

LINE ITEM	EXPLANATION
1. Location of Pickup Site.	Encrypt grid coordinates. When using <i>DRYAD Numeral Cipher</i> , the same SET line will be used to encrypt grid zone letters and coordinates. To preclude misunderstanding, a statement is made that grid zone letters are included in the message (unless unit SOP specifies its use at all times).
2. Radio Frequency, Call Sign, Suffix.	Encrypt the frequency of the radio at the pickup site, not a relay frequency. The call sign (and suffix if used) of person to be contacted at the pickup site may be transmitted in the clear.
3. Number of Patients by Precedence.	Report only applicable info & encrypt brevity codes. A = Urgent, B = Urgent-Surg, C = Priority, D = Routine, E = Convenience. (If 2 or more categories reported in same request, insert the word "break" btwn each category.)
4. Special Equipment.	Encrypt applicable brevity codes. A = None, B = Hoist, C = Extraction equipment, D = Ventilator.
5. Number of Patients by Type.	Report only applicable information and encrypt brevity code. If requesting MEDEVAC for both types, insert the word "break" between the litter entry and ambulatory entry: L + # of Pnt - Litter, A + # of Pnt - Ambul (sitting).
6. Security of Pickup Site (Wartime).	N = No enemy troops in area, P = Possibly enemy troops in area (approach with caution), E = Enemy troops in area (approach with caution), X = Enemy troops in area (armed escort required).
6. Number and type of Wound, Injury, Illness (Peacetime).	Specific information regarding patient wounds by type (gunshot or shrapnel). Report serious bleeding, along with patient blood type, if known.
7. Method of Marking Pickup Site.	Encrypt the brevity codes. A = Panels, B = Pyrotechnic signal, C = Smoke Signal, D = None, E = Other.
8. Patient Nationality and Status.	Number of patients in each category need not be transmitted. Encrypt only applicable brevity codes. A = US military, B = US civilian, C = Non-US mil, D = Non-US civilian, E = EPW.
9. NBC Contamination (Wartime).	Include this line only when applicable. Encrypt the applicable brevity codes. N = nuclear, B = biological, C = chemical
9. Terrain Description (Peacetime).	Include details of terrain features in and around proposed landing site. If possible, describe the relationship of site to a prominent terrain feature (lake, mountain, tower).

Reference: FM 8-10-6, *Medical Evacuation in a Theater of Operations*, pages 7-7 through 7-9.

MEDEVAC REQUEST FORM

LINE	ITEM	EVACUATION REQUEST MESSAGE
1	Location of Pickup Site.	
2	Radio Frequency, Call Sign, Suffix.	
3	Number of Patients by Precedence.	
4	Special Equipment.	
5	Number of Patients by Type.	
6	Security of Pickup Site (Wartime).	
6	Number and type of Wound, Injury, Illness (Peacetime).	
7	Method of Marking Pickup Site.	
8	Patient Nationality and Status.	
9	NBC Contamination (Wartime).	
9	Terrain Description (Peacetime).	

SAMPLE

3 pages

Reference: FM 8-10-6, Medical Evacuation in a Theater of Operations, pages 7-7 through 7-9.

SAMPLE
64 Universal pages

SAMPLE

SAMPLE

SAMPLE

Name: _____ Age: _____ Sex: M F

ID #: _____ DTG: _____

Weight: _____ Height: _____ Blood Type: _____ Titer: _____

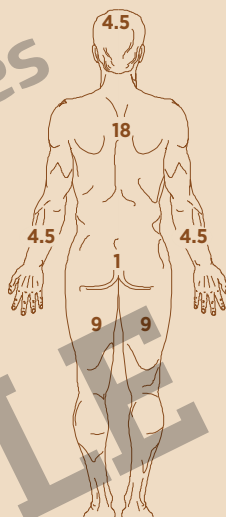
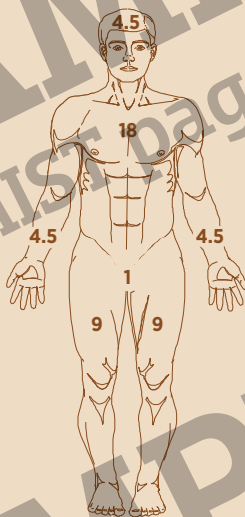
Allergies: _____ Meds: _____

PMHx: _____ Last Meal: _____

Events: _____

MOI:

- Artillery
- Blunt
- Burn
- Fall
- Grenade
- GSW
- IED
- Landmine
- MVC
- RPG
- Other: _____



Injury: Mark with X

Symptoms & Vitals

PULSE: Y N Carotid Radial MENTAL: Alert Y N

BLEEDING: Massive Minimal Controlled: Y N

AIRWAY: Intact Obstructed Corrected: Y N

BREATHING: Normal Labored Corrected: Y N

PAIN: Head Neck Chest Abd Pelvis Back Arm Leg

	1	2	3	4	5	6
Time	:	:	:	:	:	:
BP	/	/	/	/	/	/
HR						
RR						
SpO ₂	%	%	%	%	%	%
Temp.						

