALUATION <input type="checkbox"/> OTHER Specify _____ </div> </div>									

DA FORM 4700, FEB 2003

EDITION OF MAY 78 IS OBSOLETE.


JTS TACEVAC AAR & PCR OP 05 (MCMR-SRJ) NOV 2014

APD PE v1.0 ES

MEDICAL RECORD-SUPPLEMENTAL MEDICAL DATA For use of this form, see AR 40-66; the proponent agency is the Office of the Surgeon General																																																																								
REPORT TITLE Tactical Evacuation After Action Report & Patient Care Record, Page 2												JTS APPROVED (Date) <i>(12 Jul 2018) -V4.1</i>																																																												
Vital Signs																																																																								
Time	HR	BP	RR	SpO ₂	ETCO ₂	Temp	F	C	AVPU	GCS: Eyes 1-4	Verbal 1-5	Motor 1-6	Total	Pain 0-10																																																										
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Additional Interventions																																																																								
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Other Interventions _____																																																																								
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TACTICAL EVACUATION-AFTER ACTION REPORT & PATIENT CARE RECORD <small>Page 3</small> IAW AR 40-68 (RAR) 22 May 2009 Paragraph 3-7. This page is a quality assurance document. Do not file in medical records.			
Casualty's Protective Equipment <i>(Check all worn)</i>			
<input type="checkbox"/> Helmet, Ballistic <input type="checkbox"/> Tactical Vest (TOTV) <input type="checkbox"/> Eye Protection <input type="checkbox"/> Ear Protection	<input type="checkbox"/> Plate Front <input type="checkbox"/> Plate Back <input type="checkbox"/> Plate Right Side <input type="checkbox"/> Plate Left Side	<input type="checkbox"/> Neck Protector (Back) <input type="checkbox"/> Throat Protector (Front) <input type="checkbox"/> Deltoid Right <input type="checkbox"/> Deltoid Left	<input type="checkbox"/> Groin Shield <input type="checkbox"/> Pelvic Undergarment Tier 1 <input type="checkbox"/> Pelvic Undergarment Tier 2 <input type="checkbox"/> Blast Gauge <input type="checkbox"/> Blast Sensor Helmet <input type="checkbox"/> Blast Sensor Other
AAR Discussion Event Date: _____ <input type="checkbox"/> Tactical situation complicated care <i>(Explain in discussion)</i>			
Sustains		Improves	
PATIENT'S IDENTIFICATION <i>(Name: last, first, middle; grade; date; hospital or medical facility)</i>			
Last Name _____		First Name _____ MI _____	
BR# _____	Rank _____	Unit _____	
SSN _____	DOB _____	Gender <input type="radio"/> M <input type="radio"/> F	Pt Cat _____ ▼
Date _____		Allergy _____ ▼ Other _____	
The National Defense Authorization Act for fiscal year 1987 (Public Law [P.L.] No. 99-661), section 1102, Title 10, (10 USC 1102) this document was created by or for the DOD in a medical QA program and is confidential and privileged. PL 99-661 and subsequent guidance predicated on this law (10 USC 1102) preclude disclosure of, or testimony about, any records or findings, recommendations, evaluations, opinions, or actions taken as part of a QA program except in limited situations. Under the provisions of 10 USC 1102, this information is exempt from release in accordance with Exemption 3 of the FOIA. Additional detailed information regarding the confidentiality of QA documents and records is contained in appendix B.			

FOR OFFICIAL USE ONLY (FOUO)

TCCC AAR									
(Complete within 72hrs after mission and send via NIPR to the Director of the Joint Theater Trauma System)									
Event Date:		Time:		<input type="checkbox"/> Local / <input type="checkbox"/> ZULU		Country:		Region:	
<input type="checkbox"/> Battle Injury (BI):		<input type="checkbox"/> WIA / <input type="checkbox"/> KIA / <input type="checkbox"/> DOW		<input type="checkbox"/> Non-Battle Injury (NBI):		<input type="checkbox"/> Alive / <input type="checkbox"/> Dead			
Evacuation Category		<input type="checkbox"/> A / <input type="checkbox"/> B / <input type="checkbox"/> C							
<input type="checkbox"/> Ground Carry		Type:							
<input type="checkbox"/> Ground Litter		Type:							
<input type="checkbox"/> Ground Vehicle		Type:						Time of Pick Up:	
<input type="checkbox"/> Aircraft		Airframe:						Time of Pick Up:	
Casualty Demographic Information (Minimum requirement is for Battle Roster # and Unit)									
BR#:		Unit:							
LName:		FName:		Rank:		SSN:		DOB:	
Point-of-Injury Provider Information				Last Name		First Name		Rank	
NM - Non-Medic First Responder									
M - Medic									
MO - Medical Officer									
M - Mechanism of Injury			I - Injuries			Annotate Injuries			
<input type="checkbox"/> Airborne Operation <input type="checkbox"/> Aircraft Crash <input type="checkbox"/> Blast – Dismounted IED or Mine <input type="checkbox"/> Blast – Mounted IED or Mine <input type="checkbox"/> Blast – RPG or Grenade <input type="checkbox"/> Blast – Indirect Fire (Mortar/Artillery) <input type="checkbox"/> Blast – Other <input type="checkbox"/> Collapse / Crush from Structure <input type="checkbox"/> Environmental: _____ <input type="checkbox"/> Fall, Height: _____ ft <input type="checkbox"/> Fragmentation / Shrapnel <input type="checkbox"/> GSW – Gunshot Wound <input type="checkbox"/> Motor Vehicle Accident <input type="checkbox"/> Other: _____			<input type="checkbox"/> (A)mputation <input type="checkbox"/> (B)leeding <input type="checkbox"/> (Bu)m, TBSA: _____ % <input type="checkbox"/> (C)repitus <input type="checkbox"/> (D)eformity <input type="checkbox"/> (DG)degloving <input type="checkbox"/> (E)chymosis <input type="checkbox"/> (FX)Fracture <input type="checkbox"/> (GSW) Gun Shot Wound <input type="checkbox"/> (H)ematoma <input type="checkbox"/> (LAC)eration <input type="checkbox"/> (P)ain <input type="checkbox"/> (PP)Peppering <input type="checkbox"/> (PW)Puncture Wound						
S - Signs									
Initial:		<input type="checkbox"/> A <input type="checkbox"/> V <input type="checkbox"/> P <input type="checkbox"/> U		GCS: <input type="checkbox"/> /15 (E <input type="checkbox"/> /4, V <input type="checkbox"/> /5, M <input type="checkbox"/> /6)		RR: <input type="checkbox"/> /		HR: <input type="checkbox"/> /	
Last:		<input type="checkbox"/> A <input type="checkbox"/> V <input type="checkbox"/> P <input type="checkbox"/> U		GCS: <input type="checkbox"/> /15 (E <input type="checkbox"/> /4, V <input type="checkbox"/> /5, M <input type="checkbox"/> /6)		RR: <input type="checkbox"/> /		HR: <input type="checkbox"/> /	
		Eye Opening 4 – spontaneous 3 – to speech 2 – to pain 1 – no response		Verbal Response 5 – alert and oriented 4 – disoriented conversation 3 – speaking but nonsensical 2 – moans, unintelligible sounds 1 – no response		Motor Response 6 – follows commands 5 – localizes pain 4 – withdraws from pain 3 – decorticate flexion 2 – decerebrate extension 1 – no response			
T - Treatments									
WHO		WHAT				WHERE (on body)		WHEN	
Circulation - Hemorrhage Control									
<input type="checkbox"/> NM <input type="checkbox"/> M <input type="checkbox"/> MO		<input type="checkbox"/> TQ-Extremity		<input type="checkbox"/> CAT <input type="checkbox"/> SOFTT <input type="checkbox"/> Other:		<input type="checkbox"/> RUE <input type="checkbox"/> LUE <input type="checkbox"/> RLE <input type="checkbox"/> LLE			
<input type="checkbox"/> NM <input type="checkbox"/> M <input type="checkbox"/> MO		<input type="checkbox"/> TQ-Extremity		<input type="checkbox"/> CAT <input type="checkbox"/> SOFTT <input type="checkbox"/> Other:		<input type="checkbox"/> RUE <input type="checkbox"/> LUE <input type="checkbox"/> RLE <input type="checkbox"/> LLE			
<input type="checkbox"/> NM <input type="checkbox"/> M <input type="checkbox"/> MO		<input type="checkbox"/> TQ-Extremity		<input type="checkbox"/> CAT <input type="checkbox"/> SOFTT <input type="checkbox"/> Other:		<input type="checkbox"/> RUE <input type="checkbox"/> LUE <input type="checkbox"/> RLE <input type="checkbox"/> LLE			
<input type="checkbox"/> NM <input type="checkbox"/> M <input type="checkbox"/> MO		<input type="checkbox"/> TQ-Extremity		<input type="checkbox"/> CAT <input type="checkbox"/> SOFTT <input type="checkbox"/> Other:		<input type="checkbox"/> RUE <input type="checkbox"/> LUE <input type="checkbox"/> RLE <input type="checkbox"/> LLE			
<input type="checkbox"/> NM <input type="checkbox"/> M <input type="checkbox"/> MO		<input type="checkbox"/> TQ-Junctional, Type:							
<input type="checkbox"/> NM <input type="checkbox"/> M <input type="checkbox"/> MO		<input type="checkbox"/> Hemostatic Dressing, Type:							
<input type="checkbox"/> NM <input type="checkbox"/> M <input type="checkbox"/> MO		<input type="checkbox"/> Pressure Dressing, Type:							
<input type="checkbox"/> NM <input type="checkbox"/> M <input type="checkbox"/> MO		<input type="checkbox"/> Splint, Type:							
<input type="checkbox"/> NM <input type="checkbox"/> M <input type="checkbox"/> MO		<input type="checkbox"/> Other:							
Airway									
<input type="checkbox"/> NM <input type="checkbox"/> M <input type="checkbox"/> MO		<input type="checkbox"/> NPA-Nasopharyngeal Airway							
<input type="checkbox"/> NM <input type="checkbox"/> M <input type="checkbox"/> MO		<input type="checkbox"/> Cric-Cricothyroidotomy, Type:							
<input type="checkbox"/> NM <input type="checkbox"/> M <input type="checkbox"/> MO		<input type="checkbox"/> ET-Endotracheal Tube, Type:							
<input type="checkbox"/> NM <input type="checkbox"/> M <input type="checkbox"/> MO		<input type="checkbox"/> King LT, <input type="checkbox"/> LMA, <input type="checkbox"/> Other:							

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Breathing			<input type="checkbox"/> Spontaneous	<input type="checkbox"/> Labored	<input type="checkbox"/> Assisted	<input type="checkbox"/> Assisted with BVM	WHEN
<input type="checkbox"/> NM	<input type="checkbox"/> M	<input type="checkbox"/> MO	<input type="checkbox"/> Chest Seal, Type:				
<input type="checkbox"/> NM	<input type="checkbox"/> M	<input type="checkbox"/> MO	<input type="checkbox"/> Needle Decompression				
<input type="checkbox"/> NM	<input type="checkbox"/> M	<input type="checkbox"/> MO	<input type="checkbox"/> Chest Tube				
Circulation - Resuscitation							
<input type="checkbox"/> NM	<input type="checkbox"/> M	<input type="checkbox"/> MO	<input type="checkbox"/> Saline Lock				
<input type="checkbox"/> NM	<input type="checkbox"/> M	<input type="checkbox"/> MO	<input type="checkbox"/> IO-Intracosseous Device, Type:				
<input type="checkbox"/> NM	<input type="checkbox"/> M	<input type="checkbox"/> MO	<input type="checkbox"/> TXA-Tranexamic Acid		Dose:		
<input type="checkbox"/> NM	<input type="checkbox"/> M	<input type="checkbox"/> MO	<input type="checkbox"/> Hextend IVF		Volume:		
<input type="checkbox"/> NM	<input type="checkbox"/> M	<input type="checkbox"/> MO	<input type="checkbox"/> FDP-Freeze Dried Plasma		Volume:		
<input type="checkbox"/> NM	<input type="checkbox"/> M	<input type="checkbox"/> MO	<input type="checkbox"/> Other Blood Product:		Volume:		
<input type="checkbox"/> NM	<input type="checkbox"/> M	<input type="checkbox"/> MO	<input type="checkbox"/> Other IVF:		Volume:		
Interventions - Other							
<input type="checkbox"/> NM	<input type="checkbox"/> M	<input type="checkbox"/> MO	<input type="checkbox"/> Eye Shield		<input type="checkbox"/> OD	<input type="checkbox"/> OS	
<input type="checkbox"/> NM	<input type="checkbox"/> M	<input type="checkbox"/> MO	<input type="checkbox"/> C-Collar		<input type="checkbox"/> Spine Board		
<input type="checkbox"/> NM	<input type="checkbox"/> M	<input type="checkbox"/> MO	<input type="checkbox"/> Hypothermia Prevention, Product:				
<input type="checkbox"/> NM	<input type="checkbox"/> M	<input type="checkbox"/> MO	<input type="checkbox"/> Hypothermia Prevention, Product:				
Medications - Pain, Infection, Other					(Route = IM, IV, PO, PR, SL, SQ)		
<input type="checkbox"/> NM	<input type="checkbox"/> M	<input type="checkbox"/> MO	<input type="checkbox"/> Combat Wound Pill Pack				
<input type="checkbox"/> NM	<input type="checkbox"/> M	<input type="checkbox"/> MO	<input type="checkbox"/> Analgesic, Name:		Dose:	Route:	▼
<input type="checkbox"/> NM	<input type="checkbox"/> M	<input type="checkbox"/> MO	<input type="checkbox"/> Analgesic, Name:		Dose:	Route:	▼
<input type="checkbox"/> NM	<input type="checkbox"/> M	<input type="checkbox"/> MO	<input type="checkbox"/> Analgesic, Name:		Dose:	Route:	▼
<input type="checkbox"/> NM	<input type="checkbox"/> M	<input type="checkbox"/> MO	<input type="checkbox"/> Analgesic, Name:		Dose:	Route:	▼
<input type="checkbox"/> NM	<input type="checkbox"/> M	<input type="checkbox"/> MO	<input type="checkbox"/> Antibiotic, Name:		Dose:	Route:	▼
<input type="checkbox"/> NM	<input type="checkbox"/> M	<input type="checkbox"/> MO	<input type="checkbox"/> Antibiotic, Name:		Dose:	Route:	▼
<input type="checkbox"/> NM	<input type="checkbox"/> M	<input type="checkbox"/> MO	<input type="checkbox"/> Other Med, Name:		Dose:	Route:	▼
<input type="checkbox"/> NM	<input type="checkbox"/> M	<input type="checkbox"/> MO	<input type="checkbox"/> Other Med, Name:		Dose:	Route:	▼
General Comments:							
Sustains (Treatment, Equipment, Evacuation, Operations):							
Improves (Treatment, Equipment, Evacuation, Operations):							
BR#:				Unit			

