

AFTERWORD

Sunt lacrimae rerum et mentem mortalia tangunt.

—VIRGIL



. . . Though nothing can bring back the hour
Of splendour in the grass, of glory in the flower,
We will grieve not, rather find
Strength in what remains behind;
In the primal sympathy
Which having been must ever be;
In the soothing thoughts that spring
Out of human suffering;
In the faith that looks through death,
In years that bring the philosophic mind.

. . . Thanks to the human heart by which we live,
Thanks to its tenderness, its joys, and fears,
To me the meanest flower that blows can give
Thoughts that do often lie too deep for tears.

—WILLIAM WORDSWORTH, 1807



APPENDIX A Abbreviations and Acronyms

A

ABC: *Acinetobacter baumannii-calcoaceticus* complex
ABN: airborne
ACS: American College of Surgeons
AP: anteroposterior
APC: Armored Personal Carrier
aPLTs: apheresis platelets
ATLS: Advanced Trauma Life Support

B

BAMC: Brooke Army Medical Center (Fort Sam Houston, TX)
β-hCG: β-human chorionic gonadotropin
BVM: bag valve mask

C

CAT: Combat Application Tourniquet
CATS: Combat Application Tourniquet System
CBC: complete blood count
CBF: cerebral blood flow
CCATT: Critical Care Air Transport Team
CEEG: continuous electroencephalogram
CENTCOM: Central Command
coag: coagulopathy
CONUS: continental United States
COT: Committee on Trauma
CPDA: citrate, phosphate, dextrose, adenine (solution)
CPGs: Clinical Practice Guidelines
CPNB: continuous peripheral nerve block
CRNA: certified registered nurse anesthetist
CSF: cerebrospinal fluid
CSH: combat support hospital
CT: computed tomography
CXR: chest X-ray

D

DCCS: Deputy Commander for Clinical Services
DOW: died of wounds
DPL: diagnostic peritoneal lavage
DVBIC: Defense and Veterans Brain Injury Center

E

EBL: estimated blood loss
ED: emergency department
EDTA: ethylenediamine tetraacetic acid
EMEDS: Expeditionary Medical Squadron
EMS: emergency medical system (or service)
EMT: Emergency Medical Treatment (area/section)
EOD: explosive ordnance disposal
EPW: enemy prisoner of war
ETT: endotracheal tube
evac: evacuation
EWS: *Emergency War Surgery, Third United States Revision* (2004 manual)

F

FAST: Focused Abdominal Sonography for Trauma
FDA: Food and Drug Administration
FFP: fresh frozen plasma
FRSS: Fast Response Survey System
FST: Forward Surgical Team
FWB: fresh whole blood

G

GCS: Glasgow Coma Scale
GI: gastrointestinal
GIA: gastrointestinal anastomosis
GU: genitourinary

H

HBV: hepatitis B virus
HCV: hepatitis C virus
HIPAA: Health Insurance Portability and Accountability Act
HIV: human immunodeficiency virus
HMMWV: High-Mobility Multipurpose Wheeled Vehicle (“Humvee”)
HPMK: Hypothermia Prevention and Management Kit
HPPL: high-pressure pulsatile lavage
HTIG: human tetanus immunoglobulin

I

IBA: Individual Body Armor
ICH: intracranial hemorrhage
ICP: intracranial pressure
ICU: intensive care unit
IED: improvised explosive device
IFAK: Individual First-Aid Kit
INR: international normalized ratio
ISO: International Organization for Standardization
(also called International Standards Organization)
ISR: (US Army) Institute of Surgical Research
IV: intravenous
IVC: inferior vena cava

J

JTTS: Joint Theater Trauma System

K

KIA: killed in action

L

LRMC: Landstuhl Regional Medical Center
(Landstuhl, Germany)

M

MASH: Mobile Army Surgical Hospital
MEDCOM: Medical Command
MEDEVAC: medical evacuation
MFST: Mobile Field Surgical Team
MNC-I: Multi-National Corps-Iraq
MRE: Meal, Ready-to-Eat
MRI: magnetic resonance imaging
MRSA: methicillin-resistant *Staphylococcus aureus*
MT: massive transfusion

N

NATO: North Atlantic Treaty Organization
NG: nasogastric
NNMC: National Naval Medical Center (Bethesda, MD)
NPA: nasopharyngeal airway
NSAID: nonsteroidal anti-inflammatory drug

O

OEF: Operation Enduring Freedom (Afghanistan)
OIF: Operation Iraqi Freedom
OMF: oral and maxillofacial
OMFS: oral and maxillofacial surgeon
OR: operating room
OSD-HA: Office of the Assistant Secretary of Defense for
Health Affairs

P

PA: posteroanterior
Pco₂: partial pressure of carbon dioxide
PDS: polydioxanone
PEEK: polyetheretherketone
PFA: profunda femoris artery
PLTs/plts: platelets
PRBCs: packed red blood cells (also pRBCs)
PT: prothrombin time
PTFE: polytetrafluoroethylene
PTT: partial thromboplastin time

R

RBC: red blood cell
RCT: randomized controlled trial
rFVIIa: recombinant Factor VIIa (also hrFVIIa)
R/O: rule out
RPG: rocket-propelled grenade

S

SFA: superficial femoral artery
SFV: superficial femoral vein
SG: Surgeon General
SOFTT: Special Operations Forces Tactical Tourniquet
s/p: status post (Latin for “after condition”)
STP: Shock Trauma Platoon
STSG: split-thickness skin graft

T

TAT: tetanus antitoxin
TCD: transcranial Doppler
THAM: tris-hydroxymethyl aminomethane (or tromethamine)
t.i.d.: three times a day
TOA: total obligation authority
TRAC: Therapeutic Regulated Accurate Care
Tx: treatment

U

UXO: unexploded ordnance

V

VA: Veterans Administration
VAC: vacuum-assisted closure
VP: ventriculoperitoneal

W

WHMC: Wilford Hall Medical Center
WRAMC: Walter Reed Army Medical Center

APPENDIX B Product Manufacturers

Argentum Medical LLC, Willowbrook, Illinois (Silverlon)	Mallinckrodt, Hazelwood, Missouri (Shiley tracheostomy tube)
Arizant Healthcare, Inc, Eden Prairie, Minnesota (Bair Hugger)	McNeil Consumer Healthcare, Guelph, Ontario, Canada (Tylenol)
AstraZeneca Pharmaceuticals LP, Wilmington, Delaware (Diprivan [propofol])	MEDICON, Tuttlingen, Germany (Javid shunt)
Bausch & Lomb, Rochester, New York (Optima FW Trial)	Medisave Services, Inc, Markham, Ontario, Canada (butyl cyanoacrylate [corneal glue])
Bayer Corporation, Pittsburgh, Pennsylvania (ciprofloxacin)	Miltex, Inc, York, Pennsylvania (Penfield dissector)
Belmont Instrument Corporation, Billerica, Massachusetts (rapid fluid infuser, blood and fluid warmer)	Mopec, Oak Park, Michigan (Gigli saw)
BlackHawk Products Group, Norfolk, Virginia (military outdoor gear)	North American Rescue Products, Inc, Greenville, South Carolina (Hypothermia Prevention and Management Kit [HPMK])
Cloward Instruments Corporation, Honolulu, Hawaii (Hudson brace)	Novartis International AG, Basel, Switzerland (Sandostatin)
Derma Sciences, Inc, Princeton, New Jersey (Silverseal burn contact dressings)	Parks Medical Electronics, Inc, Aloha, Oregon (Doppler ultrasound)
DeRoyal Industries, Inc, Powell, Tennessee (Dermanet Wound Contact Layer)	Pfizer, Inc—US Pharmaceuticals Group, New York, New York (Dilantin [phenytoin])
Edward Weck Company, Research Triangle Park, North Carolina (Weck cell sponge)	Phil Durango, LLC, Golden, Colorado (Combat Application Tourniquet System [CATS])
E. I. du Pont de Nemours and Company, Wilmington, Delaware (Kevlar and Tyvek products/equipment)	Polymed Chirurgical, Inc, St. Laurent, Quebec, Canada (MSI-EpiDermGlu)
Ethicon, Inc, Somerville, New Jersey (DERMABOND, VICRYL suture, Prolene suture)	Procter & Gamble Pharmaceuticals, Inc, Cincinnati, Ohio (Didronel [etidronate])
GlaxoSmithKline, Research Triangle Park, North Carolina (Ancef [cephazolin])	Rocky National, Eau Claire, Wisconsin (Gerber “Seal ‘n Go” sterile bag)
Hospira, Inc, Lake Forest, Illinois (Hextend)	Sanofi-aventis U.S. LLC, Bridgewater, New Jersey (Lovenox)
Integra LifeSciences Corporation, Plainsboro, New Jersey (DuraGen)	Sherwood Medical Company, Norfolk, Nebraska (Argyle shunt)
Integra NeuroSciences, Plainsboro, New Jersey (NeuroGen nerve guide, Mayfield pins, Sundt shunt)	SonoSite, Inc, Bothell, Washington (SonoSite duplex ultrasound device)
Kendall Healthcare Products Company, Mansfield, Massachusetts (Kerlix rolls and sponges)	Sorenson Medical, Inc, West Jordan, Utah (ambIT pain pump)
Kinetic Concepts, Inc/KCI Licensing, Inc, San Antonio, Texas (wound VAC [therapy system], VAC Abdominal Dressing System, TRAC Pad)	Synthes, Inc, West Chester, New York (Synthes compression plate)
Kontur Kontac Lens Company, Richmond, California (Kontur ^{SS})	Velcro USA, Inc, Manchester, New Hampshire (Velcro strap)
LifeCell, Branchburg, New Jersey (AlloDerm)	Welch Allyn, Inc, Skaneateles Falls, New York (Propaq monitor)
	W. L. Gore & Associates, Inc, Flagstaff, Arizona (GORE-TEX)
	Z-Medica Corporation, Wallingford, Connecticut (QuikClot)