Burn Wound Management

FLUID RESUSCITATION

Goal: 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, Plasma-Lyte IV);

- 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).
- Initial IV rate 500mL/h; start while completing initial assessment.
- Adults: Measure burn size (TBSA) and multiply by 10. This is now your IV fluid rate. For example, if the burn size is 30%: $30 \times 10 = 300$. Starting rate is 300mL/h.
- For patients with weight >80kg, add an extra 100mL/h for each 10kg. For example, for a 100kg patient with 30% burns, the starting rate is 300mL/h + 200mL/h = 500mL/h.
- If resuscitation is delayed, DO NOT try to “catch up” by giving extra fluids.
- For children, $3 \times \text{TBSA} \times \text{body weight in kg}$ 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 above).
- Oral resuscitation of patients with burns up to about 30% TBSA is possible (see Hydration side bar below).
- If a nasogastric tube (NGT) is available, it is preferable to resuscitate with infusion of electrolyte solution via NGT (e.g., 300–500mL/h. But watch for nausea/vomiting).

Minimum: Rectal infusion of electrolyte solution. Rectal infusion of up to 500mL/h can be supplemented with oral hydration (see Hydration side bar).

HYDRATION

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 soda, double the amount of salt in the recipe).

Burn Wound Management

APPENDIX F: SUMMARY TABLE

CPG ID: 57

Airway	
Best	<ul style="list-style-type: none"> Rapid Sequence Intubation Continuous sedation + airway maintenance and suctioning O₂ and portable ventilator
Better	<ul style="list-style-type: none"> Cricothyroidotomy Continuous sedation + airway suctioning O₂ concentrator and portable ventilator
Minimum	<ul style="list-style-type: none"> Cricothyroidotomy Ketamine Bag-valve-mask with PEEP valve
Assess Burn Size	
Best	<ul style="list-style-type: none"> For initial estimate: Rule of 9s After wounds are cleaned/debrided: re-calculate burn size using Lund-Browder chart
Better	<ul style="list-style-type: none"> Same as minimum
Minimum	<ul style="list-style-type: none"> For large burns: Rule of 9s For small burns: Use patient's hand = 1% TBSA
Fluid Resuscitation	
Best	<ul style="list-style-type: none"> Use isotonic crystalloid: Lactated Ringer's (LR) or PlasmaLyte Starting fluid rate is rule of 10s (TBSA x 10; +100 ml/hr for each 10 kg over 80 kg)
Better	<ul style="list-style-type: none"> Oral resuscitation with electrolyte solution (avoid plain water) Possible for up to 30% TBSA burns "Coached" drinking on a schedule to meet target fluid rate
Minimum	<ul style="list-style-type: none"> Rectal infusion of electrolyte solution Can infuse up to 500 ml/hr May use to supplement oral hydration
Teleconsultation	
<ul style="list-style-type: none"> Establish contact early Ventilator management Measuring burn size Hemorrhagic shock + burns 	<ul style="list-style-type: none"> Burn > 20% TBSA Electrical burn Escharotomy needed Infection
Monitoring	
Vital Signs	
Best	<ul style="list-style-type: none"> Portable monitor Capnography Document vital signs (VS) and I/O on flowsheet
Better	<ul style="list-style-type: none"> BP cuff, stethoscope Pulse oximetry, Capnography Document VS and I/O on flow sheet
Minimum	<ul style="list-style-type: none"> Blood Pressure (BP) cuff, stethoscope Pulse oximetry Document VS on flow sheet
Urine Output	
Best	<ul style="list-style-type: none"> Foley catheter, titrate fluids to keep urine output (UO) 30-50 ml/hr Increase or decrease fluid rate by 25% each hour if UO not at goal
Better	<ul style="list-style-type: none"> Collect urine in graduated container >180 ml every 6 hours is adequate
Minimum	<ul style="list-style-type: none"> If unable to measure UOP, adjust fluids to maintain HR <140, good capillary refill, intact mental status Treat hypotension if needed, but this is a late sign of hypovolemia

Guideline Only/Not a Substitute for Clinical Judgment

Extremity Burns	
Best	<ul style="list-style-type: none"> Elevate, Exercise Monitor pulses hourly, Doppler flow meter Escharotomy if circumferential 3rd degree burn
Better	<ul style="list-style-type: none"> Elevate, Exercise Monitor pulses hourly Escharotomy only if unable to palpate distal pulses and evacuation delayed
Minimum	<ul style="list-style-type: none"> Elevate, Exercise Monitor pulses hourly
Pain Management	
Best	<ul style="list-style-type: none"> Ketamine infusion Supplement with IV opioids and midazolam (e.g., Versed), frequent small doses
Better	<ul style="list-style-type: none"> Ketamine IV Supplement with IV opioids and midazolam, frequent small doses
Minimum	<ul style="list-style-type: none"> Fentanyl Lozenge Oral acetaminophen/oxycodone (e.g. Percocet)
Infection	
Prevent Infection	
Best	<ul style="list-style-type: none"> Clean wound and debride loose dead skin using gauze and Hibiclens in clean water Apply antimicrobial cream (Silvadene or Sulfamylon), cover with gauze Alternative: Apply Silverlon dressings to clean wounds, cover with gauze
Better	<ul style="list-style-type: none"> Clean wound and debride loose dead skin using any antibacterial soap in clean water Apply any available dressing Optimize wound care and hygiene to extent possible
Minimum	<ul style="list-style-type: none"> Cover with clean sheet or dry gauze Leave blisters intact
Treat Infection	
Best	<ul style="list-style-type: none"> If cellulitis (spreading erythema around edge of burn) treat with IV antibiotics (e.g., cefazolin or clindamycin) If invasive infection with sepsis, foul smell, or burn wound color change, cover gram-positive and gram-negative and Pseudomonas bacteria (e.g. ertapenem + ciprofloxacin)
Better	<ul style="list-style-type: none"> Same as minimum
Minimum	<ul style="list-style-type: none"> If cellulitis (spreading erythema around edge of burn) or invasive infection, treat with antibiotics Any available antibiotic

URINE OUTPUT

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

Goal: Adjust IV (or oral/rectal intake) rate to UO goal of 30–50mL/h.