23. Mnemonics, Conversion Charts and Cheat Sheets

Mnemonics

Treatment Priorities (initial MARCHPAWS/prolonged field care HITMAN):

M – Massive Hemorrhage

A – Airway

R – Respirations

C – Circulation

H – Hypothermia/Head-to-toe

P – Pain

A – Antibiotics

W – Wounds

S – Splinting

H – Hydration/Hygiene/Hypothermia

I – Infection

T – Tubes and Lines

M – Medications

A – Analgesia

N – Nutrition

Patient History:

S – Signs/Symptoms

A – Allergies

M – Medications

P – Past medical history (illness, injury)

L – Last intake (food, fluid)

E – Ever happen before?

Pain Assessment:

O – Onset

P – Palliative and/or Precipitating (exacerbating) measures related to the pain

Q – Quality (sharp/dull, diffuse, pinpoint, or localized)

R – Radiating

S – Severity (scale of 1–10)

T – Timing: Time of onset; frequency; duration

Documentation/Reporting:

A – Age

T – Time of Injury

M – Mechanism of Injury

I – Injuries

S – Signs and Symptoms

T – Treatments

Causes of Coma/Decreased Level of Consciousness:

- A** – Alcohol (and other drugs), Acidosis (hyperglycemic coma/DKA)
- E** – Electrolyte abnormality, Endocrine problem, Epilepsy
- I** – Insulin (diabetes/hypoglycemic shock)
- O** – Oxygen (Hypoxia), Overdose (or poisoning)
- U** – Uremia (renal failure/insufficiency)
- T** – Trauma; Temperature (hypothermia, heat stroke)
- I** – Infection (e.g., meningitis, encephalitis, sepsis)
- P** – Psychogenic (“hysterical coma”)
- S** – Stroke or Space-occupying lesions in the cranium; Seizure; Shock

Coma Assessment:

- D** – Depth of coma (responds to verbal or painful stimulus, unresponsive)
- E** – Eyes (PERRLA)
- R** – Respiration (rate and rhythm)
- M** – Motor (posturing; loss of movement/sensation)

Level of Consciousness:

- A** – Patient is Alert and Oriented to person/place/date/time
- V** – Patient responds properly to verbal stimuli
- P** – Patient responds to painful stimuli (withdraws from stimulus)
- U** – Patient is unresponsive to all stimuli

Pupil Reaction:

- P** – Pupils
- E** – Equal
- R** – Round
- R** – Reactive to
- L** – Light

Distal Limb Assessment:

Pulse: Does the patient have distal pulses? Capillary blanch in finger in and toes?

Motor: Patient moves fingers and toes? Arms? Legs? Equal, bilateral muscle strength?

Sensory: Does the patient feel touch of fingers and toes? Does the unconscious patient respond when pinching his/her fingers and toes?

Oxygen Toxicity Symptoms:

- V** – Visual (Tunnel vision or blurred vision)
- E** – Ear symptoms (Tinnitus)
- N** – Nausea and/or vomiting
- T** – Twitching (Generally involves facial muscles, but can involve arms/legs)
- I** – Irritability (Change in diver’s mental status)
- D** – Disability (Sudden neurological deficit to include clumsiness, fatigue)
- C** – Convulsions (Often a first sign)

Airway and Critical Care References

Endotracheal Tube Size

- Adult male: **8.0**
- Adult female: **7.0**
- Infant: **3.5 no cuff**
- Toddler: **4.0 no cuff**
- 2-year old: **4.5 no cuff**
- Child: **Age+16/4 cuff ok >5 yr**

Endotracheal Tube Sizes/Airway Management					
Age	Size (mmID)	Blade	Distance@lip (cm)	LMA	Inflation Volume
Premature (1–2.5kg)	2.5*–3.0*	0Miller	6–8	N/A	
Term 60 mo. (2.5–4kg)	3.0*–3.5*	1Miller	9–11	#1	2–4mL
6–12 mo. (5–7kg)	3.5*–4.0*	1Miller	11	#1.5	2–7mL
12–20 mo. (7–10kg)	4.0*–4.5*	1.5 WisHip	12	#1.5	2–7mL
2 years (12kg)	4.5*–4.0*	1.5 WisHip	13	#2	2–10mL
4 years (14kg)	5.0*–4.5*	2Miller/Mac	14	#2	2–10mL
6 years (18kg)	5.0	2Miller/Mac	15–16	#2	2–14mL
8 years (24kg)	5.5	2Miller/Mac	16–17	#2.5	2–14mL
10 years (30kg)	6.5	2Miller/3Mac	17–18	#2.5	2–14mL
12 years (>30kg)	7.0	2Miller/3Mac	18–20	#3	20mL
Adult Normal (50–70kg)	7.0–8.0	2Miller/3Mac	20–22	#4	30mL
Adult Large (70–100kg)	8.0–9.0	3Miller/4Mac	22–24	#5	40mL
Pregnancy	6.5–7.0	2Miller/3Mac	20–22	#4	30mL
Adult Nasal Intubation	6.5–7.5	2–3Miller/3–4Mac	add 2–3 to oral	N/A	
*uncuffed ETT Size (mm) = (age + 16) ÷ 4 Distance at lip (cm) = 3 × Size (mm), Nasal = 4 × Size					

Rapid Sequence Intubation (RSI)	
Equipment: BVM, O2 supply, suction, drugs, laryngoscope handle and blade, stylette, SpO2 monitor, EtCO2 monitor or colorimetric indicator, extra-glottic device, cricothyrotomy supplies	
Contraindications	Anticipated difficult intubation, massive facial/mandibular trauma → surgical cricothyrotomy
Pre-oxygenation	Provide 100% oxygen by non-rebreathing mask while preparing for RSI
Induce, paralyze	Ketamine 150mg or etomidate 25mg followed immediately by: <ul style="list-style-type: none"> • Succinylcholine 150mg, mask ventilate for 30 seconds, then intubate, or • Rocuronium 100mg, mask ventilate for 2 minutes, then intubate • Vecuronium 100mg, mask ventilate for 3 minutes, then intubate
Pass the tube	Visualize vocal cords and pass appropriately sized tube, inflate cuff
Proof of placement	Colorimetric or EtCO2 via monitor MANDATORY. If unavailable chest rise and fogging of tube.
Post intubation care	Ventilate by hand or mechanical vent with 100% O2. Wean oxygen/rate to keep SpO2>EtCO2 35–40.
Failed intubation	Immediately place LMA or King Airway, ventilate with 100% O2. then consider surgical cricothyrotomy

Starting Vent Settings (Univent Eagle 754 and 731)

Mode-**SIMV** Rate-**10min (Peds 20min)** I:E Ratio-**1:2** Tidal Vol-**500mL (7mL/kg)**
FiO2-**50%** Hi/Lo Press-**40/0** PEEP-**5cm**

Basic Vent Management

- Initial calculation for Tidal Volume (TV) is 6–8mL/kg
- Oxygenation is influenced by FiO2 and Positive End Expiratory Pressure (PEEP)
 - If O2 sat is low (<90%), increase FiO2 and/or PEEP
 - Initial PEEP setting on vent is usually 5, can increase one or two at a time up to a max of 14
- Minute ventilation (RR X TV) drives CO2 levels measured by capnography
 - If EtCO2 high (>45) then, increase RR or TV
 - If EtCO2 low (<35) decrease RR or TV

Vent Troubleshooting

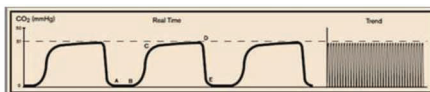
D – Displacement of ET Tube

O – Obstruction of ET Tube

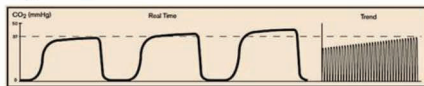
P – Pneumothorax

E – Equipment- Check hoses and connections

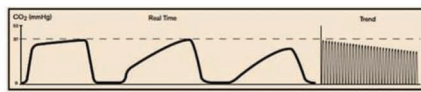
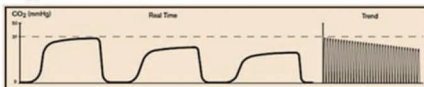
Capnography



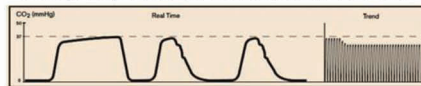
Hypoventilation



Hyperventilation



Inadequately sealed cuff around endotracheal tube



Cardiac Oscillations (normal)

- 35–45mmHg: Normal EtCO₂ range
- >45mmHg: Patient is being hypoventilated (Suspect respiratory distress)
- <35mmHg: Patient is being hyperventilated (Ensure rate is 10–12 breaths/min <1 breath/6sec>)

IV Drip Rate Chart

Quick Reference – Drip Rates

	Macro Drip (10gtts/mL)	Macro Drip (15gtts/mL)	Mini Drip (60gtts/mL)
ML/HR	GTTS/MIN	GTTS/MIN	GTTS/MIN
30mL	5	8	30
75mL	13	19	75
100mL	17	25	100
150mL	25	38	—
200mL	33	50	—
300mL	50	75	—

Conversions

Temperature		Weight		Other
°F	°C	Pounds	Kilograms	Weights and Measures
106	41.1	396	180	Volume
105	40.6	374	170	1cc = 1mL
104	40	352	160	1tsp = 5cc
103	39.4	330	150	1tbsp = 15cc
102	38.9	308	140	1fl oz = 30cc
101	38.3	286	130	1 jigger = 45cc
100	37.8	264	120	1pt = 473cc
99	37.2	242	110	2pt = 1qt
98.6	37	220	100	1qt = 946cc
98	36.7	209	95	4qt = 1gal
97	36.1	198	90	1gal = 8lb
96	35.6	187	85	Length
95	35	176	80	1cm = 0.39in
94	34.4	165	75	1in = 2.54cm
93	33.9	154	70	1 yard = 3ft
92	33.3	143	65	1ft = 0.31m
91	32.8	132	60	1m = 3.3ft
90	32.2	121	55	1km = 0.62mi
85	29.4	110	50	1mi = 1.61km
80	26.7	99	45	1mi = 5280ft
75	23.8	88	40	Weight
70	21.1	77	35	1gr = 65mg
				15gr = 1g
				1,000mg = 1g
				1oz = 28g
				454g = 1 lb
To convert °F to °C • $(^{\circ}\text{F} - 32) \text{ divide by } 1.8$		To convert lb to kg • Divide lb $\times 2.2$		1,000g = 1 kg
				1 kg = 2.2 lb
To convert °C to °F • $(^{\circ}\text{C} \times 1.8) + 32$		To convert kg to lb • Multiply kg $\times 2.2$		1 metric ton = 2,000 lb
				1 ton = 2,240 lb

GCS and APGAR Score

Glasgow Coma Scale		
Eye Opening	Spontaneous	4
	To voice	3
	To pain	2
	None	1
Verbal Response	Oriented	5
	Confused	4
	Inappropriate sounds	3
	Incomprehensible sounds	2
	None	1
Motor Response	Obeys Command	6
	Localizes pain	5
	Withdraws (pain)	4
	Flexion (pain)	3
	Extension (pain)	2
	None	1

Score of 8 or less, or deteriorating score indicates severe head injury.