APPENDIX C Glasgow Coma Scale

COMPONENT	RESPONSE	SCORE
Motor response (best extremity)	Obeys verbal command	6
	Localizes pain	5
	Flexion (withdrawal)	4
	Flexion (decortication)	3
	Extension (decerebration)	2
	No response (flaccid)	1
	Subtotal	(1–6)
Eye opening	Spontaneously	4
	To verbal command	3
	To pain	2
	None	1
	Subtotal	(1–4)
Best verbal response	Oriented and converses	5
	Disoriented and converses	4
	Inappropriate words	3
	Incomprehensible sounds	2
	No verbal response	1
	Subtotal	(1–5)
TOTAL		(3–15)

APPENDIX D Clinical Practice Guidelines*

BURN CARE

The large number of burn casualties treated by coalition forces in the Iraq theatre has prompted a reevaluation of the optimal treatment plan. Many lessons have been learned and relearned during the last 4 years of treating casualties during OIF/OEF. Burn patients are very labor intensive and consume significant personnel and class VIII (medical logistic supply materials) resources. Despite the best efforts of providers at every level of care, the mortality for burn casualties who cannot be evacuated out of the theater of operations is significantly higher than that experienced in US facilities (Table 1). Experience among US treatment facilities in the past 3-4 years reveals no survivors among host nation casualties sustaining full thickness burns to 50% or greater total body surface area (TBSA). The spread of infection in large open wards is a real concern, which can threaten the outcome of non-burn patients. Furthermore the average burn patient in Accredited Burn Centers in the US stays 1-2 days for each percent burn. The factors have prompted a reevaluation of the optimal treatment plan based on severity of injury, treatment facility capabilities and potential for evacuation. The following recommendations are provided to assist the physician in making patient management decisions unique to the deployment environment. Chapter 28 of the 2004 edition of the *Emergency War Surgery* handbook is an excellent general reference for burn care.

In every case, use of the Burn Patient Admission Orders (Appendix A) and the JTTS Burn Resuscitation Flow Sheet (Appendix B) is highly recommended, especially if the patient may transfer to another facility.

1. Coalition Casualties Who Can Be Evacuated Out of Country

- a. Protect airway early, using a large-sized endotracheal tube (ETT) as possible (i.e., 8 mm) is strongly preferred, especially if inhalation injury is noted on bronchoscopy. A large ETT tube ensures ease of bronchoscopy and facilitates pulmonary suction, which are critical with inhalation injuries.
- b. Calculate burn size using a Lund and Browder chart (Appendix C).
- c. Initiate resuscitation using a standard burn formula (1-2 mL/kg/%BSA—see Burn Resuscitation Flow Sheet) and avoid boluses if possible; uptitrate the rate of intravenous fluids to maintain adequate urine output (UOP) as described below.
- d. Monitor UOP closely and decrease or increase the LR infusion 20% per hour to maintain a UOP of 30-50 mL/hour.
 - 1) Overresuscitation is as harmful as underresuscitation; patients who receive over 6 mL/kg/%BSA burn are susceptible to severe complications.
 - 2) Hour-to-hour fluid management is critical, especially during the first 24 hours.
 - 3) Use of the Burn Resuscitation Flow Sheet to record fluid intake and UOP is mandatory. Refer to Appendix D for the Burn Resuscitation Flow Sheet Protocol.
- e. Keep the patient warm.
- f. Debride in the operating room (OR) with hibiclens, removing all blistered or sloughing skin (do not perform excision).
- g. Perform escharotomy and/or fasciotomies early if pulses are not palpable and circumferential burns are present.

*Reprinted from CENTCOM's Clinical Practice Guidelines.

- h. Wrap burns on scalp, trunk, neck, and extremities in 5% Sulfamylon solution soaked dressings TID and as needed to keep dressings moist:
 - 1) There is less mess as opposed to Sulfamylon or Silvadene cream
 - 2) Easier for receiving institution to clean and evaluate on arrival
- i. Measure abdominal compartment pressure for casualties with large burns and those who receive a large resuscitation. Pressures > 25 mm Hg warrant intervention.
- j. Shave and debride face and scalp.
- k. Apply Sulfamylon cream to ear burns BID.
- l. Apply Bacitracin to face burns QID.
- m. If available, consult ophthalmology for all patients with deep facial burns or corneal injury by Wood's lamp exam.
 - 1) Apply Bacitracin ophthalmic ointment to eye lids QID.
 - 2) Apply Erythromycin ophthalmic ointment QID in the eyes.
- n. Change dressings every day until evacuated.
- o. Consult the Army Burn Center at the USAISR at DSN 312-429-2876 or burntrauma.consult@us.army.mil.

2. Host Nation Burn Casualties

- a. Triage casualties with full thickness burns of 50% or greater TBSA as expectant and provide adequate comfort measures. This requires careful and accurate calculation of burn size using a Lund and Browder chart (Appendix C).
- b. Remember that inhalation injury, comorbidities, and extremes of age, in addition to the burn, increase mortality. Take these factors into consideration as treatment plans are initiated.
- c. For patients with combined partial and full thickness burns of 50% TBSA or greater, with less than half of the burn being full thickness, initially treat the patient as above (section 1) and allow the partial thickness component to declare itself after 2 days. It is initially sometimes difficult to determine the full extent of the full thickness burn. After 48 hours, reassess the percentage of full thickness burn.
- d. For patients with a less than 50% TBSA burn, attempts at early excision and grafting are recommend.
- e. Presently, no allograft (cadaveric skin) or xenograft (Pig skin) are available in theater; therefore, the extent of excision should be guided by amount of autograft donor skin available, meshing no wider than 3:1.
- f. Consider using a Negative Pressure Wound Dressing

(NPWD) over fresh graft with intervening non-adherent layer (i.e. Dermanet, Silverlon) and leave in place for 3-5 days.

- g. Following NPWD removal, use Sulfamylon moistened gauze dressings for next 5-7 days before transitioning to Bacitracin.
- h. Initially excise only as much as donor skin is available to cover.
 - 1) Do not excise wounds and leave open. If patients arrive in this state, re-excise and apply a NPWD until granulation tissue is present.
 - 2) Rarely need to mesh skin wider than 2:1.
- i. Take the patient to the OR for staged excisions and grafting of the full thickness burns with a goal of complete excision within 1 week of injury.
- j. Once grafts are healed, continue to keep patient clean using showers, when available.
- k. Early ambulation and physical therapy, with range of motion of all affected joints, is critical to the long-term functioning of these casualties.
- l. Early and continuous nutrition are key to wound healing. Use a nasogastric feeding tube and supplement with high protein, low fat tube enteral feedings, even when patient is able to eat. Utilize nutritionist whenever available. Supplement diet with a daily multivitamin.
- m. Questions about burn care in theater can be answered by the in-theater burn consultant who can be reached at DSN 318-239-7664.