For children, titrate infusion rate for a goal UO 0.5–1 mL/kg/h.

Best: Place Foley catheter

- If UO too low, increase IV rate by 25% every 1–2 hours (e.g., if UO = 20mL/h and IV rate = 300mL/h, increase IV rate by $0.25 \times 300 = 75\text{mL/h}$. New rate is 375mL/h).
- If UO too high, decrease IV rate by 25%.

Better: Capture urine in premade or improvised graduated cylinder

- Collect all spontaneously voided urine and carefully measure; >180mL every 6 hours 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.

Crush Syndrome

CRUSH SYNDROME - Prolonged Field Care

CPG ID: 58

INTRODUCTION

Crush syndrome is a life and limb-threatening condition that can occur as a result of entrapment of the extremities accompanied by extensive damage of a large muscle mass. It can develop following as little as 1 hour of entrapment. Effective medical care is required to reduce the risk of kidney damage, cardiac arrhythmia, and death.


Crush syndrome is a reperfusion injury that leads to traumatic rhabdomyolysis.

Reperfusion results in the release of muscle cell components, including myoglobin and potassium that can be lethal. Myoglobin release results in rhabdomyolysis, with risk of kidney damage.


Kidney damage leads to hyperkalemia and eventually cardiac arrhythmias. Calcium is taken up by injured muscle cells and this can cause hypocalcemia, contributing to cardiac arrhythmias.

The risks are increased with large areas of tissue crushed (one or both lower extremities) and the length of time the casualty is pinned prior to extrication.


The primary treatment is aggressive fluid administration. Reperfusion after prolonged tourniquet application (>2 hours), extremity compartment syndrome, and severe limb trauma involving blunt trauma can also result in rhabdomyolysis by the same mechanisms as crush syndrome, and the treatment is the same.

 **Telemedicine:** Management of crush syndrome is complex. Establish telemedicine consult as soon as possible.

FLUID RESUSCITATION

 **The principles of hypotensive resuscitation according to TCCC DO NOT apply in the setting of extremity crush injury requiring extrication.**


However:

 In the setting of a crush injury associated with noncompressible hemorrhage, aggressive fluid resuscitation may result in increased hemorrhage. Balancing the risk of uncontrolled hemorrhage against the risk of cardiotoxic levels of potassium should ideally be guided by expert medical advice.

FLUIDS

Goal: Correct hypovolemia to prevent myoglobin injury to the kidneys and dilute toxic concentrations of potassium to reduce risk of kidney damage and lethal arrhythmias.

- **Best:** IV crystalloids
Start intravenous (IV) or intraosseous (IO) administration IMMEDIATELY (before extrication).
Rate and volume: initial bolus, 2L; initial rate: 1L/h, adjust to urine output (UOP) goal of >100–200mL/h (see below).
- **Better:** oral intake of electrolyte solution.
Sufficient volume replacement may require “coached” drinking on a schedule.
- **Minimum:** rectal infusion of electrolyte solution.
Rectal infusion of up to 500mL/h can be supplemented with oral hydration.

 Life-threatening hyponatremia can result from large-volume administration of plain water. If using oral or rectal fluids because of unavailability of IV fluids or access, they must be in the form of a premixed or improvised electrolyte solution to reduce this risk.

Examples of mixed or improvised electrolyte solutions include the following:

- World Health Organization (WHO) oral rehydration salts (ORS): preferred.
- Pedialyte®
- Per 1L water: 8 tsp sugar, 0.5 tsp salt, 0.5 tsp baking soda.
- Per quart Gatorade®: 0.25 tsp salt, 0.25 tsp baking soda.

Guideline Only/Not a Substitute for Clinical Judgment

Crush Syndrome

MONITORING

Goal: Maintain high UOP, detect cardiotoxicity, ensure adequate oxygenation and ventilation, avoid hypotension, trend response to resuscitation. Document blood pressure (BP), heart rate (HR), fluid input, urine output (UOP), mental status, pain, pulse oximetry, and temperature on a flowsheet.


URINE OUTPUT

Goal: UOP of 100–200mL/h. The fluid rate should be adjusted to maintain this level of UOP.

- **Best:** place Foley catheter.
- **Minimum:** capture urine in premade or improvised graduated cylinder (e.g., Nalgene® bottle).
- Maintain goal UOP until myoglobin can be monitored and normalized.

If UOP is below goal at IV fluid rate of 1L/h for >2 hours, kidneys may be damaged and unable to respond to fluid resuscitation.


Consider:

-  Teleconsultation, if available:
- Decreasing the fluid rate to reduce risks of volume overload (e.g., pulmonary edema)
- Hemorrhage or third spacing may cause hypovolemia. **Consider:** Increasing the fluid rate


APPENDIX A: Fluid and Equipment Planning Considerations

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Best

- **Fluids:** IV fluid to provide 1L/h for 24 to 48 hours (depending on evacuation availability)
- **Equipment:** ECG, laboratory tests for serum potassium and urine myoglobin, Foley catheter with graduated collection system, tourniquets
- **Medications:** hyperkalemia: calcium gluconate (5 x 10mL vial or Bristojet), insulin: 1 vial Humulin R (500 units), D50 (120mL), albuterol (24 vials), Kayexalate (360g)
- **Pain:** refer to Analgesia, Sedation Clinical Practice Guidelines
- **Antibiotics:** Ertapenem
- **Monitoring:** Continuous monitoring with portable monitor; 15-minute to hourly vital signs, examination, urine output documented on flowsheet
-  **Communications:** real-time video telemedicine consultation