APGAR (Accomplished 1min and 5min after birth)		
Appearance	Blue or pale	0
	Body pink, extremities blue	1
	Completely pink	2
Pulse Rate	Absent	0
	Below 100	1
	Above 100	2
Grimace	No response	0
	Grimaces	1
	Cries	2
Activity	Limp	0
	Some flexion of extremities	1
	Active motion	2
Respiratory	Absent	0
	Slow, irregular	1
	Good, strong cry	2

APGAR <4 = Serious condition requiring some degree of resuscitation

APGAR 4–6 = Condition is guarded

APGAR 7–10 = Normal stable infant

Shock Table

Type	S and S	Skin	Fluids	Meds
Hemorrhagic	Bleeding, trauma	Cool-clammy	PRBCs, Plasma	TXA
Neurogenic	Paralysis, weakness, spine trauma, spine deformity/tenderness/pain	Warm-dry	NS 1–2L	Epi, vasopressin
Septic	Fever, infection source	Warm, dry or moist	NS 1–2L	Ertapenem, Epi, Decadron
Anaphylactic	Wheezing, stridor, red swollen skin, rash	Warm-dry	NS 1–2L	Epi, Benadryl Pepcid, Decadron
Cardiogenic	MI chest pain, diaphoresis, arm/jaw pain, nausea, abnl EKG	Cool-clammy	250mL NS bolus's	FONA

- Additional cheat sheets may be located on the GA Medical SharePoint:
- <https://cs2.eis.af.mil/sites/13306/medical/SitePages/Home.aspx>

9-Line MEDEVAC Request

Line – 1. Location	
Line – 2. Call sign and frequency _____	
Line – 3. Number of patients by precedence	
A – Urgent Number _____	D – Routine Number _____
B – Urgent Surgical Number _____	E – Convenience Number _____
C – Priority Number _____	
Line – 4. Special equipment required	
A – None	C – Extraction equipment
B – Hoist	D – Ventilator
Line – Number of patients _____ L – Litter Number _____	A – Ambulatory Number _____
Line – 6. Security at pick-up site	
N – No enemy	E – Enemy in area
P – Possible enemy	X – Enemy (armed escort required)
Line – 7. Method of marking pick-up site	
A – Panels	D – None
B – Pyro	E – Other
C – Smoke	
Line – 8. Patient nationality and status	
A – US Military Number	D – Non-US Civilian Number
B – US Civilian Number	E – Enemy Prisoner of War Number
C – Non-US Military Number	
Line – 9. NBC Contamination/Terrain Description	
N—nuclear	B—biological
C—chemical	
M—Mechanism of injury: _____	
I—Injury sustained: _____	
S—Symptoms/signs: _____	
T—Treatment given: _____	

Medications Cheat Sheets – Attach to Monitor

Drug	Dose (~80kg)	per/kg	Duration	Description	Adverse Reactions
ketamine RSI	150mg	2mg/kg	15–30 min	Sleep dose for RSI	Hallucinations, ↑ secretions
ketamine analgesia	20mg	0.1mg/kg	15–30 min	Analgesia	Hallucinations, ↑ secretions
midazolam	5mg	0.05mg/kg	30 min	Sedation 5mg, anxiety 2mg, seizures 5mg (up to 10)	Airway obstruction, hypoventilation
diazepam	5–10mg	0.1mg/kg	60 min	Sedation 5mg, anxiety 2mg, antipileptic 5mg (up to 10)	Airway obstruction, hypoventilation
etomidate RSI	25mg	0.4mg/kg	15 min	Sleep dose for RSI	Apnea, maintains BP
propofol RSI	200mg	3mg/kg	15 min	Sleep dose for RSI	Apnea, hypotension
morphine	10mg	0.1mg/kg	60 min	Analgesia	Hypoventilation, apnea
fentanyl	50mcg	1mcg/kg	20 min	Analgesia	Hypoventilation, apnea
succinylcholine RSI	150mg	2mg/kg	10 min	Short acting paralytic	Apnea, hyperK ⁺ , rhabdomyolysis
rocuronium	100mg	1mg/kg	30 min	Intermediate acting paralytic	Apnea
vecuronium	10mg	0.1mg/kg	45 min	Intermediate acting paralytic	Apnea
atropine	0.4mg	0.01mg/kg	30 min	Treats bradycardia	Tachycardia, dilated pupils
naloxone	0.4mg	0.01mg/kg	20 min	Narcotic reversal	Increased pain
flumazenil	0.2mg	0.01mg/kg	20 min	Benzodiazepine reversal	Agitation
dexamethasone	4mg	0.01mg/kg	6 hours	Anaphylaxis, HACE, severe AMS	Hyperglycemia
mannitol	50gm	1gm/kg	4 hours	Extrication for crush injury	Caution with long QT (torsades)
ondansetron	4mg	0.1mg/kg	4 hours	Antiemetic	Sedation (Benadryl)
diphenhydramine	50mg	1mg/kg	4 hours	Antihistamine	Sedation (Phenergan)
promethazine	50mg	1mg/kg	6 hours	Antihistamine, antiemetic	Hypertension, ↑ HR
dopamine	1 to 10mcg/kg/min	—	Infusion	↑ cardiac contractility	Hypertension, ↑ HR
dobutamine	2 to 20mcg/kg/min	—	Infusion	↑ cardiac contractility	Hypertension, renal failure
phenylephrine	0.15–0.5mcg/kg/min	—	Infusion	↑ systematic vascular resistance	Hypertension, renal failure
norepinephrine	0.05–0.5mcg/kg/min	—	Infusion	↑ systematic vascular resistance	Hypertension
vasopressin	0.01–0.035U/kg/HR	—	Infusion	↑ SVR and renal blood flow	Skin necrosis in distal areas
epinephrine 1:1,000	0.5mg (0.5mL) SQ	0.01mg/kg	1 hour	Tx anaphylaxis, bronchospasm	
Sedation/hypnotic		Analgesic	Paralytic	Anticholinergics	Pressors
				Misc.	

Adult ACLS		
		Further Dosing – Indications
adenosine	6mg IV/IO push	IV PUSH in 1–2 seconds to treat SVT, double and repeat dose up to 2x if no effect
amiodarone	300mg IV/IO over 10min	then 150mg q3–5min. To treat pulseless VT/VF.
atropine	1mg IV/IO q3–5min	for asystole or bradycardic PEA. For bradycardic 0.4mg. 3mg max.
defibrillation	120J	then 150J, then 200J. Repeat after each medication.
cardioversion	75J synchronized	then 120J, then 150J.
CaCl ₂	10mg/kg q10min PRN	for cardiac arrest with 1K ⁺ , 1Ca, or Ca Channel blocker overdose
epinephrine	1mg IV/IO q3–5min	for VF/pulseless VT, asystole, and PEA
lidocaine	1–1.5mg/kg IV/IO initial, 30–50mcg/kg/min infusion	0.5–0.75mg/kg after 5–10min; for persistent VF/VT Maximum dose 3mg/kg
magnesium	1–2g IV in 100mL D ₅ W	Infuse at 0.5–1g/hr for torsades, 1Mg or refractory VF
NaHCO ₃	1mEq/kg initial, then 0.5mEq/kg q10min	Guided by ABG: $0.3 \times \text{wt (kg)} \times \text{base deficit} = \text{incremental dose in mEq}$. Do not mix with catecholamines or calcium salts. Helpful for treatment of 1K ⁺
procainamide	20mg/min IV infusion	maximum 17mg/kg, 100mg IVP q5min if in refractory VF/VT
vasopressin	40U IV/IO/ET × 1	Alternate pressor to epinephrine in Cardiac Arrest
NAVEL (naloxone, atropine, vasopressin, epinephrine, lidocaine) may be given via ETT in 10cc NS, at 2–3 × IV dose, Vaspressin 1 × IV dose.		
Pediatric Code		
		Further Dosing – Indications
adenosine	0.1mg/kg IV/IO push	IV PUSH in 1–2 seconds to treat SVT, double and repeat dose up to 2x if no effect
amiodarone	5mg/kg IV/IO load	over 10minutes for pulseless VT/VF
atropine	0.02mg/kg IV/IO	may repeat × 1. 1mg max.
defibrillation	2J/kg initial	then 4J/kg × 2. Repeat after each medication.
cardioversion	0.5–1J/kg	synchronized
epinephrine	0.01mg/kg IV/IO	q3–5min (0.1mL/kg of 1:10,000)
glucose	0.5–1g/kg IV/IO	2–4mL/kg of D25W. Give <i>slowly</i> .
lidocaine	1mg/kg IV/IO	may repeat × 1 after 10minutes
magnesium	25–50mg/kg IV/IO	for torsades de pointes or hypomagnesemia
NaHCO ₃	1mEq/kg	use only with ventilation. Give <i>slowly</i> .
volume	10–20mL/kg	isotonic (crystalloid). Repeat as guided by vital signs.

Appendix 1. TCCC Protocols

Principles of Combat Casualty Care

Guidelines and Considerations:

Care of trauma patients in a combat environment is not the same as in the civilian environment. ATLS, BTLS and PHTLS were never designed for use on the battlefield. In combat medicine, care of the patient must be modified to fit the tactical situation. It must be stressed that TCCC deals specifically with military combat trauma, and its recommendations apply solely to *tactical* pre-hospital settings.

The following TCCC guidelines for medical personnel (5 Nov 2020) have been modified for Pararescue applicability

(Updates to guidelines can be found at www.deployedmedicine.com or <http://www.naemt.org>)

Basic Management Plan for Care Under Fire/Threat

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 or when tactically feasible, move or drag casualty to cover.
4. Try to keep the casualty from sustaining additional wounds.
5. Casualties should be extracted 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.
 - i) Alternative hemostatic adjuncts:
 - 1) Celox Gauze or
 - 2) ChitoGauze or
 - 3) XStat (best for deep, narrow-tract junctional wounds)
 - 4) iTClamp (may be used alone or in conjunction with hemostatic dressing or XStat)
 - ii) 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.

- iii) 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.
 - c. For external hemorrhage of the head and neck where the wound edges can be easily re-approximated, the iTClamp may be used as a primary option for hemorrhage control. Wounds should be packed with a hemostatic dressing or XStat, if appropriate, prior to iTClamp application.
 - i) The iTClamp does not require additional direct pressure, either when used alone or in combination with other hemostatic adjuncts.
 - ii) If the iTClamp is applied to the neck, perform frequent airway monitoring and evaluate for an expanding hematoma that may compromise the airway. Consider placing a definitive airway if there is evidence of an expanding hematoma.
 - iii) DO NOT APPLY on or near the eye or eyelid (within 1cm of the orbit).
 - d. Perform initial assessment for hemorrhagic shock (altered mental status in the absence of brain injury and/or weak or absent radial pulse) and consider immediate initiation of shock resuscitation efforts.
4. Airway Management:
 - a. Conscious casualty with no airway problem identified:
 - i) No airway intervention required
 - b. Unconscious casualty without airway obstruction:
 - i) Place casualty in the recovery position
 - ii) Chin lift or jaw thrust maneuver OR

- iii) Nasopharyngeal airway OR
- iv) Extraglottic airway
- c. Casualty with airway obstruction or impending airway obstruction:
 - i) Allow a conscious casualty to assume any position that best protects the airway, to include sitting up and/or leaning forward.
 - ii) Use a chin lift or jaw thrust maneuver
 - iii) Use suction if available and appropriate
 - iv) Nasopharyngeal airway OR
 - v) Extraglottic airway (if the casualty is unconscious)
 - vi) Place an unconscious casualty in the recovery position
- d. If the previous measures are unsuccessful, perform a surgical cricothyroidotomy using one of the following:
 - i) Cric-Key technique
 - ii) Bougie-aided open surgical technique using a flanged and cuffed airway cannula of less than 10mm outer diameter, 6–7mm internal diameter, and 5–8cm of intratracheal length
 - iii) Standard open surgical technique using a flanged and cuffed airway cannula of less than 10mm outer diameter, 6–7mm internal diameter, and 5–8cm of intra-tracheal length (least desirable option)
 - iv) Use local anesthetic and *Procedural Sedation Protocol* if the casualty is conscious and clinical and tactical situation permit

NOTE: Localize the airway in a thick neck patient by using a syringe with needle to aspirate air, leave needle in place, make incision on needle, and place bougie or use tracheal hook for positive control of the airway.