3. Pitfalls

- a. Excising uninfected full thickness burns before having donor skin to cover the wound.
- b. Pseudomonas infections:
 - 1) High rate of graft loss.
 - 2) Ominous sign.
 - 3) Liberal use of Dakin's solution.
 - 4) Delay subsequent grafting until topical pseudomonas is well-treated.
- c. Transition from aggressive care to comfort care:
 - 1) Difficult decision.
 - 2) Initial burn may appear survivable but graft loss, topical infections, or donor site conversion may convert a potentially survivable situation into a nonsurvivable injury.
 - 3) Be aware of this possibility and the need for potential change to an expectant category.
 - 4) Elicit opinions from medical leaders, partners, and nurses, as this is a decision that should not be made solely by the treating physician.

- d. Consider inhalational injury in relationship to the TBSA burned when deciding whether to treat the patient or deem the patient expectant. (i.e., a patient with a 40% TBSA burn and an inhalational injury will likely not do well as a patient with a 40% TBSA burn and no inhalational burn)
 - e. Perform large dressing changes in the OR (not ICU or ICW), especially early in the treatment process:
 - 1) Better evaluation.
 - 2) Improved ability to clean wounds.
 - 3) Improved pain control.
 - f. Initial burn may appear survivable but graft loss, topical infections, or donor site conversion may lead to transition from a potentially survivable situation into a nonsurvivable injury. Be aware of this possibility and the need for potential change to an expectant category.
 - g. The decision to do less than everything possible should not be viewed as failure, but rather part of reality in a combat zone. The attending physician should not feel isolated about making the decision to decrease the level of care but should seek the opinions of leaders, partners, and nurses. Consult the Chaplain and, if needed, an interpreter to counsel the patient's family about the prognosis and plans.
- 4. Recommendations for Complicated Burn Care**
- a. Recommendations for the difficult fluid resuscitation:
 - 1) At 12-18 hours post-burn, calculate the PROJECTED 24-hour resuscitation if fluid rates are kept constant. If the projected 24-hour resuscitation requirement exceeds 6 mL/kg/% TBSA, the following steps are recommended:
 - a) Initiate 5% albumin early as described previously in the *Emergency War Surgery* handbook.
 - b) Check bladder pressures every 4 hours.
 - c) If available, strongly consider placing a pulmonary artery (PA) catheter to guide resuscitation with specific PCWP and SvO₂ goals (Goal PCWP 10-12 mm Hg, SvO₂ 65-70%). If PA catheter placement is not practical, consider monitoring central venous pressures from a subclavian or IJ catheter along with central venous O₂ saturations (Goal CVP 8-10 cm H₂O, ScvO₂ 60-65%).
 - If CVP or PCWP is not at goal, increase fluid rate.
 - If CVP or PCWP is at goal, consider vasopressin 0.02-0.04 units/min to augment MAP (and thus UOP) or dobutamine 5 mcg/kg/min IV (titrate until SvO₂ or ScvO₂ at goal). The maximum dose of dobutamine is 20 mcg/kg/min.
 - If both CVP or PCWP and SvO₂ or ScvO₂ are at GOAL, stop increasing fluids (EVEN if UOP < 30 mL/hr). Consider the patient hemodynamically optimized and that the oliguria is likely a result of an established renal insult. Tolerate and expect some degree of renal failure. **Continued increases in fluid administration despite optimal hemodynamic parameters will only result in "resuscitation morbidity" that is often times more detrimental than renal failure.**
 - d) If the patient becomes hypotensive and oliguric (UOP < 30 mL/hr), then follow the **hypotension guidelines**.
 - e) Every attempt should be made to minimize fluid administration while maintaining organ perfusion. If UOP > 50 mL/hr, then decrease the fluid rate by 20%.
- 2) After 24 hours, titrate LR infusion down to maintenance levels and continue albumin until the 48-hour mark.
- 3) War burn patients have exhibited multisystem injury to include soft tissue injury secondary to blunt/penetrating injury/blast and inhalational injury, which all affect resuscitation amounts and may result in marked increased fluid needs above and beyond standard burn resuscitation formulas. The air evacuation environment may also increase fluid requirements and wound edema.
- b. Recommendations for hypotension:
 - 1) The optimal minimum blood pressure for burn patient must be individualized. Some patients will maintain adequate organ perfusion (and thus have adequate UOP) at MAPs lower than 70 mm Hg. True hypotension must be correlated with UOP. If a MAP is not adequate (generally < 55 mm Hg) to maintain the UOP goal of at least 30 mL/hr, the following steps are recommended.
 - a) Vasopressin 0.02-0.04 units/min IV drip (DO NOT TITRATE).
 - b) Monitor CVP (Goal 8-10 cm H₂O).
 - c) If CVP not at goal, increase fluid rate.
 - d) If CVP at goal, add Levophed (norepinephrine) 2-20 mcg/min IV.
 - e) If additional pressors are needed, consider inserting a PA catheter to guide resuscitation with specific PCWP and SvO₂ goals (goal

PCWP 10-12 mm Hg, SvO₂ 65-70%). These patients may be volume depleted, but also suspect a missed injury.

- If PCWP at goal, consider a dobutamine drip at 5 mcg/kg/min IV (titrate until SvO₂ at goal). The maximum dose of dobutamine is 20 mcg/kg/min.
- If hypotension persists, look for a missed injury.
- Consider adding epinephrine or neosynephrine as a last resort.

f) If the patient exhibits catecholamine-resistant shock, consider the following diagnoses:

- Missed injury and on-going blood loss.
- Acidemia. If pH < 7.20, adjust ventilator settings to optimize ventilation (target PCO₂ 30-35 mm Hg). If despite optimal ventilation, patient still has a pH < 7.2, consider bicarb administration.
- Adrenal insufficiency. Check a random cortisol and start hydrocortisone 100 mg every 8 hours.
- Hypocalcemia. Maintain ionized calcium > 1.1 mmol/L.

c. Recommendations for inhalational injury:

- 1) Inhalation injury is further exacerbated by retained soot and chemicals. Remember, inhalation injury is mostly a chemical injury that will benefit from removing the chemical.
- 2) Upon arrival, if patients are found to have visible soot in the airways, make every attempt to debride through bronchoscopic suction as much soot as possible. In addition, keep in mind that irrigation may actually make the injury worse by transporting injurious substances to new, uninjured parts of the lung, so irrigate judiciously.
- 3) If a diagnosis of inhalation injury is made, use aerosolized heparin 5,000 units every 4 hours. Mix heparin with albuterol as heparin can induce bronchospasm.

d. Recommendations for abdominal compartment syndrome:

- 1) Massive fluid replacement (> 6 mL/kg/% burn) has led to abdominal compartment syndrome (increased bladder pressure, increased airway pressures, decreased UOP, hypotension) and extremity compartment syndromes (beyond standard escharotomy treatment).

- 2) If the patient requires a decompressive laparotomy, do a full midline incision (NOT a small mini-laparotomy incision) followed by a temporary abdominal closure. If the abdominal wall skin is burned, Ioban dressing will not adhere to burnt skin. Use a traditional Bogotá bag or 3 L NS IV bag sewn to the skin (keep loose).

e. Recommendations for escharotomy/fasciotomy:

- 1) The requirement for escharotomy or fasciotomy usually presents in the first few hours following injury. If the need for either procedure has not presented in the first 24 hours, then circulation is likely to remain adequate without surgical intervention. For this reason, it would be unusual for a patient to require a new escharotomy or fasciotomy by the time of arrival at an Level IV facility.
- 2) More likely, a patient with previous escharotomy or fasciotomy performed in the field might require extension of the incision or placement of a second incision on the other side of an extremity to restore circulation. This can occur if significant volumes of intravenous fluid are given in transit between the time of initial escharotomy and patient arrival at a rear medical facility.
- 3) On arrival, assess distal circulation of all extremities by palpating the radial, dorsalis pedis and posterior tibial arteries. If a pulse is palpable in one or more arteries in each extremity, neither escharotomy nor fasciotomy is indicated, and serial assessments are appropriate. Elevate injured extremities 30-45°. Use Doppler ultrasound to assess distal circulation in the absence of palpable pulses. Absent Doppler signals or pulses that are diminishing on serial exam 30 minutes to one hour apart should prompt consideration of escharotomy.
- 4) Escharotomy is normally performed when an extremity has a circumferential full thickness burn. If the burn is superficial or not circumferential and pulses are absent, consider inadequate circulation from other causes such as hypovolemia, hypotension, or occult traumatic injury.
- 5) Extend escharotomy incisions the entire length of the full-thickness burn and carry across the joint when the burn extends across the joint. In the lower extremity, make a mid-lateral or mid-axial incision with a knife or electrocautery through

the dermis to the level of fat. It is not necessary to carry the incision to the level of fascia. Although full-thickness burn is insensate, the patient will often require intravenous narcotics and benzodiazepines during this procedure. Give morphine 2-5 mg IV and midazolam 1-2 mg IV at 5- to 10-minute intervals as needed. On completion of midlateral or midmedial escharotomy, reassess the pulses. If circulation is restored, bleeding should be controlled with electrocautery and the extremity dressed and elevated at a 30-45° angle. Assess pulses hourly for at least 12-24 hours. If circulation is not restored, perform a second incision on the opposite side of the extremity.