Better

- **Fluids:** IV fluid to provide 1L/h for 24 to 48 hours
- **Equipment:** Dipstick urine tests to monitor urine, graduated container to monitor urine output, tourniquets
- **Medications:** hyperkalemia: calcium gluconate (5 x 10mL vial or Bristojet), insulin: 1 vial Humulin R (500 units), D50 (120mL)
- **Pain medications**
- **Antibiotics**
- **Monitoring:** 15-min to hourly vital signs, examination, urine output documented on flowsheet
-  **Communications:** telephone, possibly e-mail telemedicine consultation

Minimum

- **Fluids:** IV fluid for initial bolus resuscitation (2L), then oral or rectal fluid resuscitation with commercial or improvised electrolyte solution
- **Equipment:** Graduated container to monitor urine output, tourniquets
- **Medications:** hyperkalemia: calcium gluconate (5 x 10mL vial or Bristojet)
- **Pain medications**
- **Antibiotics**
- **Monitoring:** 15-minute to hourly vital signs, examination, urine output documented on flowsheet or other written format
-  **Communications:** telemedicine by telephone

FLUIDS		Phase 1 Entrapment	Phase 2 Extrication	Phase 3 Immediately Following Extrication	Phase 4 Prolonged Field Care
Best Better Minimum	IV or IO crystalloids	Initial bolus: 2L, continue 1L/h	Continue 1L/h	Titrate to UOP 100 - 200mL/h	Titrate to UOP 100 - 200mL/h
	Oral electrolyte solution	Continue	Continue	Continue. Goal UOP 100 - 200mL/h	Continue. Goal UOP 100 - 200mL/h
	Rectal electrolyte solution	Continue	Continue	Continue. Goal UOP 100 - 200mL/h	Continue. Goal UOP 100 - 200mL/h
Telmedicine: Consult on management					
Monitoring: 15 minute to hourly vital signs, examination, urine output documented on flowsheet					
VITAL SIGNS					
UOP	Best	Portable monitor with ECG	Record every 15 min	Record every 15 min	Record every 1 hour
	Better	Check intermittent vital signs	Record every 15 min	Record every 15 min	Record every 1 hour
	Minimum	Monitor pulse and mental status	Record every 15 min	Record every 15 min	Record every 1 hour
	Best	Place Foley catheter	N/A	Record UOP every 1 hour	Record UOP every 2 hours
Urine myoglobinuria	Minimum	Capture urine in premade or improvised graduated cylinder			
	Best	Laboratory monitoring	N/A	N/A	Every 6 hours
	Better	Assess urine color (red, brown, or even black)			
Potassium and cardiac arrhythmia	Minimum	Dark urine (red, brown, or even black)	N/A	N/A	Every 4-6 hours
	Best	Laboratory monitoring of potassium levels	N/A	Check	Every 4-6 hours
	Better	12-lead ECG	N/A	Check	Every 4-6 hours
	Minimum	Laboratory monitoring of potassium levels	N/A	Check	Every 4-6 hours
Treatments for Hyperkalemia (>5.5mEq/L) or Cardiac Arrhythmia	Better	3-5 lead ECG	Initiate	Continue	Continue
	Minimum	Close monitoring of vitals and circulatory examination	Initiate	Continue	Continue
Calcium gluconate (10%) Insulin (regular) and D50 Albuterol (2.5mg/3mL vial) Sodium polystyrene sulfonate (Kayexalate)	Best	10mL IV over 2-3 minutes	N/A	N/A	Monitor; repeat as required
		10 units IV push + 50mL D50	N/A	N/A	
		10mg (4 vials) in nebulizer	N/A	N/A	
		15 - 30g suspended in 50-100mL liquid, oral or rectal	N/A	N/A	

		Phase 1 Entrapment	Phase 2 Extraction	Phase 3 Immediately Following Extrication	Phase 4 Prolonged Field Care
Calcium gluconate 10% Alternate: calcium chloride 10%	Better	10mL IV over 10 minutes			
Insulin (regular) and D50 Any individual or combination of above, as available	Minimum	10 units IV push + 50mL D50 See above	N/A N/A	N/A N/A	Monitor; repeat as required
Management of Injured Extremity					
Extremity compartment syndrome	Best	Clinical assessment • 6 Ps* • Rigid compartment	---	---	Fasciotomy: only if qualified medical personnel or teleconsultation available
	Minimum				Cool limb (evaporative or environmental cooling; no ice/snow)
Tourniquet (for crush management)	Best	If adequate fluids are unavailable, or arrhythmia cannot be managed during entrapment and extrication	If entrapment time >2 hours, consider tourniquet. Place two tourniquets side by side and proximal to the injury	If the patient meets criteria for tourniquet: conversion or removal, and fluids are available, initiate crush injury protocol before loosening tourniquet.	
Tourniquet (for irreversible injury)		A limb that is cool, insensate, tensely swollen, and pulseless is likely dead. Patient may develop shock and kidney damage, and may die.			Consider fasciotomy. If no improvement, place two tourniquets side by side and proximal to the injury. Amputation anticipated
Pain					
			Per TCCC	Per TCCC	Per TCCC
Infection Control					
Antibiotics	Best	Portable monitor with ECG	Ertapenem, 1g IV/day (1g, 10mL saline or sterile water)		
	Better	Check intermittent vital signs	Cefazolin, 2g IV every 6 to 8 hours; clindamycin (300–450mg by mouth three times daily or 600mg IV every 8 hours); or moxifloxacin (400mg/day; IV or by mouth)		
	Minimum	Monitor pulse and mental status	---	---	Ensure wounds are cleaned and dressed, and hygiene of wounds and patient optimized to the extent possible given environment.
*6 Ps: Pain persisting despite adequate analgesia is most important symptom, followed by paresthesia, pallor, paralysis, poikilothermia, pulselessness					