- e. Cervical spine stabilization is not necessary for casualties who have sustained only penetrating trauma. Perform spinal motion restriction if unable to clear the spine (A and O, no drugs/ ETOH/pain meds, no midline spine pain or tenderness, neuro intact, no pain with motion).
- f. Monitor the hemoglobin oxygen saturation in casualties may change over time and requires frequent reassessment.
- g. Always remember that the casualty's airway status may change over time and requires frequent reassessment.

NOTES:

- 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.
 - i) Suspect a tension pneumothorax and treat when a casualty has significant torso trauma or primary blast injury and one or more of the following:
 - 1) Severe or progressive respiratory distress
 - 2) Severe or progressive tachypnea
 - 3) Absent or markedly decreased breath sounds on one side of the chest
 - 4) Hemoglobin oxygen saturation <90% on pulse oximetry
 - 5) Shock
 - 6) 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.

- ii) Initial treatment of suspected tension pneumothorax:
 - 1) If the casualty has a chest seal in place, burp or remove the chest seal
 - 2) Establish pulse oximetry monitoring
 - 3) 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
 - 4) Decompress the chest on the side of the injury with a 14-gauge or a 10-gauge, 3.25-inch needle/catheter unit
 - 5) 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

NOTE: 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.

- iii) The NDC should be considered successful if:
 - 1) Respiratory distress improves, OR
 - 2) 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
 - 3) Hemoglobin oxygen saturation increases to 90% or greater (note that this may take several minutes and may not happen at altitude), OR
 - 4) A casualty with no vital signs has return of consciousness and/or radial pulse.
- iv) If the initial NDC fails to improve the casualty's signs/symptoms from the suspected tension pneumothorax:
 - 1) 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.

- 2) Consider, based on the mechanism of injury and physical findings, whether decompression of the opposite side of the chest may be needed.
- v) If the initial NDC was successful, but symptoms later recur:
 - 1) Perform another NDC at the same site that was used previously. Use a new needle/catheter unit for the repeat NDC.
 - 2) Continue to re-assess!
- vi) If the second NDC is also not successful:
 - 1) Proceed to finger or tube thoracostomy.
- 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-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.
- c. Initiate pulse oximetry. All individuals with moderate/severe TBI, trauma, shortness of breath should be monitored with pulse oximetry. Readings may be misleading in the settings of shock or marked hypothermia.
- d. Casualties with moderate/severe TBI should be given supplemental oxygen when available to maintain an oxygen saturation >90%.
- e. If smoke inhalation is suspected, administer oxygen and monitor EtCO₂ if available
6. Circulation:
 - a. Bleeding:
 - i) A pelvic binder should be applied for cases of suspected pelvic fracture:
 - 1) Severe blunt force or blast injury with one or more of the following indications:
 - i. Pelvic pain
 - ii. Any major lower limb amputation or near amputation
 - iii. Physical exam findings suggestive of a pelvic fracture
 - iv. Unconsciousness
 - v. Shock
 - ii) 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.*
 - iii) 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 labs are available.
 - iv) 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/IO Access:
 - i) 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.
 - 1) An 18 gauge IV or saline lock. 14 or 16 gauge for blood products preferred for hemorrhagic shock.
 - 2) If vascular access is needed but not quickly obtainable via the IV route, use the IO route. Start 2 × IOs for true hemorrhagic shock.
- c. Tranexamic Acid (TXA):
 - i) If a casualty will likely need a blood transfusion (for example: presents with hemorrhagic shock, one or more major amputations, penetrating torso trauma, or evidence of severe bleeding) or
 - ii) If the casualty has signs or symptoms of significant TBI or has altered mental status associated with blast injury or blunt trauma:
 - 1) Administer 2g of tranexamic acid via slow IV or IO push as soon as possible but NOT later than 3 hours after injury.
- d. Fluid Resuscitation:
 - i) Assess for hemorrhagic shock (altered mental status in the absence of brain injury and/or weak or absent radial pulse).
 - ii) The resuscitation fluids of choice for casualties in hemorrhagic shock, listed from most to least preferred, are: cold stored whole blood; fresh whole blood; plasma and RBCs in a 1:1 ratio; plasma or RBCs alone; then crystalloids (Lactated Ringer's or Plasma-Lyte A).

NOTE: Hypothermia prevention measures [Section 7] should be initiated while fluid resuscitation is being accomplished.

 - 1) If not in shock:
 - i. No IV fluids are immediately necessary
 - ii. Fluids by mouth are permissible if the casualty is conscious and can swallow and has no major abdominal injury
 - 2) If in shock and blood products are available under an approved command or theater blood product administration protocol:
 - i. Resuscitate with whole blood; OR if not available
 - a. Plasma and RBCs in a 1:1 ratio; OR if not available
 - b. Reconstituted dried plasma, liquid plasma or thawed plasma alone or RBCs alone
 - ii. Reassess the casualty after each unit. Continue resuscitation until a palpable radial pulse, improved mental status or systolic BP of 80–90 is present.
 - 3) 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:
 - i. 1–2L of lactated Ringer or Plasma-Lyte A
 - ii. Reassess the casualty after each 500mL IV bolus.
 - iii. Continue resuscitation until a palpable radial pulse, improved mental status, or systolic BP of 80–90mmHg is present

NOTE: If TBI is suspected and casualty has a weak or absent radial pulse, resuscitate as necessary to restore and maintain a normal radial pulse. If BP monitoring is available, resuscitate to systolic of 100mmHg for uncontrolled hemorrhage or 110mmHg for controlled hemorrhage.

- iv. Discontinue fluid administration when one or more of the above end points has been achieved
- 4) 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.
- e. Refractory Shock
 - i) 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. Take early and aggressive steps to prevent further body heat loss and add external heat when possible for both trauma and severely burned casualties.
 - b. Minimize casualty's exposure to cold ground, wind and air temperatures. Place insulation material between the casualty and any cold surface as soon as possible. Keep protective gear on or with the casualty if feasible.
 - c. Replace wet clothing with dry clothing, if possible, and protect from further heat loss.
 - d. Place an active heating blanket on the casualty's anterior torso and under the arms in the axillae (to prevent burns, do not place any active heating source directly on the skin or wrap around the torso).
 - e. Enclose the casualty with the exterior impermeable enclosure bag.
 - f. As soon as possible, upgrade the hypothermia enclosure system to a well-insulated enclosure system using a hooded sleeping bag or other readily available insulation inside the enclosure bag/external vapor barrier shell.
 - g. Pre-stage an insulated hypothermia enclosure system with external active heating for transition from the non-insulated hypothermia enclosure systems; seek to improve upon existing enclosure system when possible.
 - h. Use a battery-powered warming device to deliver IV resuscitation fluids, in accordance with current CoTCCC guidelines, at flow rate up to 150mL/min with a 38°C output temperature.
 - i. Protect the casualty from exposure to wind and precipitation on any evacuation platform.
- 8. Penetrating Eye Trauma:
 - a. If a penetrating eye injury is noted or suspected:
 - i) Perform a rapid field test of visual acuity and document findings.
 - ii) Cover the eye with a rigid eye shield (NOT a pressure patch.)
 - iii) Ensure that the 400mg moxifloxacin tablet is taken, otherwise ertapenem IV/IO/IM
- 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:
 - i) Option 1
 - 1) Mild to Moderate Pain
 - Casualty is still able to fight

- i. TCCC Combat Wound Medication Pack (CWMP)
 - a. Tylenol – 500mg tablet, 2 PO q8hr
 - b. Meloxicam – 15mg PO qd
- ii) Option 2
 - 1) Moderate to Severe Pain
 - Casualty IS NOT in shock or respiratory distress AND
 - Casualty IS NOT at significant risk of developing either condition
 - i. Oral transmucosal fentanyl citrate (OTFC) 800µg
 - a. May repeat once more after 15 minutes if pain uncontrolled by first
 - ii. Fentanyl 50mcg IV (0.5–1mcg/kg)
 - a. May repeat q30min
 - iii. Fentanyl 100mcg IN
 - a. May repeat q30min
- iii) Option 3
 - 1) Moderate to Severe Pain
 - Casualty IS in hemorrhagic shock or respiratory distress OR
 - Casualty IS at significant risk of developing either condition
 - i. Ketamine 30mg (or 0.3mg/kg) slow IV or IO push
 - a. Repeat doses q20min PRN for IV or IO
 - b. End points: Control of pain or development of nystagmus (rhythmic back-and-forth movement of the eyes)
 - ii. Ketamine 50–100mg (or 0.5–1mg/kg) IM or IN
 - a. Repeat doses q20–30min PRN for IM or IN
 - iii. If an emergence phenomenon occurs, consider giving 0.5–2mg midazolam
 - iv. If continued dissociation is required, move to the Prolonged Casualty Care (PCC) analgesia and sedation guidelines
 - If longer duration analgesia is required:
 - i. Ketamine slow IV infusion 0.3mg/kg in 100mL 0.9% sodium chloride over 5–15 minutes
 - a. Repeat doses q45min PRN for IV or IO
 - b. End points: Control of pain or development of nystagmus (rhythmic back-and-forth movement of the eyes)

Analgesia notes:

- a. Disarm casualties after being given OTFC or ketamine
- b. Document AVPU status and GCS prior to administering opioids or ketamine
- c. For all casualties given opioids or ketamine – monitor airway, breathing, O2 saturation and circulation closely
- d. Directions for administering OTFC:
 - i) 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.
 - ii) Reassess in 15 minutes
 - iii) Add second lozenge, in other cheek, as necessary to control severe pain
 - iv) Monitor for respiratory depression
- e. IV Morphine is an alternative to OTFC if IV access has been obtained:
 - i) 5mg IV/IO

- ii) Reassess in 10 minutes
 - iii) Repeat dose every 10 minutes as necessary to control severe pain
 - iv) Monitor for respiratory depression
 - f. Naloxone (0.4mg IV or IM) should be available when using opioid analgesics
 - g. Withhold pain medicine for TBI and patient not complaining of or visibly in pain
 - h. Eye injury does not preclude the use of ketamine
 - 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, 4mg Orally Dissolving Tablet (ODT)/IV/IO/IM, q8hr 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 8mg 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:
 - i) Moxifloxacin (from the CWMP), 400mg PO once a day
 - ii) If unable to take PO meds (shock, unconsciousness)
 - b. Ertapenem, 1g IV/IM once a day
12. Inspect and dress known wounds. Clean and irrigate if time permits
13. Check for additional wounds
14. Burns:
- a. Assess and treat as a trauma casualty with burns and not burn casualty with injuries.
 - b. 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.
 - c. Estimate total body surface area (TBSA) burned to the nearest 10% using the Rule of 9's.
 - d. 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.
 - e. Fluid resuscitation (USAISR Rule of Ten):
 - i) 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 Ringers or normal saline. Avoid >4L NS.
 - ii) Initial IV/IO fluid rate is calculated as $\%TBSA \times 10\text{mL/hr}$ for adults weighing 40–80 kg.
 - iii) For every 10 kg ABOVE 80 kg, increase initial rate by 100mL/hr. Example: A 90 kg casualty with 50% TBSA burn would receive an initial rate of $(10\text{mL} \times 50)/\text{hr} + 100\text{mL/hr}$ or 600mL/hr.
 - iv) 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). All trauma care precedes burn care.
 - v) Consider oral fluids for burns up to 30% TBSA if casualty is conscious and able to swallow.
 - f. Analgesia in accordance with the TCCC Guidelines in Section (10) may be administered to treat burn pain.

- g. Prehospital antibiotic therapy is not indicated solely for burns, consider them for maritime missions or other scenarios where patient has been exposed to the elements, dirty environments, or prolonged field care/extended evac times.
 - h. All TCCC interventions can be performed on or through burned skin in a burn casualty.
 - i. 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. Cardiopulmonary resuscitation (CPR):
 - a. Resuscitation on the battlefield for victims of blast or penetrating trauma who have no pulse, no ventilations, no response to pain, and have fixed and dilated pupils 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 and declaring VSA (vital signs absent).
- 17. 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.
- 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 to the next level of care.
- 19. Prepare for Evacuation:
 - a. Complete and secure the TCCC Card (DD 1380) or PJ card, if a DD 1380 is unavailable, 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. Use padding and fill voids for long evacuations.
 - e. Provide instructions, eye and ear protection to ambulatory patients as needed.
 - f. Stage casualties for evacuation in accordance with unit standard operating procedures.
 - g. Maintain security.