- 6) For upper extremities, place the hand in the anatomic position (palm facing forward) and make an incision in the midradial or mid ulnar line. Ulnar incisions should stay anterior (volar) to the elbow joint to avoid the ulnar nerve, which is superficial at the elbow. If pulses are not restored, a second incision may be necessary on the opposite side of the extremity. If both the hand and arm are burned, continue the incision across the mid ulnar or midradial wrist and onto the mid ulnar side of the hand or to the base of the thumb and then the thumb webspace.
- 7) Finger escharotomies are controversial. Before performing finger escharotomies, consider that there is little other than bone and tendon in the fingers and that fingers burned badly enough to require escharotomy frequently end up as amputations. If finger escharotomies are performed, avoid functional surfaces (radial surface of the index and ulnar surface of the little finger). Place the fingers in a clenched position and note the finger creases at DIP and PIP joints. Escharotomy incisions should be just dorsal to a line drawn between the tops of these creases.
- 8) If bilateral extremity incisions do not restore circulation, re-evaluate the adequacy of the

patient's overall circulation. A well-resuscitated adult burn patient should have a clear sensorium, a heart rate in the range of 110-130 beats per minute, and a UOP of 30 mL/hr or more.

- 9) In unusual cases, following escharotomy, fasciotomy may be necessary to restore circulation. This is more common in electrical injuries and in crush or other traumatic injuries. Leg fasciotomies should release all four compartments. Forearm fasciotomies should decompress all three compartments. The dorsal compartment may be accessed via a 3 inch longitudinal mid dorsal forearm incision. Dissect to the fascia, enter the fascia and then slide a Metzenbaum scissor distal to the level of the wrist and proximal to the upper forearm. The volar compartment is approached via a lazy-S curved incision from the elbow to wrist. Avoid straight incisions on the volar surface as these may lead to later contractures. Also use the volar incision to access the mobile compartment, which is the fascia overlying the brachioradialis muscle. If escharotomies have already been performed, it may be possible to access the dorsal, volar, and mobile compartments by dissection between the dermis and fascia from the escharotomy site to the desired areas. Circulation should not be compromised by a desire to avoid additional incisions; however, the burned tissue will be excised later during burn surgery. When performing an arm fasciotomy, some hand surgeons prefer to also decompress the median nerve at the carpal tunnel and/or the ulnar nerve at the Canal of Guyon.
- 10) Following escharotomy or fasciotomy, late bleeding may occur as pressure is decompressed and circulation restored. Examine the surgical site every few minutes for up to 30 minutes for signs of new bleeding, which is usually easily controlled with electrocautery.

MEDICAL RECORD – PROVIDER ORDERS

For use of this form, see MEDCOM Circular 40-5

DIRECTIONS: The provider will SIGN, DATE, and TIME each order or set of orders recorded. Only one order is allowed per line. Orders completed during the shift in which they are written will be signed off adjacent to the order and do not require recopying on other ITR forms.

DATE / TIME ORDERS

(SIGNATURE REQUIRED FOR EACH ORDER/SET OF ORDERS. SIGNATURE MUST BE LEGIBLE; PROVIDER WILL USE SIGNATURE STAMP OR PRINT NAME).

BURN PATIENT ADMISSION ORDERS (Page 1 of 5)

1. **Admit/Transfer** to ICU (1 / 2 / 3), SDU, ICW (1 / 2 / 3) to Physician _____

2. **Diagnosis:**

3. **Condition:** VSI SI NSI **Category:** Nation/Service (e.g., US/USA, HN/IA) _____

4. **Allergies:** Unknown NKDA Other: _____

5. Monitoring

5.1 Vital signs: Q ____ hrs

5.2 Urine output: Q ____ hrs

5.3 Transduce bladder pressure Q ____ hrs

5.4 Neurovascular/Doppler pulse checks Q ____ hrs

5.5 Transduce: ____ CVP ____ A-line ____ Ventriculostomy

5.6 Neuro checks: Q ____ hrs

5.7 Cardiac monitor: Yes / No

6. Activity

6.1 ____ Bedrest ____ Chair Q shift ____ Ad lib ____ Roll Q 2 hrs

6.2 ____ Passive ROM to UE and LE Q shift

6.3 Spine precautions: ____ C-Collar/C-Spine ____ TLS spine

7. Wound Care

7.1 ____ NS wet to dry BID to: _____

7.2 ____ Dakin's wet to dry BID to: _____

7.3 ____ VAC dressing to: ____ 75 mm Hg ____ 125 mm Hg

7.4 ____ Abdominal closure drains to LWS

7.5 ____ Other: _____

8. Tubes/Drains

8.1 ____ NGT to LCWS or ____ OGT to LCWS

8.2 ____ Place DHT ____ Nasal ____ Oral and confirm via KUB

8.3 ____ Foley to gravity

8.4 ____ Flush feeding tube Q shift with 30 mL water

8.5 ____ JP(s) to bulb suction; strip tubing Q 4 hrs and PRN

8.6 ____ Chest tube to: ____ 20 cm H₂O suction (circle: R L Both) or ____ Water seal (circle: R L Both)

Physician Signature _____

Date/Time _____

MEDCOM FORM 688-RB (TEST) (MCHO) JUL 07

PREVIOUS EDITIONS ARE OBSOLETE

MC V2.00

PATIENT IDENTIFICATION (For typed or written entries note: Name – last, first, middle initial; grade; DOB; hospital or medical facility)	Nursing Unit	Room No.	Bed No.	Page No.
	Complete the following information on page 1 of provided orders only. Note any changes on subsequent pages.			
	Diagnosis: _____			
	Allergies and reaction: _____			
	Height: _____ Weight (Kg): _____ Diet: _____			

MEDICAL RECORD – PROVIDER ORDERS

For use of this form, see MEDCOM Circular 40-5

DIRECTIONS: The provider will SIGN, DATE, and TIME each order or set of orders recorded. Only one order is allowed per line. Orders completed during the shift in which they are written will be signed off adjacent to the order and do not require recopying on other ITR forms.