Traumatic Brain Injury Management

Traumatic Brain Injury Management in Prolonged Field Care

CPG ID: 63

- **Primary survey:** Perform a rapid trauma survey to assess all injuries. Determine and record the Glasgow Coma Scale (GCS) score (**Table 1 below**). Assess pupils and motor function in all four extremities.
- **Secondary survey:** After stabilizing any immediate life-threatening injuries, assess for TBI red flags that may indicate moderate to severe head injury (**Table 2 below**), and perform an initial detailed neurologic examination. See **Appendix A** for further details on performing a neurologic examination. Annotate findings on the PFC flowsheet.
- **TBI severity classification** using the GCS score:
 - Mild: 13–15
 - Moderate: 9–12
 - Severe: 3–8

Table 1. Glasgow Coma Scale

Eye Opening	Verbal Response	Motor Response
4 – Spontaneous	5 – Oriented	6 – Obeys commands
3 – To verbal command	4 – Confused	5 – Localizes to painful stimuli
2 – To painful stimuli	3 – Inappropriate words	4 – Withdraws from pain
1 – No response	2 – Incomprehensible sounds	3 – Flexion to pain
	1 – No response	2 – Extension to pain
		1 – No response

Table 2. Features Indicative of Moderate to Severe Head Injury

Red Flags
Witnessed loss of consciousness
Two or more blast exposures within 72 hours
Unusual behavior or combative
Unequal pupils
Seizures
Repeated vomiting
Double vision or loss of vision
Worsening headache
Weakness on one side of the body
Cannot recognize people or disoriented to place
Abnormal speech

APPENDIX A: NEUROLOGICAL EXAMINATION

I. MENTAL STATUS

Level of Consciousness: Note whether the patient is:

- Alert/responsive
- Not alert but arouses to verbal stimulation
- Not alert but responds to painful stimulation
- Unresponsive

Orientation: Assess the patient's ability to provide:

- Name
- Current location
- Current date
- Current situation (e.g., ask the patient what happened to him/her)

Language: Note the fluency and appropriateness of the patient's response to questions.

Note patient's ability to follow commands when assessing other functions (e.g., smiling, grip strength, wiggling toes). Ask the patient to name a simple object (e.g., thumb, glove, watch).

Speech: Observe for evidence of slurred speech.

II. CRANIAL NERVES

All patients:

- Assess the pupillary response to light.
- Assess position of the eyes and note any movements (e.g., midline, gaze deviated left or right, nystagmus, eyes move together versus uncoupled movements).

Noncomatose patient:

- Test sensation to light touch on both sides of the face.
- Ask patient to smile and raise eyebrows, and observe for symmetry.
- Ask the patient to say "Ahhh" and directly observe for symmetric palatal elevation.

Comatose patient:

- Check corneal reflexes; stimulation should trigger eyelid closure.
- Observe for facial grimacing with painful stimuli.
- Note symmetry and strength.
- Directly stimulate the back of the throat and look for a gag, tearing, and/or cough.

III. MOTOR

Tone: Note whether resting tone is increased (i.e. spastic or rigid), normal, or decreased (flaccid).

Strength: Observe for spontaneous movement of extremities and note any asymmetry of movement (i.e. patient moves left side more than right side). Lift arms and legs, and note whether the limbs fall immediately, drift, or can be maintained against gravity. Push and pull against the upper and lower extremities and note any resistance given. Note any differences in resistance provided between the left and right sides.

NOTE: it is often difficult to perform formal strength testing in TBI patients. Unless the patient is awake and cooperative, reliable strength testing is difficult.

Involuntary movements: Note any involuntary movements (e.g., twitching, tremor, myoclonus) involving the face, arms, legs, or trunk.

IV. SENSORY

If patient is not responsive to voice, test central pain and peripheral pain.

Central pain: Apply a sternal rub or supraorbital pressure, and note the response (e.g., extensor posturing, flexor posturing, localization).

Peripheral pain: Apply nail bed pressure or take muscle between the fingers, compress, and rotate the wrist (do not pinch the skin). Muscle in the axillary region and inner thigh is recommended. Apply similar stimulus to all four limbs and note the response (e.g., extensor posturing, flexor posturing, withdrawal, localization).

NOTE: In an awake and cooperative patient, testing light touch is recommended. It is unnecessary to apply painful stimuli to an awake and cooperative patient.

V. GAIT

If the patient is able to walk, observe his/her casual gait and note any instability, drift, sway, and so forth.