Basic Management Plan for Tactical Evacuation Care (TACEVAC)

1. Transition of Care:
 - a. Establish evacuation point security and stage casualties for evacuation.
 - b. Communicate patient information and status to TACEVAC personnel if you are not evacuating the patient. Include stable or unstable, injuries, and treatments rendered.
 - c. TACEVAC personnel should stage casualties on evacuation platforms as required.
 - d. Secure casualties in the evacuation platform.
 - e. Re-assess casualties, re-evaluate all injuries and previous interventions.
2. MARCH PAWS:

NOTE: Oxygen supplementation:

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

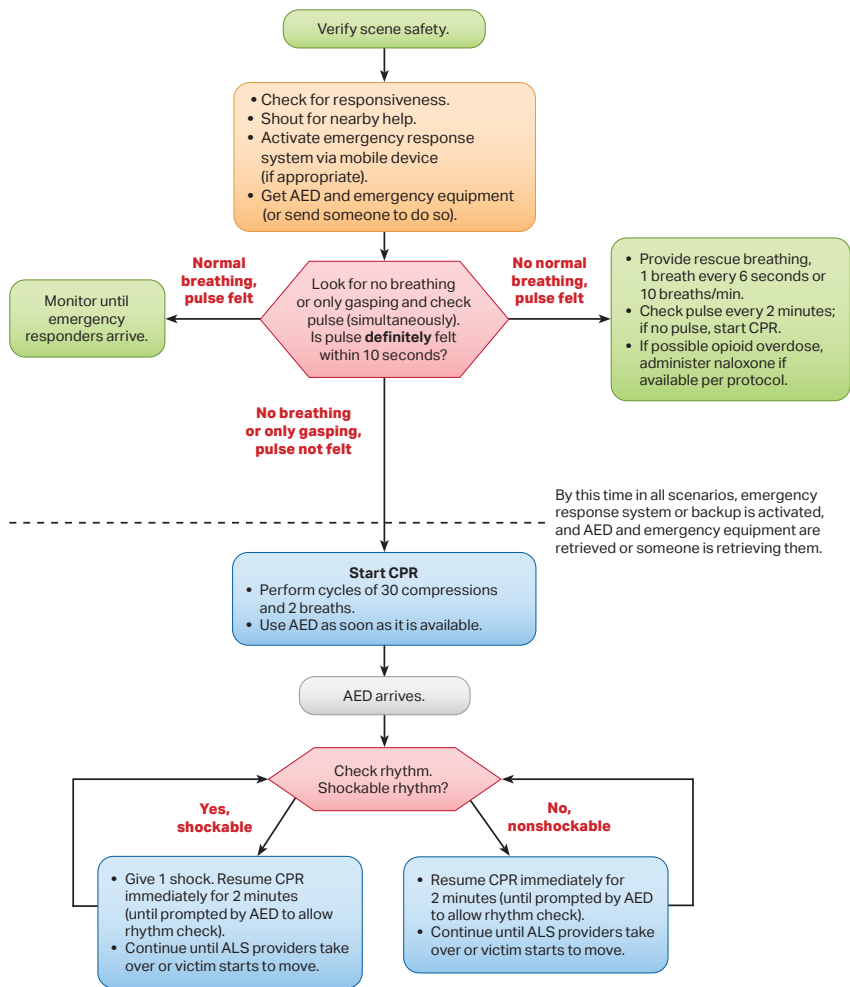
- i) Low oxygen saturation (<90%) by pulse oximetry
 - ii) Injuries associated with impaired oxygenation
 - iii) Unconscious casualty
 - iv) Casualty with TBI (maintain oxygen saturation >90%)
 - v) Casualty in shock
 - vi) Casualty at altitude
 - vii) Known or suspected smoke inhalation
3. Traumatic Brain Injury:
 - a. Casualties with moderate/severe TBI should be monitored and treated for:
 - i) Decreases in level of consciousness
 - ii) Pupillary dilation
 - iii) Keep SBP ≥ 100 mmHg
 - iv) Keep O₂ sat $\geq 90\%$
 - v) PCO₂ (If capnography is available, maintain between 35–40mmHg)
 - vi) Penetrating head trauma (if present, administer antibiotics), use Versed for seizures
 - vii) 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:
 - i) Administer Hypertonic saline (30mL – 23.4% Saline)
 - ii) Elevate the casualty's head 30°
 - iii) Hyperventilate the casualty
 - a. Respiratory rate 20
 - b. Capnography should be used to maintain the end-tidal CO₂ between 30–35mmHg.
 - c. The highest oxygen concentration (FIO₂) possible should be used for hyperventilation.
 - d. Do not hyperventilate the casualty unless signs of impending herniation are present.
4. Hypothermia Prevention:
 - a. Treat per *Tactical Field Care Hypothermia Protocol*
 - b. Protect the casualty from wind if doors must be kept open

5. Monitoring:
 - a. VS, EKG, pulse ox, capnometry if intubated, surgical airway or supraglottic airway (SGA) used
 - b. Rely on frequent radial pulse checks, observing the patient's eyes, and respiratory patterns
6. Constant reassessment, monitoring, and documentation
7. Re-dress and clean any wounds so the packaging is neat and clean
8. Reassess fractures, check pulses, make sure all splints are well placed
9. 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.
10. CPR in TACEVAC Care:
 - a. Casualties with torso trauma or polytrauma who have no pulse or respirations during TACEVAC should have bilateral needle decompression performed to ensure they do not have a tension pneumothorax. The procedure is the same as described in Tactical Field Care, Section (5a) above.
 - b. CPR may be attempted during this phase of care if the casualty does not have obviously fatal wounds and will be arriving at a facility with a surgical capability within a short period of time. CPR should not be done at the expense of compromising the mission or denying lifesaving care to other casualties.
 - c. If patients with hemorrhagic shock lose their pulse, focus on pressured blood/blood product infusion through 2 lines, compressions can be considered after fluid resuscitation.
 - d. If declaring VSA, have 2 PJs sign card documenting, pulseless, apneic, unresponsive to pain, and bilateral fixed and dilated pupils.
11. Documentation of Care:
 - a. Document clinical assessments, treatments rendered, and changes in the casualty's status on a TACEVAC AAR & PCR (DA Form 4700). Forward this information with the casualty to the next level of care.

Appendix 2. Emergency Cardiovascular Care

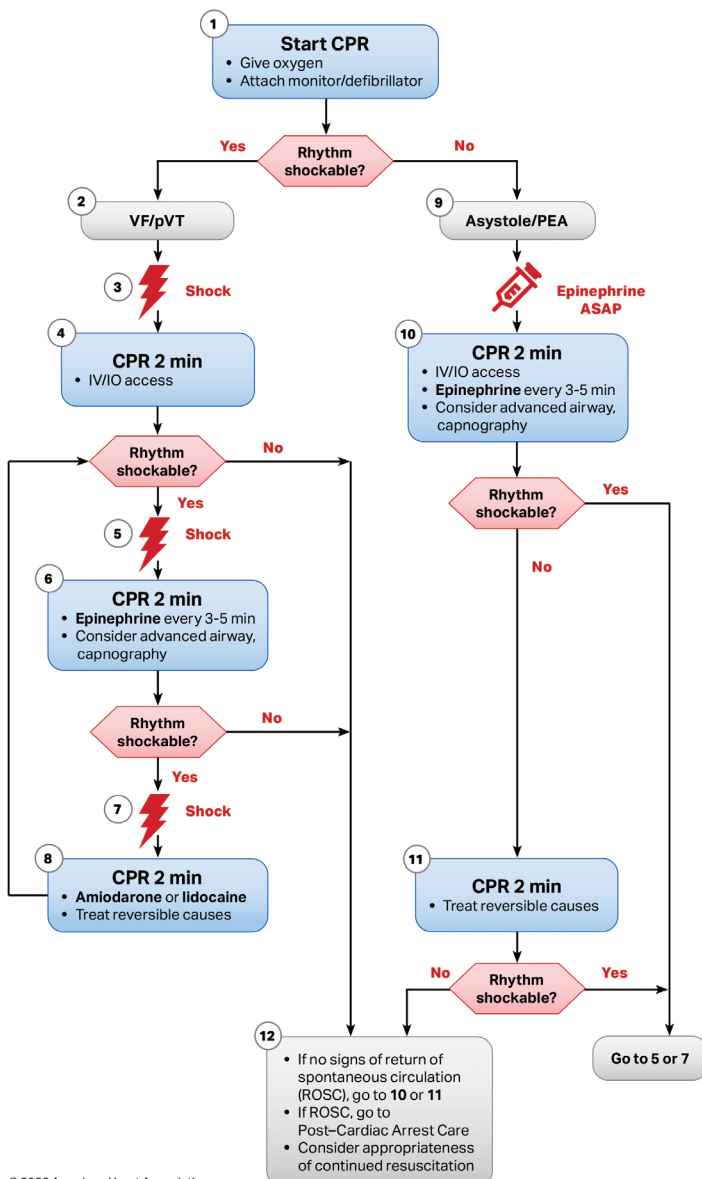
The following algorithms are compiled from the AHA 2020 Emergency Cardiovascular Care guidelines. For more information visit: <https://cpr.heart.org/en/resuscitation-science/cpr-and-ecc-guidelines>.

Adult BLS/CPR



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Adult ACLS Cardiac Arrest



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CPR Quality

- Push hard (at least 2 inches [5 cm]) and fast (100–120/min) and allow complete chest recoil.
- Minimize interruptions in compressions.
- Avoid excessive ventilation.
- Change compressor every 2 minutes, or sooner if fatigued.
- If no advanced airway, 30:2 compression-ventilation ratio, or 1 breath every 6 seconds.
- Quantitative waveform capnography
 - If PETCO₂ is low or decreasing, reassess CPR quality.

Shock Energy for Defibrillation

- **Biphasic:** Manufacturer recommendation (eg, initial dose of 120–200 J); if unknown, use maximum available. Second and subsequent doses should be equivalent, and higher doses may be considered.
- **Monophasic:** 360 J

Drug Therapy

- **Epinephrine IV/IO dose:** 1 mg every 3–5 minutes
- **Amiodarone IV/IO dose:** First dose: 300 mg bolus. Second dose: 150 mg.
- **Lidocaine IV/IO dose:** First dose: 1–1.5 mg/kg. Second dose: 0.5–0.75 mg/kg.

Advanced Airway

- Endotracheal intubation or supraglottic advanced airway
- Waveform capnography or capnometry to confirm and monitor ET tube placement
- Once advanced airway in place, give 1 breath every 6 seconds (10 breaths/min) with continuous chest compressions

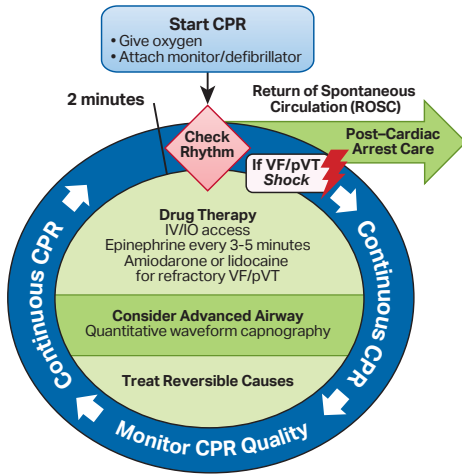
Return of Spontaneous Circulation (ROSC)

- Pulse and blood pressure
- Abrupt sustained increase in PETCO₂ (typically ≥40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

Reversible Causes

- Hypovolemia
- Hypoxia
- Hydrogen ion (acidosis)
- Hypo-/hyperkalemia
- Hypothermia
- Tension pneumothorax
- Tamponade, cardiac
- Toxins
- Thrombosis, pulmonary
- Thrombosis, coronary

Adult ACLS Cardiac Arrest (Circular)



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CPR Quality

- Push hard (at least 2 inches [5 cm]) and fast (100-120/min) and allow complete chest recoil.
- Minimize interruptions in compressions.
- Avoid excessive ventilation.
- Change compressor every 2 minutes, or sooner if fatigued.
- If no advanced airway, 30:2 compression-ventilation ratio.
- Quantitative waveform capnography
 - If PETCO₂ is low or decreasing, reassess CPR quality.

Shock Energy for Defibrillation

- **Biphasic:** Manufacturer recommendation (eg, initial dose of 120-200 J); if unknown, use maximum available. Second and subsequent doses should be equivalent, and higher doses may be considered.
- **Monophasic:** 360 J

Drug Therapy

- **Epinephrine IV/IO dose:** 1 mg every 3-5 minutes
- **Amiodarone IV/IO dose:** First dose: 300 mg bolus. Second dose: 150 mg.
- or
- **Lidocaine IV/IO dose:** First dose: 1-1.5 mg/kg. Second dose: 0.5-0.75 mg/kg.