DATE / TIME ORDERS

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BURN PATIENT ADMISSION ORDERS (Page 2 of 5)

9. Nursing

- 9.1 Strict I & O and document on the JTTS Burn Resuscitation Flow Sheet Q 1hr for burns > 20% TBSA
- 9.2 ___ Clear dressing to Art Line/CVC, change Q 7D and prn
- 9.3 ___ Bair Hugger until temperature > 36° C
- 9.4 ___ Lacrilube OU Q 6hrs while sedated
- 9.5 ___ Oral care Q 4hrs; with toothbrush Q 12 hrs
- 9.6 ___ Maintain HOB elevated 45°
- 9.7 ___ Fingerstick glucose Q ___ hrs
- 9.8 ___ Routine ostomy care
- 9.9 ___ Ext fix pin site care
- 9.10 ___ Trach site care Q shift
- 9.11 ___ Incentive spirometry Q 1 hr while awake; cough & deep breath Q 1 hr while awake

10. Diet

- 10.1 ___ NPO
- 10.2 ___ PO Diet: _____
- 10.3 ___ TPN per Nutrition orders
- 10.4 ___ Tube Feeding: _____ @ _____ mL/hr OR ___ Advance per protocol

11. Burn Resuscitation (%TBSA > 20%)

- 11.1 Post Burn 1-8 hrs: LR at _____ mL/hr IV (0.13 mL x Wt in kg x %TBSA)
- 11.2 Post Burn 8-24 hrs: LR at _____ mL/hr IV (0.06 mL x Wt in kg x %TBSA)
- 11.3 Titrate resuscitation IVF as follows to maintain target UOP (Adult: 35-50 mL/hr; Children: 1.0 mL/kg/hr)
- Decrease rate of LR by 20% if UOP is greater than 50 mL/hr for 2 consecutive hrs
 - Increase rate of LR by 20% if UOP is less than 30 mL/hr (adults) or pediatric target UOP for 2 consecutive hrs
- 11.4 If CVP > 10 cm H₂O and patient still hypotensive (SBP < 90 mm Hg), begin vasopressin gtt at 0.02 – 0.04 Units/min
- 11.5 Post burn day #2 (Check all that apply)
- ___ Continue LR at _____ mL/hr IV
- ___ Begin _____ at _____ mL/hr IV for insensible losses
- ___ Start Albumin 5% at _____ mL/hr IV ((0.3 – 0.5 x %TBSA x wt in kg) / 24) for 24 hrs

Physician Signature _____

Date/Time _____

MEDCOM FORM 688-RB (TEST) (MCHO) JUL 07

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	Height: _____ Weight (Kg): _____ Diet: _____			

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BURN PATIENT ADMISSION ORDERS (Page 3 of 5)12. IVF (% TBSA \leq 20%): ___ LR ___ NS ___ D5NS ___ D5LR ___ D5 .45NS ___ + KCl 20 meq/L @ ___ mL/hr**13. Laboratory Studies & Radiology**

13.1 ___ CBC, Chem-7, Ca/Mg/Phos: ___ ON ADMIT ___ DAILY @ 0300

13.2 ___ PT/INR ___ TEG ___ Lactate: ___ ON ADMIT ___ DAILY @ 0300

13.3 ___ LFTs ___ Amylase ___ Lipase: ___ ON ADMIT ___ DAILY @ 0300

13.4 ___ ABG: ___ ON ADMIT ___ 30 mins after ventilator change ___ Q AM (while on ventilator)

13.5 ___ Triglyceride levels after 48 hours on Propofol

13.6 ___ Portable AP CXR on admission

13.7 ___ Portable AP CXR Q AM

14. Prophylaxis

14.1 ___ Protonix 40 mg IV Q day

14.2 ___ Lovenox 30 mg SQ BID OR ___ Heparin 5000 U SQ BID starting _____

14.3 ___ Pneumatic compression boots

15. Ventilator Settings

15.1 Mode: ___ SIMV ___ CMV ___ AC ___ CPAP

15.2 FiO₂: ___ %

15.3 Rate: ___

15.4 Tidal Volume: ___ cc

15.5 PEEP: ___

15.6 Pressure Support: ___

15.7 Insp Pressure: ___

15.8 I/E Ratio: ___

15.9 ___ APRV: Phi ___ Plow ___ Thi ___ Tlow ___ FiO₂: ___ %

15.10 ___ Maintain patient in soft restraints while on ventilator

15.11 ___ Wean FiO₂ to keep SpO₂ > 92% or PaO₂ > 70 mm Hg

15.12 ___ Nebulizer/MDIs: ___ Albuterol ___ Atrovent ___ Xopenex Unit Dose Q 4 hrs

Physician Signature _____ Date/Time _____

MEDCOM FORM 688-RB (TEST) (MCHO) JUL 07

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	Height: _____ Weight (Kg): _____ Diet: _____

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DATE / TIME ORDERS

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BURN PATIENT ADMISSION ORDERS (Page 4 of 5)

16. Analgesia/Sedation/PRN Medications

- 16.1 ____ Propofol gtt at ____ mcg/kg/min, titrate up to 80 mcg/kg/min for SAS 3-4.
- 16.2 ____ Versed gtt at ____ mg/hr, titrate up to 10 mg/hr for SAS 3-4; may give 2-5 mg IVP Q 15 minutes for acute agitation or burn wound care.
- 16.3 ____ Ativan gtt at ____ mg/hr, titrate up to 15 mg/hr for SAS 3-4; may give 1-4 mg IVP Q 2-4 hours for acute agitation.
- 16.4 ____ Fentanyl gtt at ____ mcg/kg/hr, titrate up to 250 mcg/kg/hr; for analgesia may give 25-100 mcg IVP Q 15 minutes for acute pain or burn wound care.
- 16.5 ____ Morphine gtt at ____ mg/hr, titrate up to 10 mg/hr, for analgesia may give 2-10 mg IVP Q 15 minutes for pain or burn wound care
- 16.6 Important: Hold continuous IV analgesia/sedation at 0600 hrs for a SAS \geq 4. If further analgesia/sedation is indicated, start medications at $\frac{1}{2}$ of previous dose and titrate for a SAS 3-4.
- 16.7 ____ Morphine 1-5 mg IV Q 15 minutes prn pain
- 16.8 ____ Fentanyl 25-100 mcg IV Q 15 minutes prn pain
- 16.9 ____ Ativan 1-5 mg IV Q 2-4 hrs prn agitation
- 16.10 ____ Percocet 1-2 tablets po Q 4 hrs prn pain
- 16.11 ____ Motrin 800 mg po TID prn pain
- 16.12 ____ Toradol 30 mg IV loading dose, then 15 mg IV Q 8 hrs for 48 hours
- 16.13 ____ Tylenol ____ mg / Gm PO / NGT / PR Q ____ hrs PRN for fever or pain
- 16.14 ____ Morphine PCA: Program (circle one): 1 2 3 4
- 16.15 ____ Zofran 4-8 mg IVP Q 4 hrs PRN for nausea/vomiting
- 16.16 ____ Dulcolax 5 mg PO / PR Q day PRN for constipation

17. Specific Burn Wound Care

- 17.1 Cleanse and debride facial burn wounds with Sterile Water or (0.9% NaCl) Normal Saline Q 12 hrs, use a washcloth or 4x4s to remove drainage/eschar
- 17.2 Cleanse and debride trunk and extremities with chlorhexidine gluconate 4% solution (Hibiclens) and Sterile Water or Normal Saline, before prescribed dressing changes
- 17.3 Change fasciotomy dressings and outer gauze dressings daily and as needed; moisten with sterile water Q 6 hours and as needed to keep damp, not soaking wet

Physician Signature _____

Date/Time _____

MEDCOM FORM 688-RB (TEST) (MCHO) JUL 07

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	Diagnosis:			
	Allergies and reaction:			
	Height: _____			
	Weight (Kg): _____			
	Diet: _____			

MEDICAL RECORD – PROVIDER ORDERS

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BURN PATIENT ADMISSION ORDERS (Page 5 of 5)

17. Specific Burn Wound Care (continued)

Face & Ears

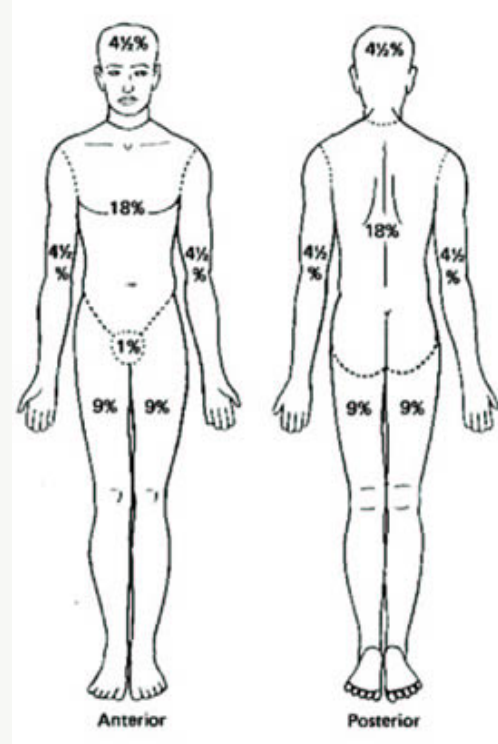
- ___ Bacitracin ointment BID & PRN
- ___ Sulfamylon cream to ears BID & PRN
- ___ 5% Sulfamylon solution dressing changes Q AM & wet downs Q 6 hrs
- ___ Bacitracin ophth ointment: apply OU Q 6 hrs