GOAL	MINIMUM	BETTER	BEST
Neurological Assessment			
<p>Goal: Rapidly identify TBI and associated injuries; assess TBI severity.</p>	<p>Consider: If patient is unconscious, measure a baseline optic nerve sheath diameter with ultrasound using a 10(-5)MHZ linear probe.</p>	<p>Secondary survey: Evaluate for TBI red flags. Perform detailed neurologic examination.</p>	<p>Primary survey: Perform rapid trauma survey to assess all injuries. Determine and record Glasgow Coma Score. Assess pupils and motor function in all four extremities. Recognize Cushing's triad.</p>
<p>ONSD should not be attempted on any patient with an open globe injury to the eye. Cushing's triad: increased SBP/widened pulse pressure, bradycardia, irregular breathing (typically rapid/shallow)</p>			
Monitoring			
<p>Prevent secondary brain injury, maintain adequate oxygenation and ventilation, avoid hypotension, detect elevated ICP.</p>	<p>Blood pressure cuff, stethoscope, pulse oximeter, method to monitor urine output. If advanced airway is in place, monitor EtCO₂ with capnometer. Check pupils and GCS hourly or as often as possible.</p>		<p>Portable monitor with continuous vital-signs display. Foley catheter to monitor urine output. If advanced airway in place, monitor end-tidal CO₂(EtCO₂) with capnography. Check pupils and GCS hourly.</p>
<p>Neurologic examination and vital-sign trends are essential to identifying a deteriorating patient with TBI. Monitoring EtCO₂ is critical for severe TBI patients. Bring the correct equipment whenever possible.</p>			
Management Hemodynamic Control			
<p>Maintain systolic pressure >110mmHg</p>	<p>Stop all external bleeding. Manage internal bleeding to the extent possible with available resources. Administer TXA per TCCC guidelines. Avoid medications that may lower the blood pressure.</p>	<p>If there is evidence of bleeding and no blood products are available, 0.9% sodium chloride 1L. Target SBP: >110mmHg</p>	<p>If evidence of bleeding, transfuse whole blood or, if not available, transfuse blood products per TCCC guidelines. Target SBP: >110mmHg</p>
<p>Brain injury in the presence of hemorrhagic shock requires balancing hemorrhage control with cerebral perfusion. Telemedicine consultation is strongly encouraged. Do not neglect scalp bleeding. Take care to inspect for skull fractures; DO NOT tightly pack an open head wound. Hypotonic fluids (to include lactated Ringer's) should be avoided whenever possible because they can worsen cerebral edema.</p>			

Management: Airway, Oxygenation/Ventilation	
Maintain or secure airway. If GCS score ≤ 8 or there is facial trauma or other airway compromise, consider definitive airway placement.	Nasopharyngeal airway and bag-valve-mask with PEEP. Supplemental oxygen, if available. Maintain SpO_2 : $>90\%$.
Perform cricothyroidotomy/ETT followed by continuous sedation, supplemental O_2 , portable ventilator. Target SpO_2 $>95\%$, $EtCO_2$ 35–40mmHg. Check arterial blood gas values. PEEP: 5cmH $_2$ O (increase up to 15cmH $_2$ O if needed).	
Perform cricothyroidotomy/ETT or place supraglottic airway followed by continuous sedation, supplemental O_2 , portable ventilator. Target SpO_2 : $>95\%$. $EtCO_2$: 35–40mmHg.	
Avoid hyperventilation except in extreme cases where imminent cerebral herniation is suspected.	
Management ICP	
Suspect high ICP in any head injury patient with GCS score ≤ 8 or declining findings on neurologic examination. Minimize factors that could contribute to elevated ICP, such as pain, anxiety, and fever.	<ul style="list-style-type: none"> Elevate HOB 30–45° Neck midline, loosen collar SBP >10mmHg (or at least >100mmHg) SpO_2 $>90\%$ or 95% on ventilator $EtCO_2$ 35–40mmHg. Core temp 96–99.5°F Prevent/treat seizure Last choice if sign of herniation: hyperventilate to $EtCO_2$ 30mmHg \times 20 min.
In addition to minimum steps, ensure adequate sedation and analgesia. If SBP >160 mmHg or agitated: <ul style="list-style-type: none"> Ketamine 20mg IV/IO Hydromorphone 0.5–2mg IV/IO Fentanyl 25–50μg IV/IO Midazolam 1–2mg IV/IO 	In addition to minimum and better steps, give osmotic therapy IV/IO: <ul style="list-style-type: none"> HTS 3% 250mL over 20 minutes. Repeat every 3 hours if needed. Mannitol (if no bleeding and SBP >110mmHg) 1g/kg IV/IO over 20 minutes, repeat 0.5g/kg every 3 hours, if needed.
Telemedicine consultation early and often in the patient with elevated ICP.	
Management: Infection Control	
Dress all wounds and administer antibiotic prophylaxis for penetrating brain injuries and open wounds.	Dress all wounds to prevent further introduction of infection. Optimize wound care and patient hygiene to extent possible.
Ertapenem 1g IV/IO every 24 hours and moxifloxacin 400mg PO every 24 hours for 5 days.	Use an antibiotic with strong CNS penetration. <ul style="list-style-type: none"> Ceftriaxone 2 gm IV/IO every 24 hours or cefazolin 2g IV/IO every 8 hours for 5 days Add metronidazole 500mg IV/IO every 8 hours if wounds contaminated with organic debris.
Moxifloxacin may be replaced with levofloxacin 750 mg PO daily to provide better coverage of bacteria found in wet terrain/ jungle environment. Ertapenem and moxifloxacin may increase the risk of seizure and ertapenem may not penetrate an intact blood-brain barrier. If recommended antibiotics are not available or significant drug allergies are present, obtain teleconsultation to discuss alternative medications.	