Advanced Airway

- Endotracheal intubation or supraglottic advanced airway
- Waveform capnography or capnometry to confirm and monitor ET tube placement
- Once advanced airway in place, give 1 breath every 6 seconds (10 breaths/min) with continuous chest compressions

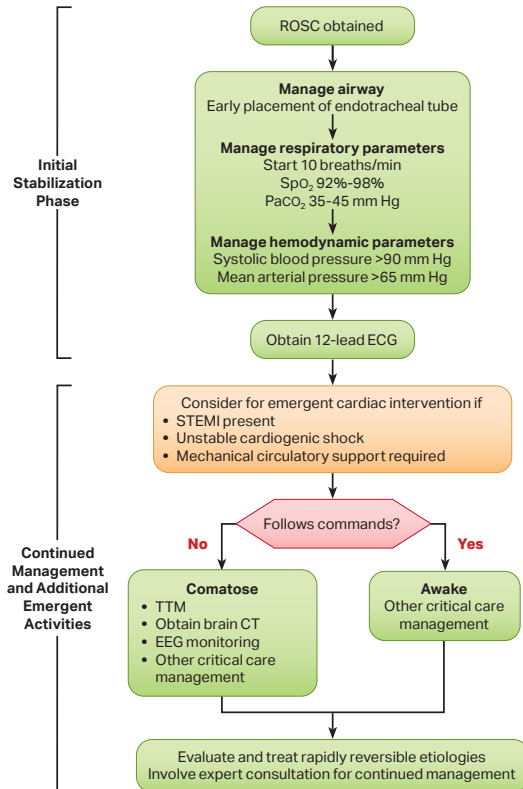
Return of Spontaneous Circulation (ROSC)

- Pulse and blood pressure
- Abrupt sustained increase in PETCO₂ (typically ≥40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

Reversible Causes

- | | |
|---------------------------|-------------------------|
| • Hypovolemia | • Tension pneumothorax |
| • Hypoxia | • Tamponade, cardiac |
| • Hydrogen ion (acidosis) | • Toxins |
| • Hypo-/hyperkalemia | • Thrombosis, pulmonary |
| • Hypothermia | • Thrombosis, coronary |

Adult ACLS Post Cardiac Arrest Care



Initial Stabilization Phase

Resuscitation is ongoing during the post-ROSC phase, and many of these activities can occur concurrently. However, if prioritization is necessary, follow these steps:

- **Airway management:**
Waveform capnography or capnometry to confirm and monitor endotracheal tube placement
- **Manage respiratory parameters:**
Titrate FiO_2 for SpO_2 92%-98%; start at 10 breaths/min; titrate to PaCO_2 of 35-45 mm Hg
- **Manage hemodynamic parameters:**
Administer crystalloid and/or vasopressor or inotrope for goal systolic blood pressure >90 mm Hg or mean arterial pressure >65 mm Hg

Continued Management and Additional Emergent Activities

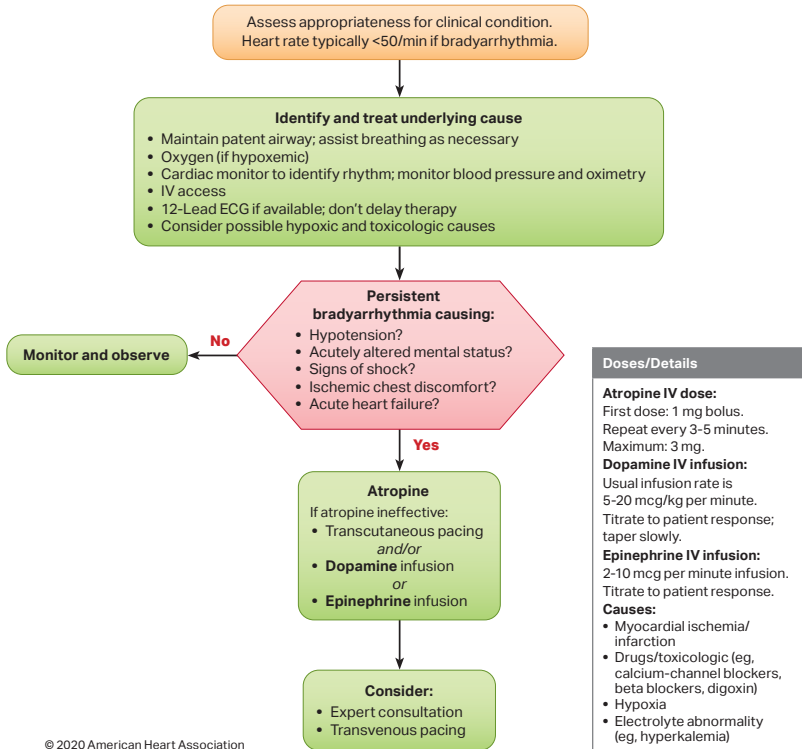
These evaluations should be done concurrently so that decisions on targeted temperature management (TTM) receive high priority as cardiac interventions.

- **Emergent cardiac intervention:**
Early evaluation of 12-lead electrocardiogram (ECG); consider hemodynamics for decision on cardiac intervention
- **TTM:** If patient is not following commands, start TTM as soon as possible; begin at 32-36°C for 24 hours by using a cooling device with feedback loop
- **Other critical care management**
 - Continuously monitor core temperature (esophageal, rectal, bladder)
 - Maintain normoxia, normocapnia, euglycemia
 - Provide continuous or intermittent electroencephalogram (EEG) monitoring
 - Provide lung-protective ventilation

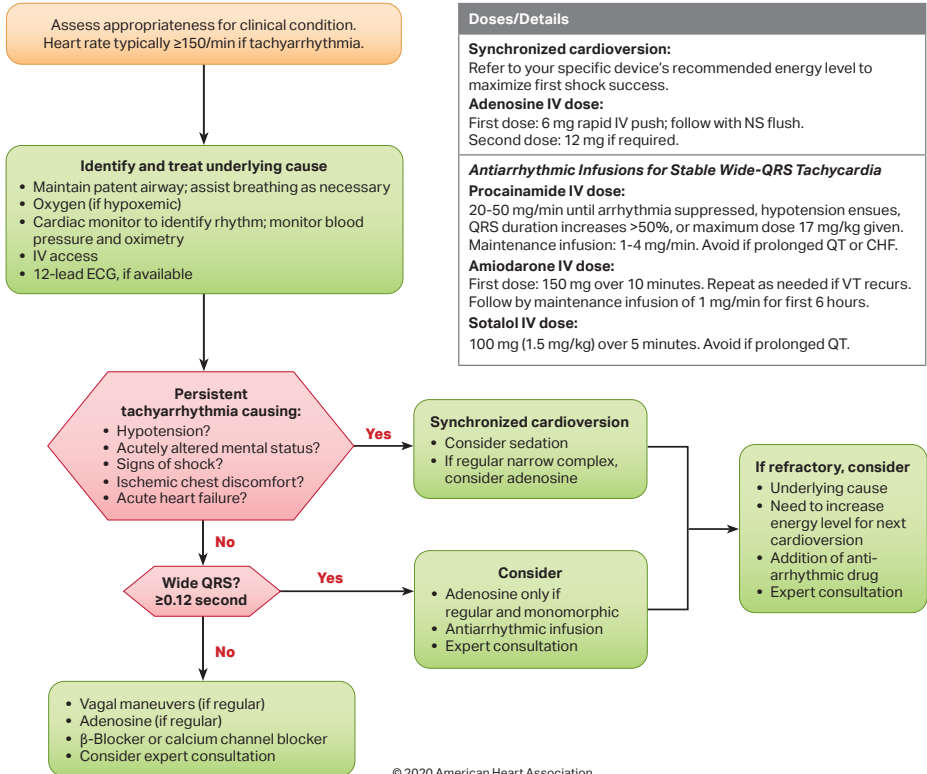
H's and T's

Hypovolemia
Hypoxia
Hydrogen ion (acidosis)
Hypokalemia/hyperkalemia
Hypothermia
Tension pneumothorax
Tamponade, cardiac
Toxins
Thrombosis, pulmonary
Thrombosis, coronary