BUEs & Hands, BLEs, Chest, Abdomen & Perineum

- ___ Silvadine cream Q AM & PRN (*deep partial & full thickness*)
- ___ Sulfamylon cream Q PM & PRN (*deep partial & full thickness*)
- ___ 5% Sulfamylon solution - change Q AM & wet downs Q 6 hrs (*superficial partial thickness, perineal burn wounds, or Pt O/C to OR/AE*)
- ___ Silverlon dressing & Sterile Water wet downs Q 6 hrs (apply dressing and DO NOT remove for 72 hrs)

Back

- ___ Silvadine cream Q AM & PRN (*deep partial & full thickness*)
- ___ Sulfamylon cream Q PM & PRN (*deep partial & full thickness*)
- ___ 5% Sulfamylon powder dressing changes Q AM & wet downs Q 6 hrs (*superficial partial thickness, Pt O/C to OR/AE*)



18. Other Orders

- 18.1 _____
- 18.2 _____
- 18.3 _____

19. Notify Physician if: SBP < _____, MAP < _____, HR < _____ or > _____, SaO₂ < _____%, T > _____, UOP < 30 mL for 2 consecutive hours

Physician Signature _____ Date/Time _____

MEDCOM FORM 688-RB (TEST) (MCHO) JUL 07

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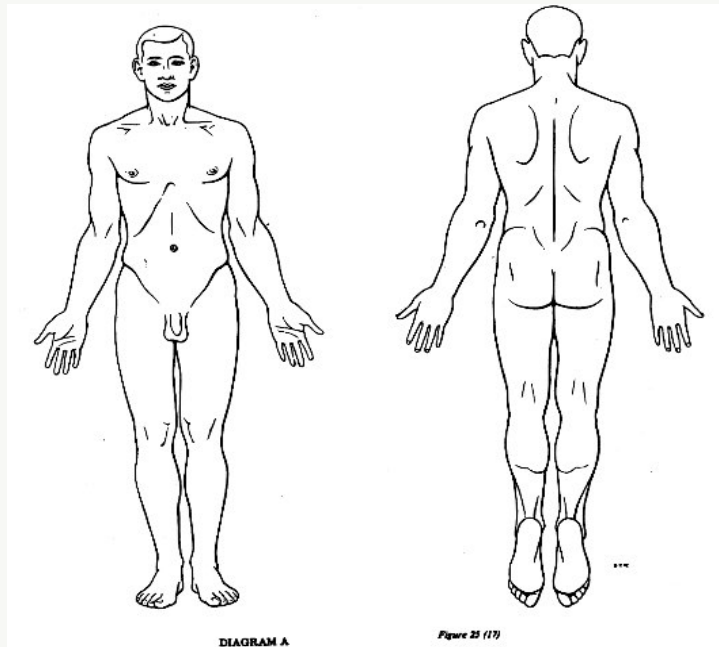
MC V2.00

PATIENT IDENTIFICATION (For typed or written entries note: Name – last, first, middle initial; grade; DOB; hospital or medical facility)	Nursing Unit	Room No.	Bed No.	Page No.
	Complete the following information on page 1 of provided orders only. Note any changes on subsequent pages.			
	Diagnosis:			
	Allergies and reaction:			
	Height: _____ Weight (Kg): _____ Diet: _____			

BURN ESTIMATE AND DIAGRAM

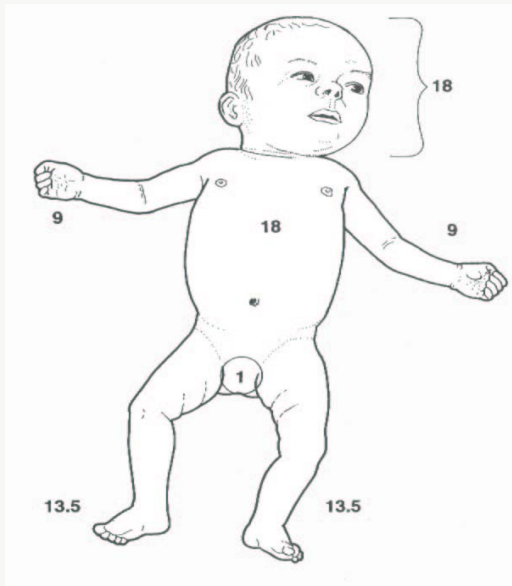
Total Area front/back (circumferential)							
		one side-- anterior	one side-- posterior				
	Adult	adult	adult	1st	2nd	3rd	TBSA
Head	7	3.5	3.5				0
Neck	2	1	1				0
Anterior trunk*	13	13	0				0
Posterior trunk*	13	0	13				0
Right buttock	2.5	na	2.5				0
Left buttock	2.5	na	2.5				0
Genitalia	1	1	na				0
Right upper arm	4	2	2				0
Left upper arm	4	2	2				0
Right lower arm	3	1.5	1.5				0
Left lower arm	3	1.5	1.5				0
Right hand	2.5	1.25	1.25				0
Left hand	2.5	1.25	1.25				0
Right thigh	9.5	4.75	4.75				0
Left thigh	9.5	4.75	4.75				0
Right leg	7	3.5	3.5				0
Left leg	7	3.5	3.5				0
Right foot	3.5	1.75	1.75				0
Left foot	3.5	1.75	1.75				0
	100	48	52	0	0	0	0

Age: _____
Sex: _____
Weight: _____



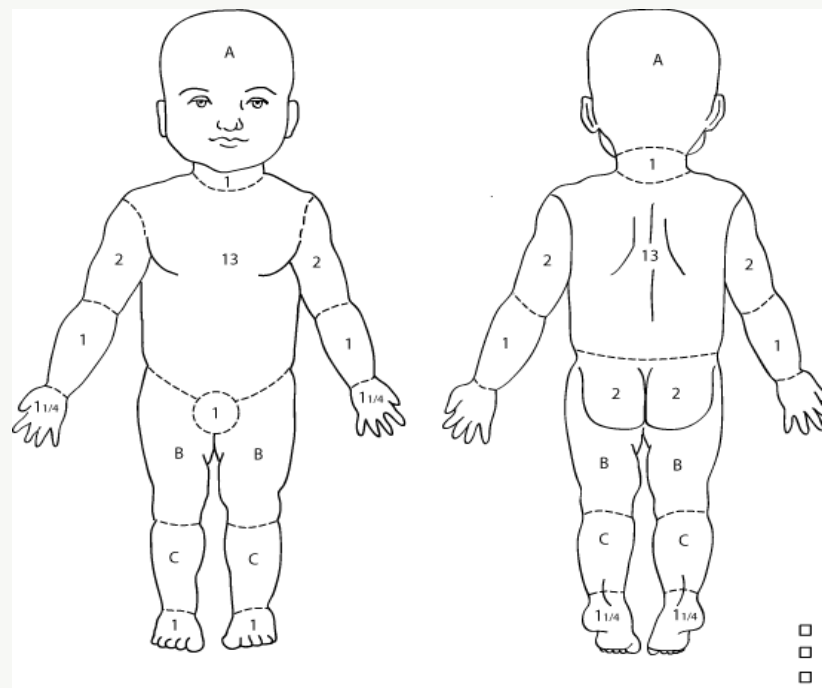
BABY BURN ESTIMATE AND DIAGRAM

Total Area					
front/back	Birth to1				
(circumferenti	year	1st	2nd	3rd	TBSA
Head	19				0
Neck	2				0
Anterior trunk*	13				0
Posterior trunk	13				0
Right buttock	2.5				0
Left buttock	2.5				0
Genitalia	1				0
Right upper arm	4				0
Left upper arm	4				0
Right lower arm	3				0
Left lower arm	3				0
Right hand	2.5				0
Left hand	2.5				0
Right thigh	5.5				0
Left thigh	5.5				0
Right leg	5				0
Left leg	5				0
Right foot	3.5				0
Left foot	3.5				0



CHILD BURN ESTIMATE AND DIAGRAM

Total Area front/back (circumferential)	1 to 4 years	5 to 9 years	10 to 14 years	15 years	1st	2nd	3rd	TBSA
Head	17	13	11	9				0
Neck	2	2	2	2				0
Anterior trunk*	13	13	13	13				0
Posterior trunk*	13	13	13	13				0
Right buttock	2.5	2.5	2.5	2.5				0
Left buttock	2.5	2.5	2.5	2.5				0
Genitalia	1	1	1	1				0
Right upper arm	4	4	4	4				0
Left upper arm	4	4	4	4				0
Right lower arm	3	3	3	3				0
Left lower arm	3	3	3	3				0
Right hand	2.5	2.5	2.5	2.5				0
Left hand	2.5	2.5	2.5	2.5				0
Right thigh	6.5	8	8.5	9				0
Left thigh	6.5	8	8.5	9				0
Right leg	5	5.5	6	6.5				0
Left leg	5	5.5	6	6.5				0
Right foot	3.5	3.5	3.5	3.5				0
Left foot	3.5	3.5	3.5	3.5				0



JTTS Burn Resuscitation Flow Sheet Protocol

Purpose: The JTTS Burn Resuscitation Flow Sheet provides clinicians with a tool to track burn resuscitation over a 72-hour period. Conceptually, the flow sheet creates a continuum between clinicians during the resuscitation phase. This format allows clinicians to accurately trend intake and output, hemodynamics and vasoactive medications, and promotes optimal outcomes through precise patient management.