Management: Seizures	MINIMUM	BETTER	BEST
Rapidly identify and manage seizures.	For a witnessed or suspected seizure, ensure safety and airway is clear. Treat with rapid-acting benzodiazepine: <ul style="list-style-type: none"> Midazolam 5mg IV/IO/IM every 5 minutes until seizure stops 		Levetiracetam 2,000mg IV/IO loading dose over 15 minutes + 500mg every 12 hours. Alternate therapy: <ul style="list-style-type: none"> Phenytoin 1.5g IV/IO load + 100mg IV/IO every 8 hours Phenobarbital 1.5g IV/IO load + 100mg IV/IO daily.
Consider nonconvulsive seizures in any TBI patient with GCS score ≤ 8 who is not improving with appropriate treatments. If not already placed, consider a definitive airway in any patient who experiences seizure. Perform after seizures are controlled.			
Management: Fever Control			
Maintain core temperature between 96°F and 99.5°F. Treat fever aggressively.	Remove patient from heat or sun. Remove clothing. Use surface cooling measures with misting and fan cooling	Apply cold packs to axillary, posterior cervical, and groin regions.	Acetaminophen 650mg every 4 hours PO or rectally for rectal temperature >99.5°F. Cold saline IV bolus if available.
Avoid NSAIDs, such as ibuprofen, naproxen, and ketorolac, because these agents may increase intracranial hemorrhage, if present.			
Management: Sodium Control			
Avoid hyponatremia. Mild hyponatremia optimal. Target sodium level: 145 - 160mmol/L.	Avoid administration of free water or hypotonic fluids.		Monitor serum sodium via laboratory blood samples. If patient is stable, check levels every 6 hours. In an unstable patient or one receiving HTS, check sodium level every 3 hours and adjust fluids as needed.
Numerous conditions can rapidly affect sodium levels in TBI patients. Monitor sodium and urine output whenever possible.			
Management: BGL Control			
Avoid both hypo- and hyperglycemia. Target blood glucose 100–180mg/dL.	Monitor for signs and symptoms of hypoglycemia. Allow patient to eat as long as they are able.		Check blood glucose every 6 hours with handheld glucometer. If <100mg/dL, give 25g (50mL) dextrose 50% (D50) IV/IO or 5tsp sugar/4tsp honey PO/NG.
Numerous conditions can rapidly affect sodium levels in TBI patients. Monitor sodium and urine output whenever possible.			
Transportation			
TBI patients for ground and/or air transport to higher levels of care.	Dose sedative/analgesic medications, osmotic therapies, and/or benzodiazepines before any significant ground or air transport if possible.		Provide a detailed brief to the transport assets highlighting any neurologic deficits and treatments and/or accommodations required during transport.
Neuromuscular blockers should only be used when the benefit outweighs the risks. Most patients should be transported in the supine position with the HOB elevated at least 30°.			
**For fixed-wing aircrafts: load patient with head to the front of the aircraft to minimize G-forces transmitted to the brain.			
**For altitudes >8000 ft, TBI patients are at risk of hypobaric hypoxia and high-altitude cerebral edema (HACE), which can worsen.			

Sepsis Management

APPENDIX A: SEPSIS PATIENT MANAGEMENT CHECKLIST

If sepsis is suspected, the following checklist should be employed to begin treatment and set up a safety net for ongoing patient care:

- Placement of 2 IV access points (Large bore IV/IO).
- Collect blood cultures x2 (if available).
- Start IVF with goal resuscitation of adequate urine output, up to maximum bolus of 30ml/kg (usually about 2-3 Liters).
- Consider placement of advanced monitoring equipment (if available).
- Place a Foley catheter.
- Monitor all vital signs and continuously trend heart rate, blood pressure, respiratory rate, and mental status every 15 minutes on a flowsheet. Temperature and urine output should be documented hourly.
- Place on oxygen if indicated and available (for SpO₂ < 92%).
- Ensure a secure airway is in place, or the equipment for a definitive airway is on hand along with the elements of M.S.M.A.I.D.
- Search for the source of infection. Address this as appropriate (wound care, removal of infected catheters, surgical consultation, etc.).
- Give the most appropriate antibiotics.
- Call telemedicine consultant early and often.
- Take/Give Approach: Take – Vital signs, neurologic assessment, wound/ skin infection exams, serum lactate level, urine output (Foley catheter), rapid tests.
Give –Antibiotics, Fluids, Oxygen (if available), Vasopressors (with telemedicine).
- If providing nutrition, monitor for signs of GI upset or obstruction: nausea, abdominal pain, and abdominal distension.

CCAT Mechanical Ventilation Clinical Practice Guideline

Appendix B – Mechanical Ventilation in ARDS

**** NOT APPLICABLE TO PATIENTS WITH TBI ****

Volume Control Ventilation

1. Set the I:E ratio at 1:2 to 1:4. The 731 ventilator defaults to a 1:2.5 I:E Ratio.
2. Set PEEP and FiO₂ according to ARDSNet ARMA Trial PEEP table to achieve SaO₂ 92 - 96%¹. Note that the LTV 1000 is limited to PEEP 20 and the 731 limited to PEEP 25.
3. Set tidal volume at 6 cc/Kg and note peak inspiratory pressure (PIP)². If necessary, decrease tidal volume by 1 cc/Kg as needed to keep peak inspiratory pressure ≤ 35 cm H₂O (preferably ≤ 30). Do not go below 4cc/Kg. Use table on the next page as reference for appropriate tidal volume³.
4. Adjust respiratory rate to achieve pH ≥ 7.3⁴. The actual PCO₂ is not important, only the pH.