Adult ACLS Bradycardia

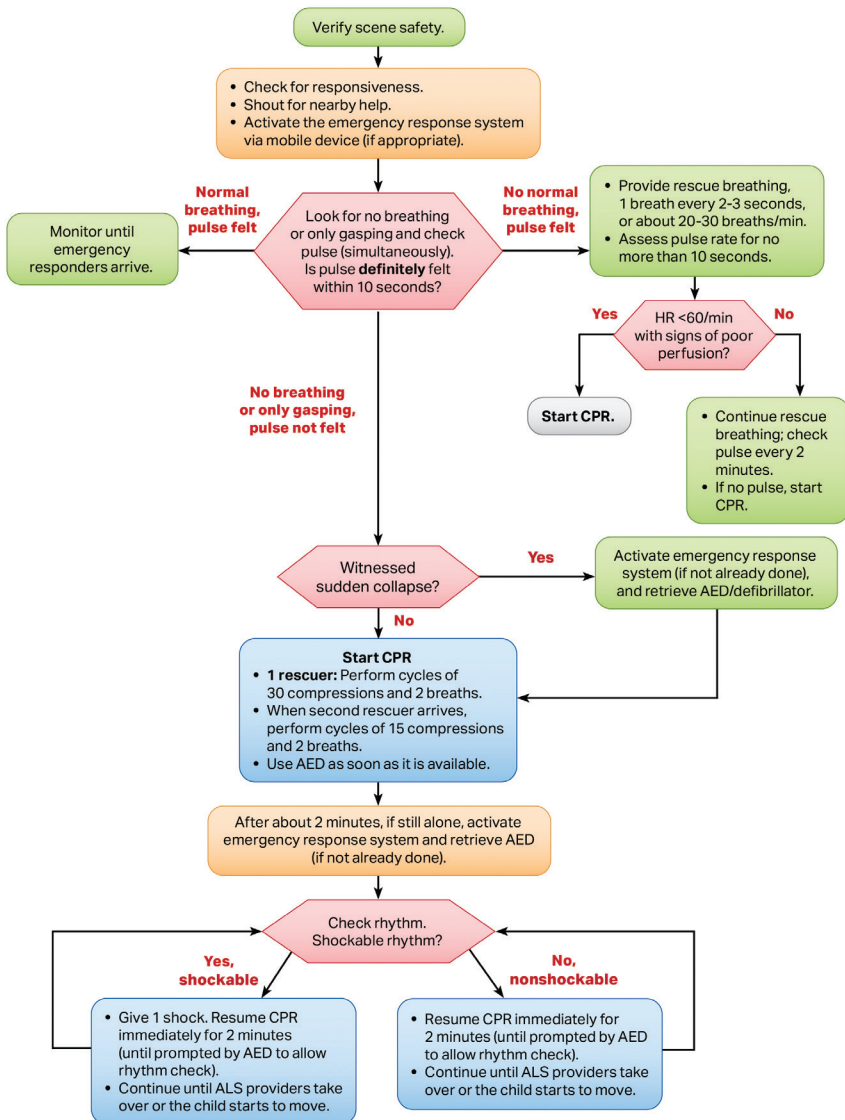


Adult ACLS Tachycardia

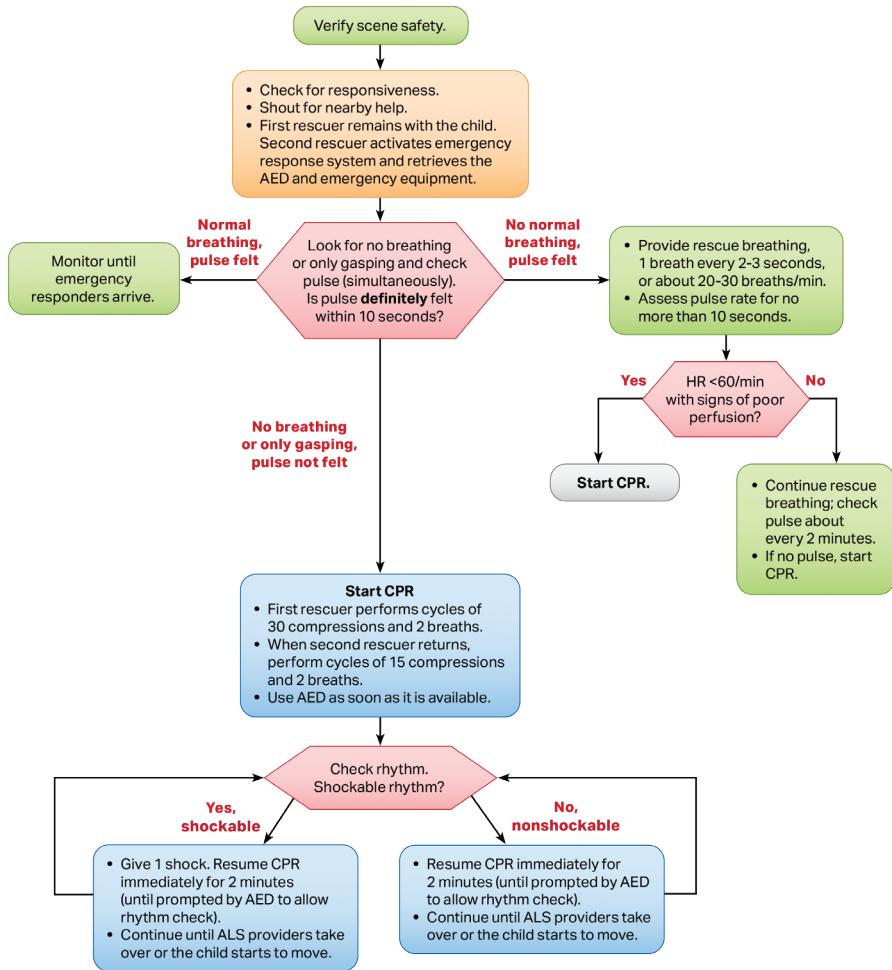


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PALS BLS Single Rescuer

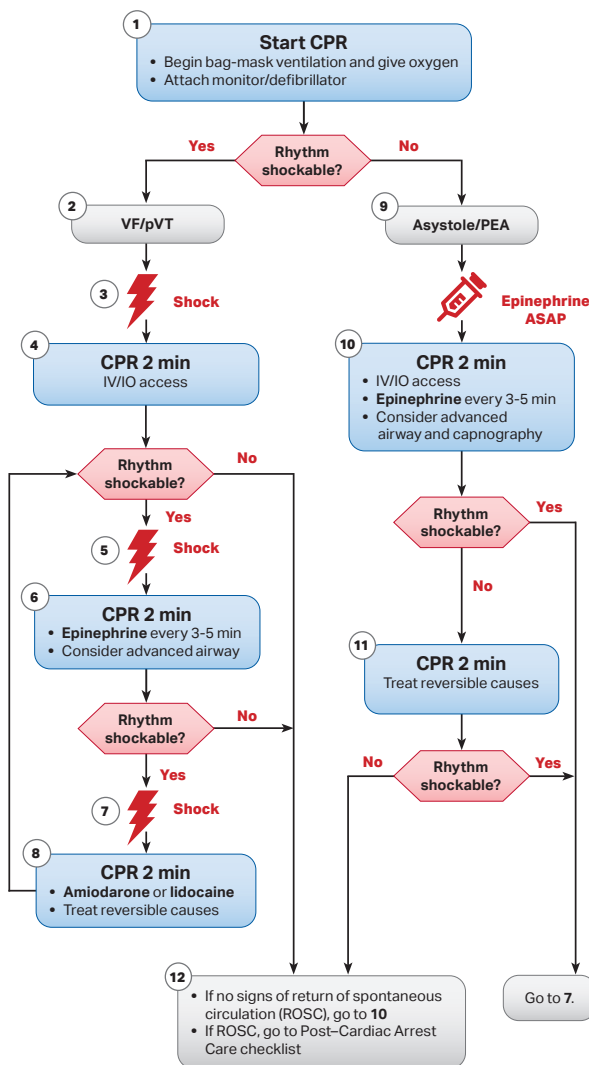


PALS BLS 2 Rescuers



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PALS Cardiac Arrest



CPR Quality

- Push hard ($\geq 1/3$ of anteroposterior diameter of chest) and fast (100-120/min) and allow complete chest recoil
- Minimize interruptions in compressions
- Change compressor every 2 minutes, or sooner if fatigued
- If no advanced airway, 15:2 compression-ventilation ratio
- If advanced airway, provide continuous compressions and give a breath every 2-3 seconds

Shock Energy for Defibrillation

- First shock 2 J/kg
- Second shock 4 J/kg
- Subsequent shocks ≥ 4 J/kg, maximum 10 J/kg or adult dose

Drug Therapy

- Epinephrine IV/IO dose:** 0.01 mg/kg (0.1 mL/kg of the 0.1 mg/mL concentration). Max dose 1 mg. Repeat every 3-5 minutes. If no IV/IO access, may give endotracheal dose: 0.1 mg/kg (0.1 mL/kg of the 1 mg/mL concentration).
- Amiodarone IV/IO dose:** 5 mg/kg bolus during cardiac arrest. May repeat up to 3 total doses for refractory VF/pulseless VT or
- Lidocaine IV/IO dose:** Initial: 1 mg/kg loading dose

Advanced Airway

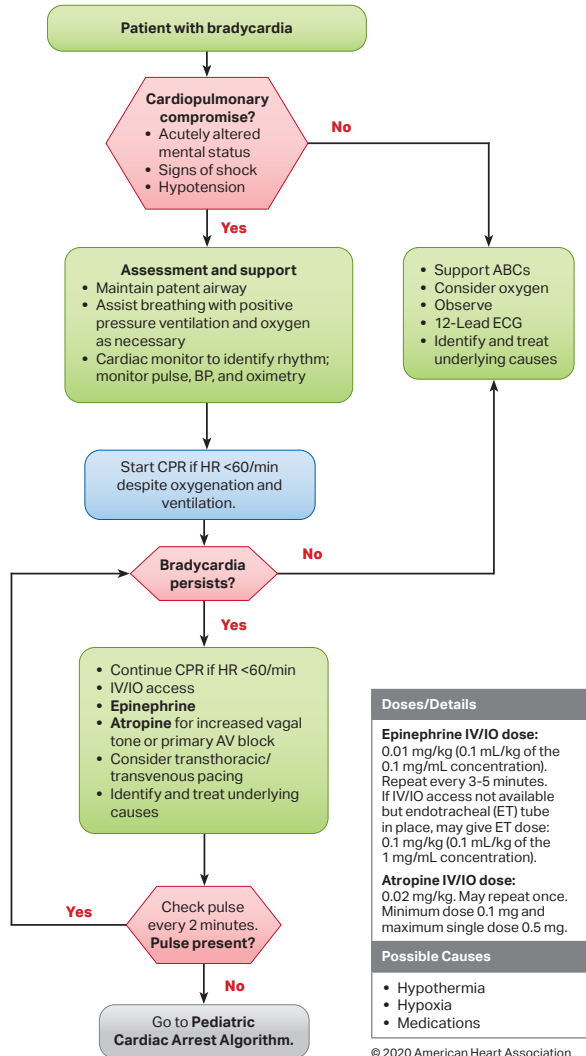
- Endotracheal intubation or supraglottic advanced airway
- Waveform capnography or capnometry to confirm and monitor ET tube placement

Reversible Causes

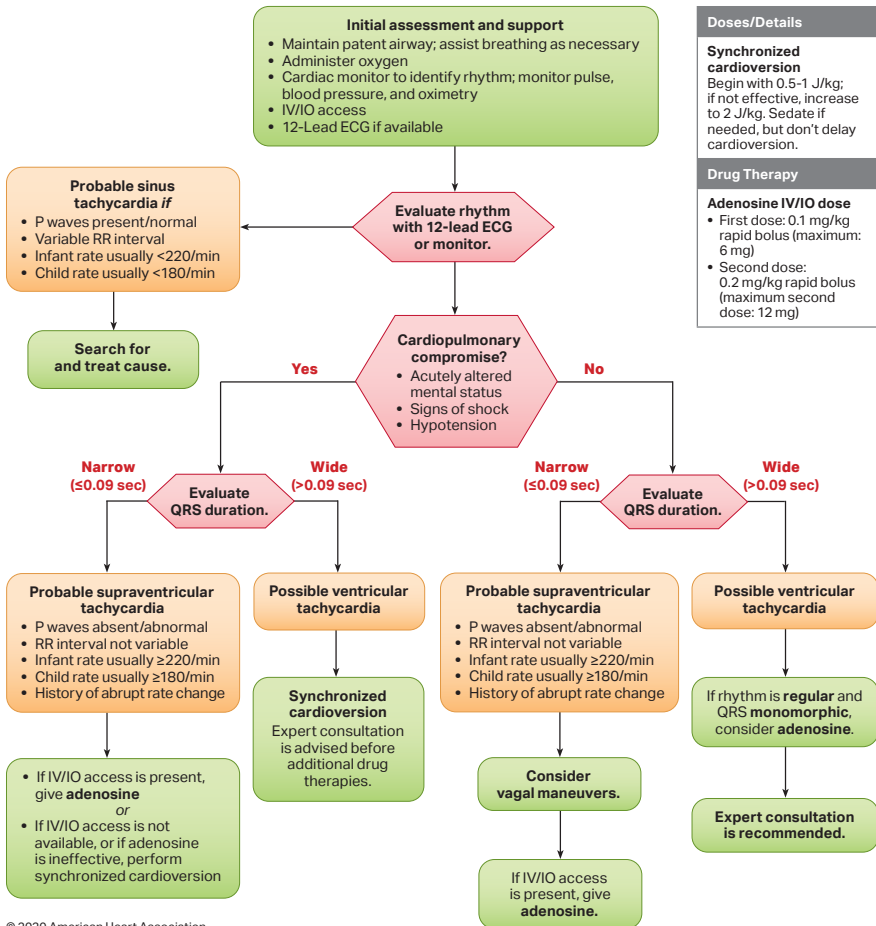
- Hypovolemia
- Hypoxia
- Hydrogen ion (acidosis)
- Hypoglycemia
- Hypo-/hyperkalemia
- Hypothermia
- Tension pneumothorax
- Tamponade, cardiac
- Toxins
- Thrombosis, pulmonary
- Thrombosis, coronary

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PALS Bradycardia



PALS Tachycardia



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Facial Droop

(have patient show teeth or smile)

NORMAL →



● Both sides of face move equally.

← **ABNORMAL**



● One side of face does not move as well as the other side.

Arm Drift

(patient closes eyes and extends both arms straight out, with palms up for 10 seconds)

NORMAL →



● Both arms move the same or both arms do not move at all.

← **ABNORMAL**



● One arm does not move or one arm drifts down compared with the other.

Abnormal Speech

(have the patient say “you can’t teach an old dog new tricks”)

● Normal - Patient uses correct words with no slurring.

● Abnormal - Patient slurs words, uses the wrong words, or is unable to speak.

If any 1 of these 3 signs is abnormal, the probability of a stroke is 72%

Appendix 3. Pararescue Medical Skills Certification

SCORING/GRADING GUIDE

The Pararescue Medical Skills certification's purpose is to certify an Operator's medical competency. The certification is divided into two sections: a physical assessment and a cognitive discussion of protocols and medications. An Operator must pass both sections with an 80% or above for successful certification. Points are awarded based on competency during each event-awarded based on the knowledge presented by the Operator at the evaluator's discretion. For sections that are N/A to the scenario, the evaluator will ensure a verbalization of the sections is completed by the Operator before or after the scenario, ensuring competency for all sections.

Operator Name:		Date:			Total score: /100	PASS (80% section 1&2): YES / NO	
Evaluator Name:					Section 1 Score: /60	Section 2 Score: /40	
Section 1. Assessment							
Task	Description				Notes	Points Available	Points Awarded
Care Under Fire							
	Return Fire, Move to Cover, Directs TQ application				If not applicable to scenario, verbalize appropriate actions	3	
Tactical Field Care							
LOCs	Introduces himself “Hi my name is ----- . I’m a PJ”					1	
Massive Hemorrhage	Ext./junctional TQ, direct pressure, pressure dressing, combat gauze					2	
Airway	Use NPA/Rolls patient to recovery position if unconscious					2	
Respiration	Look, use stethoscope, feel chest, pulse ox & provide treatment					2	
Circulation	Diagnose (pulse/mental status) & treat (fluids/meds) shock					2	
Head	Diagnose increased ICP (AVPU, pupils, posturing, respirations)					2	
Hypothermia	Hypothermia prevention					2	
Vital Signs	Pulse	RR	SpO2	BP	Pain 1–10 & Temp	5	
AMPLE	Asks AMPLE questions					5	
Secondary Assessment	Head to toe assessment					5	
Pain	Use appropriate sequence based on casualty presentation 1. Mild to moderate: Tylenol, NSAIDs (Mobic, Motrin, or Toradol) 2. Moderate to severe: a. Hemodynamically stable: Oral: Percocet or fentanyl; Parenteral: dilaudid or fentanyl b. Hemodynamically unstable: ketamine IV/IO/IM					2	
Antibiotics	State indication: All open wounds					2	
Wounds	Steps: Remove gross debris, irrigate, debride, dress					2	
Splinting	Indications: Fracture, soft tissue trauma, joint instability					2	
CASEVAC							
Packaging	Packaging: Pad boney prominences, fill the voids					2	
Triage	Identifies and correctly categorizes pts					2	
Patient Treatment Card	Fills out complete and legible					2	