- I. The clinicians at the first medical facility where the patient receives treatment will initiate the JTTS Burn Resuscitation Flow Sheet. This treatment facility will be listed in the “Initial Treatment Facility” block. Clinicians at any level of care may initiate the flow sheet.
- II. Record today’s date in the “Date” block according to the current date where the recorder is located (do not adjust this date based on the patient’s origin or destination; use the local date).
- III. Record the patient’s full name and social security number in the “Name” and “SSN” blocks. Document name and SSN on all three pages of the flow sheet.
- IV. Record the patient’s weight in the “Pre-burn est. wt (kg)” block. In theater, record the estimated weight based on the patient’s weight prior to injury or “dry weight.” If a patient presents prior to initiating resuscitation and an accurate weight can be easily obtained without delaying care, providers are urged to weigh the patient and record the result.
- V. Record the total body surface area burned in the “% TBSA” block. Clinicians will assess the burn size and use this value to determine fluid resuscitation requirements. Following the patient’s transfer to another facility, the receiving clinicians are required to “re-map” the burn, considering that burn wound may “convert” between assessments at one facility or during transport between two facilities.
- VI. Burn Fluid Resuscitation Calculations: Use the ABLS guidelines to determine fluid requirements for the first 24 hours post-burn. At 8-12 hours post-burn, reevaluate resuscitation efforts and recalculate fluid resuscitation needs. If fluid resuscitation needs exceed ABLS formula calculations,

consider the guidelines established in the *Emergency War Surgery* handbook and the addendum to the handbook, “Recommendations for Level IV Burn Care.” [LRMC specific: USAISR/BAMC Burn Unit Guidelines can also be found in the *LRMC Burn Care Guide*]

- a. Clinicians at the first medical facility to treat the patient will calculate the fluid requirements for the first 24 hours post-burn and record the amount in the block on page 1 labeled “Estimated fluid vol. pt should receive.”
 - b. Clinicians will record the “fluid volume ACTUALLY received” during the first 24 hours of resuscitation in the block labeled as such at the top of page 2. This amount will equal the actual volume delivered during the first 24 hours (as recorded on page 1).
 - c. Clinicians will transcribe the 24-hour fluid volume totals recorded on pages 1 and 2 of the flow sheet onto page 3 in the block labeled “fluid volume ACTUALLY received.” This allows clinicians to see the first 48-hour totals as the patient enters into the last 24 hours of the 72-hour period.
- VII. Record the local date and time that the patient was injured in the “Date & Time of Injury” block. This date and time IS NOT the time that the patient arrived at the medical facility, but rather the date and time of INJURY.
 - VIII. Record the facility name and/or treatment team in the “Tx Site/Team” block. The facility name/team name is the team of clinicians who managed the patient during each specified hour on the flow sheet. This team may reside within a facility, in which case the facility name is recorded, or be a transport team (e.g., Medevac, CCATT, Aerovac).
 - IX. “Hr from burn” is defined as the number of hours after the burn injury occurred. If a patient does not arrive at a medical facility until 3 hours after the burn occurred, clinicians do not record hourly values for hours 1-3 but begin recording in the row marked “4th” hour post-burn. To the extent possible, clinicians should confer with level I and II clinicians to determine fluid intake and urine output. These totals may be recorded in the 3rd hour row.

- X. Record the current local time of the recorder in the “Local Time” block, be it Baghdad Time, Berlin Time, ZULU, or CST. As with date, do not adjust this time based on the patient’s origin or destination; use the local time.
- XI. Record the total volume of crystalloids and colloids administered in the “crystalloid/colloid” column, not the specific fluids delivered. Clinicians should refer to the critical care flow sheet to determine the fluid types and volumes. This burn flow sheet is designed to track total volumes. Examples of crystalloid solutions are LR, 0.45% NS, 0.9% NS, D5W, and D5LR. Examples of colloids are Albumin (5% or 25%), blood products, and other volume expanders such as dextran, hespan, or hexend.
- XII. Document the name, dosage, and rate of vasoactive agents in the “Pressors” block. Patients who receive vasoactive agents may also have invasive pressure monitoring devices (e.g., arterial line, central venous line, pulmonary artery catheter), in which case significant values should be recorded in the “BP” and “MAP (>55)/CVP” columns
- XIII. For additional burn resuscitation guidelines refer to the *Emergency War Surgery* handbook and the “Recommendations for Level IV Burn Care.”

Burn Flow Sheet Documentation

JTTS Burn Resuscitation Flow Sheet							Page 1
Date:	[1]	Initial Treatment Facility:					[2]
Name		SSN	Pre-burn est. wt (kg)	% TBSA	Estimated fluid vol. pt should receive		
	[3]	[4]	[5]	[6]	1st 8 hrs	2nd 16th hrs	Est. Total 24 hrs
					[7]	[8]	[9]
Date & Time of Injury	[10]		BAMC/ISR Burn Team DSN 312-429-2876				

Tx Site/Team	HR from burn	Local Time	Crystalloid (mL)	Colloid	TOTAL	UOP	Base Deficit	BP	MAP (>55)	CVP	Pressors (Vasopressin 0.02-0.04 u/min)
	1st										
	2nd										
	3rd										
	4th										
	5th										
	6th										
	7th										
	8th										
	9th										
	10th										
	11th										
	12th										
	Total Fluids 1st 12 hrs		[21]								
	13th										
	14th										
	15th										
	16th										
	17th										
	18th										
	19th										
	20th										
	21st										
	22nd										
	23rd										
	24th										
	Total Fluids:		[22]								

Pre-burn Est. Wt (kg)	%TBSA	Fluid Volume ACTUALLY received		
		1st 8 hrs	2nd 16th hrs	24 hr Total
		[a]	[b]	[c]

Page 2 (24-48 hrs)

The guidelines for page 2 remain the same as for page 1, with the exception of the calculation table. On page 2, the values in [a] and [c] are the **actual** volumes delivered and recorded from page 1, blocks 21 & 22. [b] is the **actual** volume delivered from the 9th hour through the 24th hour. These values allow caregivers to re-calculate the mL/kg/% TBSA, and evaluate for over-resuscitation

Pre-burn Est. Wt (kg)	%TBSA	Fluid Volume ACTUALLY received		
		1st 24 hrs	2nd 24 hrs	48 hr Total
		[d]	[e]	[f]

Page 3 (48-72 hrs)

The guidelines for page 3 remain the same as for pages 1 & 2, with the exception of the calculation table. On page 3, the values in [d] and [e] are the **actual** 24 hour fluid totals recorded from pages 1 & 2. [f] is the **total** volume delivered over the first 48 hrs ([d] + [e]). Once again, these values allow caregivers to re-calculate the mL/kg/% TBSA, and evaluate for over-resuscitation