Pressure Control Ventilation

1. Set I time to achieve I:E ratio of 1:2 to 1:4.
2. Set PEEP and FiO₂ according to ARDSNet ARMA Trial PEEP table to achieve SaO₂ 92 - 96%¹. Note that the LTV 1000 is limited to PEEP 20 and the 731 limited to PEEP 25.
3. Set inspiratory pressure to achieve a tidal volume of 6 cc/kg. If this value is > 30 cm H₂O then decrease until it is ≤ 30 cm H₂O or until tidal volume is 4 cc/kg. Use table on the next page as reference for appropriate tidal volume³.
4. Adjust respiratory rate to achieve pH ≥ 7.3⁴. The actual PCO₂ is not important, only the pH.

¹ Increasing PEEP can decrease cardiac output and may cause significant hypotension in hypovolemic patients. Additional volume loading may be necessary to maintain hemodynamics.

² This is a fairly accurate indicator of plateau pressure in our patient population. Plateau pressure is the correct parameter to follow but it cannot be easily measured with the Impact 731 ventilator.

³ Measuring the patient's "wingspan" should be used as an estimate of height. Sternum to fingertip multiplied x 2.

⁴ A pH of 7.2 may be an appropriate target if hemodynamics are relatively normal.

Tidal Volumes for Ventilation of Patients with ARDS

ARDSNet ARMA Trial

Male Patients

Height				cc's per Kg						
				4	5	6	7	8	9	10
ft in	in	cm	Pre Wt (Kg)							
5'6"	66	168	64	255	320	385	445	510	575	640
5'8"	68	173	68	275	340	410	480	545	615	685
5'10"	70	178	73	290	365	440	510	585	655	730
6'	72	183	78	310	390	465	545	620	700	775
6'2"	74	188	82	330	410	495	575	660	740	820
6'4"	76	193	87	345	435	520	610	695	780	870
6'6"	78	198	91	365	455	550	640	730	825	915

Female Patients

Height				cc's per Kg						
				4	5	6	7	8	9	10
ft in	in	cm	Pre Wt (Kg)							
5'	60	152	46	180	230	275	320	365	410	455
5'2"	62	157	50	200	250	300	350	400	450	500
5'4"	64	163	55	220	275	330	385	440	490	545
5'6"	66	168	59	235	295	355	415	475	535	595
5'8"	68	173	64	255	320	385	445	510	575	640
5'10"	70	178	69	275	345	410	480	550	615	685
6'	72	183	73	290	365	440	510	585	660	730

PEEP Titration Table -ARDSNet ARMA Trial

PEEP	5	5	8	8	10	10	10	12	14	14	14	16	18	18	20	22	24
FiO2	0.3	0.4	0.4	0.5	0.5	0.6	0.7	0.7	0.7	0.8	0.9	0.9	0.9	1	1	1	1

<-----Move across table to keep SaO₂ 92 – 96 %----->

Patients falling in shaded area are not necessarily too sick for flight but risks and benefits should be considered as described in the CPG.

Guideline Only/Not a Substitute for Clinical Judgment

The Richmond Agitation-Sedation Scale (RASS)

+4	Combative	Combative, violent, immediate danger to staff
+3	Very agitated	Pulls to remove tubes or catheters; aggressive
+2	Agitated	Frequent non purposeful movement; fights ventilator
+1	Restless	Anxious, apprehensive, movements not aggressive
0	Alert and calm	Spontaneously pays attention to caregiver
-1	Drowsy	Not fully alert but has sustained awakening to voice (eye opening and contact >10 seconds)
-2	Light sedation	Briefly awakens to voice (eyes open and contact <10 seconds)
-3	Moderate sedation	Movement of eye opening to voice (no eye contact)
-4	Deep sedation	No response to voice but movement or eye opening to physical stimulation
-5	Unarousable	No response to voice or physical stimulation
Procedure for RASS assessment		Score
1. Observe patient. • Patient is alert, restless, or agitated.		0 to +4
2. If not alert, state patient's name and tell patient to open eyes and look at speaker. • Patient awakens with sustained eye opening and eye contact. • Patient awakens with eye opening and eye contact, but not sustained. • Patient has any movement in response to voice but no eye contact.		-1 -2 -3
3. When no response to verbal stimulation, physically stimulate patient by shaking shoulder and/or rubbing sternum. • Patient has any movement to physical stimulation. • Patient has no response to any stimulation.		-4 -5

Common IV Meds Cheat Sheet

	Moderate Pain	Pain Dose Range	Sedation
Ketamine	20mg IV	0.1-0.2mg/kg IV	1mg/kg IV
Midazolam	1mg IV	0.5-2mg IV	1mg every 1-6 hours
Morphine	5mg IV	2.5-10mg IV	
Fentanyl IV	25µg IV	25-100µg IV	
Hydromorphone	0.5-1mg IV	0.25-2mg IV	
OTFC	800µg pop: between cheek and gum		
Opioid overdose	Naloxone: Dilute 0.4mg (1mL) with 9mL normal saline. Give 1ml slowly. Repeat dose PRN		
Benzodiazepine overdose	Flumazenil: <ul style="list-style-type: none"> • Draw 1mL (0.5mg) • Dilute with 4mL sterile water (0.1mg/mL) • Give 3mL/0.3mg over 15 seconds • Additional 1mL/0.1mg every 1 minute PRN Maximum dose, 1mg/h (can cause seizures)		

IV, intravenous; OTFC, oral transmucosal fentanyl citrate; PRN, as needed.

The moderate-pain category follows this clinical practice guideline philosophy:

Prolonged Field Care analgesia/sedation should begin with smaller amounts of a drug first:
START LOW, GO SLOW.

The doses are not all inclusive; therefore, the dose by weight or a safe range is also included.

Guideline Only/Not a Substitute for Clinical Judgment