Patient Transfer				
Age	State AT MIST during patient transfer		1	
Time			1	
Mechanism of Injury			1	
Injuries			1	
Signs & Symptoms			1	
Treatment Performed			1	
Extended Care				
Hydration	PO/ IV/ IO/ NG tube	If not applicable to scenario, verbalize appropriate actions	1	
Hypothermia	Insulates from ground, keep warm and dry	If not applicable to scenario, verbalize appropriate actions	1	
Hygiene	Pressure sores/roll & pad pt., keep pt. clean & dry	If not applicable to scenario, verbalize appropriate actions	1	
Infection	Check temps, change dressings q12–24h, antibiotics	If not applicable to scenario, verbalize appropriate actions	1	
Tubes & Lines	Tubes & lines are “neat and tidy” & function & drain properly	If not applicable to scenario, verbalize appropriate actions	1	
Medications	6 rights: pt., med, dose, time, route, documentation	If not applicable to scenario, verbalize appropriate actions	1	
Monitoring	Unstable q2–4h, VS including AVPU/temp/O2 sat, q6–12h	If not applicable to scenario, verbalize appropriate actions	1	
Analgesia	Document with pain scale. Add Versed to ketamine or fentanyl PRN to potentiate, sedate or manage anxiety.	If not applicable to scenario, verbalize appropriate actions	1	
Nutrition	Discusses oral/NG routes	If not applicable to scenario, verbalize appropriate actions	1	
80% of applicable points to Pass Section 1 (Min 48)		Total	60	

Section 2. Knowledge Validation of Protocols / Medications

Task	Condition	Standard Comprehension: 2pts=full, 1pt=partial, 0pt=marginal	Points Available	Points Awarded
Combat Shock	Demonstrate knowledge of the diagnosis and treatment of the combat shock protocol based on the Task Standard and the PJ Med Handbook	Dx: 1. MOI and blood loss 2. Declining LOC in the absence of head trauma 3. Weak or absent radial pulse Rx: 1. 2 lines (IV/IO), 2. TXA 2g flush (otherwise after 1st unit blood) 3. Whole blood or blood products 4. 1g Calcium after 1st unit, then every 4 units	2	
TBI	Demonstrate knowledge of the diagnosis and treatment of the protocol based on the Task Standard and the PJ Med Handbook	Mild Dx: 1. “bell rung”, “saw stars”, “stunned”, loss of consciousness <30 minutes, memory loss around event Rx: 1. Perform neuro exam, GCS and MACE 2. Rest for 72 hours, neurology evaluation prior to return Moderate Dx: 1. GCS≤12, or P or U an AVPU 2. LOC/mental status changes>30 minutes Rx: 1. Prevent hypoxemia (secure airway PRN) 2. Prevent hypotension (IV/IO) 3. TXA 2g slow IV push if patient cannot follow commands 4. Elevate the head 30 degrees if no shock 5. Document GCS Severe (impending or ongoing Herniation) Dx:	2	

		<ol style="list-style-type: none"> Declining consciousness Asymmetric/fixed and dilated pupil Posturing or weakness on one side of body Irregular, snoring respirations Cushing's triad (HTN, bradycardia, irregular/depressed respirations) <p>Rx:</p> <ol style="list-style-type: none"> In addition to "Moderate" Rx, give 30mL 23.4% hypertonic saline 		
Basilar Skull Fracture	Demonstrate knowledge of the diagnosis and treatment of the protocol based on the Task Standard and the PJ Med Handbook	<p>Dx:</p> <ol style="list-style-type: none"> Raccoon eyes Battle signs CSF rhinorrhea or otorrhea (clear fluid from the nose or ears) <p>Rx:</p> <ol style="list-style-type: none"> None Document GCS Transport to neurosurgeon 	2	
Oro-pharyngeal Hemorrhage	Demonstrate knowledge of the diagnosis and treatment of the protocol based on the Task Standard and the PJ Med Handbook	<p>Dx:</p> <ol style="list-style-type: none"> Massive, uncontrolled bleeding coming from the mouth or throat in a casualty with neck or facial trauma <p>Rx (if not responding to sit up and lean forward):</p> <ol style="list-style-type: none"> Sedate and local anesthesia if able Cric Pack the oropharynx with combat gauze – leave a tail for each roll outside the mouth Maintain complete sedation 	2	
Thoracic Trauma	Demonstrate knowledge of the diagnosis and treatment of the protocol based on the Task Standard and the PJ Med Handbook	<p>Dx:</p> <ol style="list-style-type: none"> Chest trauma Respiratory distress Decreased breath sounds, if time and tactics permit stethoscope use <p>Rx:</p> <ol style="list-style-type: none"> ND × 2 in lateral site Finger or tube thoracostomy PPV Supplemental O2 Vented chest seal during wound care 	2	
Acute abdomen	Demonstrate knowledge of the diagnosis and treatment of the protocol based on the Task Standard and the PJ Med Handbook	<p>Dx: Can be from trauma or medical problem</p> <ol style="list-style-type: none"> Rigidity Rebound or percussion tenderness, severe focal tenderness Distension <p>Rx:</p> <ol style="list-style-type: none"> NPO IV access. NS (normal saline) if medical, or combat shock protocol if trauma and hemorrhagic shock Ertapenem NG tube in PFC for intractable vomiting (unresponsive to Zofran) Fentanyl or hydromorphone for pain Zofran for nausea Tylenol by mouth with water for fever 	2	
Burns	Demonstrate knowledge of the diagnosis and treatment of the protocol based on the Task Standard and the PJ Med Handbook	<p>Dx (9, 10, 20, 30 principle):</p> <ol style="list-style-type: none"> TBSA (total body surface area) - there are 11 "9"s: 2 front torso, 2 back torso, 1 each upper extremity, 2 each lower extremity, 1 head <p>Rx:</p> <ol style="list-style-type: none"> 10mL/hr LR × % TBSA (adjust if >80kg) Start fluid resuscitation for >20% TBSA Target urine output to 30-50mL/hr Treat per pain management protocol No antibiotics unless wounds present Secure airway for stridor or respiratory distress Dry sterile or clean dressings to cover burns Escharotomy as needed 	2	
Penetrating Eye Trauma	Demonstrate knowledge of the diagnosis and treatment of the protocol based on the Task Standard and the PJ Med Handbook	<p>Rx:</p> <ol style="list-style-type: none"> Field vision test Rigid eye shield Antibiotics 	2	

Abdominal Evisceration	Demonstrate knowledge of the diagnosis and treatment of the protocol based on the Task Standard and the PJ Med Handbook	Rx: 1. Stop bleeding 2. Clean the bowel 3. Gently put back in if able, otherwise moist dressing over bowels, occlusive over that 4. Close abdomen if bowel re-placed 5. Ertapenem	2	
Flail Chest	Demonstrate knowledge of the diagnosis and treatment of the protocol based on the Task Standard and the PJ Med Handbook	Rx: 1. Analgesics 2. Monitor for desaturation or respiratory distress 3. PPV: assisted ventilations or RSI and bag/vent	2	
Extremity Trauma	Demonstrate knowledge of the diagnosis and treatment of the protocol based on the Task Standard and the PJ Med Handbook	Rx: 1. Splint/immobilize 2. If pelvis is stable, use traction device for isolated mid-femur fractures 3. Document PMS 4. Reduce fractures and dislocations when possible 5. R/O compartment syndrome: pain out of proportion to appearance and pain with passive motion 6. Consider fasciotomy for leg compartment syndrome and >6 hours to definitive care	2	
Endotracheal Intubation Indications	Demonstrate knowledge of the diagnosis and treatment of the Task Standard and the PJ Med Handbook	Rx: 1. Unresponsive head trauma patient (GCS<8) 2. Unable to maintain airway 3. Persistent desaturation despite supplemental O2 and airway maneuvers 4. Respiratory rate <8 and >24 (or 10 & 30).	2	
Non-hemorrhagic Shock	Demonstrate knowledge of the diagnosis and treatment of the Task Standard and the PJ Med Handbook	1. Cardiogenic Dx: Chest pain, diaphoresis, abnl EKG Rx: FONA, 500mL LR 2. Anaphylactic Dx: allergic stimulus, red skin, facial swelling, respiratory distress, hypotension Rx: Epi, Benadryl Decadron, Pepcid 3. Neurogenic Dx: Spine trauma, back pain, deformity of spine, weakness/paralysis/decreased sensation of extremities Rx: 1-2L LR, Epi if no response 4. Septic Dx: Infection source, fever Rx: Ertapenem, 1-2L LR, Epi if no response	2	
High Altitude Pulmonary Edema	Demonstrate knowledge of the diagnosis and treatment of the Task Standard and the PJ Med Handbook	Dx: 1. Shortness of breath at rest 2. Rales 3. Pink, frothy sputum Rx: 1. Descent 2. O2 3. Nifedipine 4. Albuterol	2	
High Altitude Cerebral Edema	Demonstrate knowledge of the diagnosis and treatment of the protocol based on the Task Standard and the PJ Med Handbook	Dx: 1. Ataxia 2. Confusion Rx: 1. Assisted descent 2. Decadron	2	
Acute Mountain Sickness	Demonstrate knowledge of the diagnosis and treatment of the protocol based on the Task Standard and the PJ Med Handbook	Dx: 1. Headache, listless, loss of appetite, nausea, vomiting, etc. Rx: 1. Hydration 2. Ibuprofen 3. Diamox 250mg BID until 2 days after resolved and still at altitude 4. Hold any ascent until asymptomatic for 24 hours	2	

Frostbite	Demonstrate knowledge of the diagnosis and treatment of the protocol based on the Task Standard and the PJ Med Handbook	Dx: 1. Hard, white tissue – frozen Rx: 1. Keep warm 2. Only rewarm in 102° water if no risk of refreezing 3. Gauze/cotton between digits 4. Do not rub 5. Analgesics when rewarming	2	
Hypothermia	Demonstrate knowledge of the diagnosis and treatment of the protocol based on the Task Standard and the PJ Med Handbook	Dx: 1. Mild: shivering, alert 2. Moderate: stop shivering, confused/obtunded 3. Severe: coma Rx: 1. Insulate from ground 2. Remove wet clothes 3. Cover 4. Actively warm if able 5. For Severe Hypothermia, use care to be gentle due to risk of ventricular fibrillation	2	
Hyperthermia	Demonstrate knowledge of the diagnosis and treatment of the protocol based on the Task Standard and the PJ Med Handbook	Dx: 1. Cramps 2. Exhaustion 3. Stroke/CNS findings (emergency) Rx: 1. Shade/cool the casualty 2. Hydrate 3. If stroke/CNS deficiencies present—actively cool	2	
Dive Medical Emergencies	Demonstrate knowledge of the diagnosis and treatment of the protocol based on the Task Standard and the PJ Med Handbook	Dx: 1. Musculoskeletal or joint pain 2. Skin – marble rash, hives, edema, itching, blotching, pain, discomfort 3. Neuro symptoms & abnormal neurologic exam 4. Pulmonary – dyspnea, dry cough 5. Cardiac – substernal chest pain, hypotension Rx: 1. ABCs & 100% O2 2. Evacuate to a Dive Chamber	2	
	80% to Pass Section 2	Total (Min 32)	40	

[illegible]

Notes

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Bibliography

- Brady Paramedic Emergency Care, Bledsoe, et al., Prentice Hall.
- Brady Weapons of Mass Destruction, De Lorenzo, Porter, Prentice Hall.
- The Joint Trauma System Clinical Practice Guidelines, https://jts.amedd.army.mil/index.cfm/PI_CPGs/cpgs.
- The Joint Trauma System TCCC Guidelines. 5 Nov 2020. deployedmedicine.com
- Emergency Medicine: A Comprehensive Study Guide, 6th Ed., Tintanalli, et al., McGraw-Hill.
- Lippincott Nursing Manual, J. B. Lippincott Co.
- Physicians' Desk Reference, Medical Economics Data Production Co.
- Physicians GenRx, Mosby, 1998.
- Wilderness Medicine: Management of Wilderness and Environmental Emergencies, 3rd Ed., PA Auerbach, Mosby 1995.
- Emergency Medicine Concepts and Clinical Practice, 5th Ed., Rosen, et al., Mosby 1998.
- Clinical Anesthesia, 4th Ed., Barash, et al., Lippincott Williams and Wilkins.
- Medical Management of Chemical Casualties Handbook, US Army Medical Research Institute of Chemical Defense, Feb 2007.
- Medical Management of Biological Casualties Handbook, US Army Medical Research Institute of Infectious Diseases, Apr 2005.
- The *Journal of Special Operations Medicine* Advanced Tactical Paramedic Protocols Handbook, 10th Ed. 2017. Breakaway Media.
- Flight Paramedic Certification – A Comprehensive Study Guide. January 1, 2011 by Kyle Faudree PA-C NRP FP-C.
- American Heart Association 2020 Emergency Cardiovascular Care Guidelines. 21 Oct 2020. <https://cpr.heart.org/en/resuscitation-science/cpr-and-ecc-guidelines>

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Look for **ALERTS** as real time updates for Pararescue Medicine.



PARARESCUE CREED

It is my duty as a Pararescueman to save lives and to aid the injured. I will prepared at all times to perform my assigned duties quickly and efficiently, placing these duties before personal desires and comforts.

These things I do, that others may live.



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