- [1] **Date:** Today's date
- [2] **Initial Treatment Facility:** Where this form is initiated
- [3] **Name:** Patient's name
- [4] **SSN:** Patient's social security number
- [5] **Weight (Kg):** Estimated weight PRE-BURN "dry weight"
- [6] **% TBSA:** Total body surface area burned
- [7] **1st 8 Hrs:** ½ total calculated fluids per burn resuscitative formula (ABLS), given over 1st 8 hrs post-burn
- [8] **2nd 16 Hrs:** Remaining ½ of the calculated fluids over next 16 hrs
- [9] **Estimated Total Fluids:** Total fluids calculated for the 24 hrs post-burn injury
- [10] **Time of Injury:** Time the patient burned, **NOT** the time patient arrived at the facility
- [11] **Treatment (Tx) Site/Team:** Facility, CCATT or care providing care at specified hour
- [12] **Hour From Burn:** "1st" hour is the first hour post burn example: pt arrives @ facility 3 hrs post-burn. Clinicians v start their charting for the "4th" hour. Enter IVF & UOP to from level I & II care, prior to arrival at the current facility the "3rd" hour row.
- [13] **Local Time:** Current time being used by recorder
- [14a] **Crystalloid (mL):** Total crystalloid volume given over hour (LR, NS, etc.)
- [14b] **Colloid (mL):** Total colloid volume given over the 1st hour (Albumin 5%-25%, blood products, Hespan, etc.) **No when using Albumin:** With large resuscitations, start 5% Albumin at the 12 hour mark; with normal resuscitations, start at the 24 hour mark.
- [15] **Total:** Total volume (crystalloid + colloid) for the hour
- [16] **UOP:** Urine output for last hour
- [17] **Base Deficit:** enter lab value, if avail. (indicates acidosis)
- [18] **BP:** Systolic BP / Diastolic BP
- [19] **MAP/CVP:** MAP and/or CVP if available.
- [20] **Pressors:** Vasopressin, Levophed, etc., and rate/dose
- [21] **12-hr Total:** Total IVF & UOP for 1st 12 hours post-burn
- [22] **24-hr Total:** Total IVF & UOP for 1st 24 hours post-burn

MANAGEMENT OF PATIENTS WITH SEVERE HEAD TRAUMA



Severely head injured patients are those comatose patients with Glasgow Coma Scores (GCS) of 3 to 8. The current Coalition referral center for patients with severe head injuries is the 332nd EMDG in Balad. All severely head injured Coalition and civilian patients are referred to Balad for definitive neurosurgical care. Several trends have been observed since 2003, warranting the standardization of care for these patients. The mortality of American service members with severe head injuries is 30% for GCS 3–5 and 10% for GCS 6–8. Of these survivors, progression to independent living in the United States is 30% for GCS 3–5 and 60% for GCS 6–8. These excellent outcomes are achieved through rapid evacuation from the battlefield, timely neurosurgical intervention, meticulous critical care, and team rehabilitation that often continues for months. On the contrary, many Iraqi patients cannot be afforded even basic critical care and rehabilitation. During the past four years, approximately 90% of severely head injured patients treated in Balad are Iraqi Nationals. After resuscitative surgery and initial critical care, all comatose Iraqi patients are transported to Baghdad. Those with isolated head injuries are treated at the “CNS” hospital. Those with multi-system injuries are treated at “Medical City.” Personal communication with staff neurosurgeons at

these facilities confirms that patients who fail to quickly recover to independent or minimally-assisted living will not be aggressively treated. Given this standard of care, all Coalition patients with GCS 3–8 and Iraqi patients with GCS 6–8 should be referred to Balad for definitive neurosurgical care. Transfer of Iraqi patients with GCS 3–5 is optional, as these patients are likely to be treated expectantly.

RECOMMENDATIONS

1. Always address immediate life-threatening injuries and begin resuscitation using ATLS protocols.
 - a. Normal saline is the preferred crystalloid solution.
 - b. Blood products are preferred over albumin and hespan if colloids are necessary.
 - c. Consider recombinant Factor VIIa for life threatening intracranial bleeding.
 - d. Consider hyperventilation (goal PaCO₂ 30–35 mm Hg) to decrease ICP.
 - e. Antibiotics are unnecessary for isolated closed head injuries. Patients with open head injuries should receive 2 grams (child 50 mg/kg) cefazolin (Ancef) IV on admission and every 8 hours until wounds are closed.
 - f. Steroids provide no benefit to head injured patients.
2. Two most important factors to manage:
 - a. Hypotension: keep SBP > 90 mm Hg.
 - b. Hypoxemia: keep SpO₂ Sat > 93%.
3. Document neurological examinations. These should include:
 - a. Glasgow Coma Score (GCS).
 - b. Size and reactivity of pupils.
 - c. Presence of gross unilateral weakness, paraplegia, or quadriplegia.
 - d. Interval changes while at your facility.
4. Neurosurgeons in Balad prefer to examine patients when they arrive. Avoid medications which cause long lasting sedation or paralysis.

Note: at no time should these preferences override the need for safe transport

- a. Vecuronium (Norcuron) 5–10 mg (child 0.1 mg/kg) IV is preferred for paralysis. Avoid redosing within one hour of arrival in Balad.

JTTS Clinical Practice Guideline For Severe Head Trauma

MONITORING & LAB EVALUATION		INDICATIONS & GUIDELINES	
INTRACRANIAL PRESSURE (ICP)		Glasgow Coma Score 8 or less.	
ARTERIAL LINE		Any head trauma that requires tracheal intubation or other definitive airway.	
CENTRAL VENOUS PRESSURE		When ICP or CPP management requires mannitol (Osmitrol) or hypertonic saline.	
NEUROIMAGING		Non-contrast head CT upon admission then at 6-24 hours after admission.	
EEG		Continuously when barbiturates are employed to manage ICP.	
LABS		ABG, CBC, Chem 10, PT, PTT, and INR <i>at least</i> q12 hrs during the first 48 hours of care.	
GENERAL MANAGEMENT PRINCIPLES			
PHILOSOPHY		<ul style="list-style-type: none">• Maintain continuous communication between the care teams.• Aggressively avoid hypotension, hypoxemia, fever, and hyponatremia.• Remember, the longer the ICP is elevated and the MAP/CPP are low, the worse the outcome.	
RESUSCITATION FLUID		Prefer Normal Saline. (Beware of iatrogenic, hyperchloremic acidosis)	
MAINTENANCE FLUID		Prefer Normal Saline 1 cc/kg/hr. (Child use 4/2/1 rule X 80%)	
SEDATION		<ul style="list-style-type: none">• Prefer propofol (Diprivan) 10-50 mcg/kg/min IV.• Consider other short-acting agents such as fentanyl (Sublimaze) 1 mcg/kg/hr IV or midazolam (Versed) 1-2 mg/hr IV.	
ULCER PROPHYLAXIS		<ul style="list-style-type: none">• All patients should receive pantoprazole (Protonix) 40 mg QD.• Child dosing for pantoprazole (Protonix) is 1 mg/kg to maximum of 40 mg QD.	
DVT PROPHYLAXIS		<ul style="list-style-type: none">• Pneumatic stockings for all adults.• Consider enoxaparin (Lovenox) 30 mg SC bid 24 hours after injury.• DVT Prophylaxis is not indicated in children (age < 16 yrs).	
SEIZURE PROPHYLAXIS		<ul style="list-style-type: none">• For all patients with injuries penetrating the cortex or blunt injuries with abnormal CT.• Minimum treatment 7 days.• Fosphenytoin (Cerebyx) loading dose: 18 mg/kg IV over 10 minutes. Adult maintenance: 100 mg q8h (child 2 mg/kg q8h). Therapeutic level: 10-20 µg/ml: [Phy corrected] = [Phy measured]/(0.2 x [albumin]) + 0.1.• Phenytoin (Dilantin) causes irritation of peripheral veins; run IV bolus over 20 minutes.	
ANTIBIOTICS		Cefazolin (Ancef) 1 gm IV (child 25 mg/kg) q8h X 5 days for all open injuries.	
NURSING		Assess neurologic status hourly; document ICP/CPP ventriculostomy output.	
STEROIDS		<ul style="list-style-type: none">• Steroids are <i>not</i> recommended for head trauma.• High dose methylprednisolone (Solu-Medrol) is contraindicated in penetrating injuries.• Consider methylprednisolone (Solu-Medrol) in blunt trauma with incomplete cervical spinal cord injuries. This protocol is not recommended for thoracic and lumbar trauma.• The protocol for methylprednisolone (Solu-Medrol) is 30 mg/kg bolus IV, then 5.4 mg/kg/hr.	
NUTRITION		≈140% of basal energy expenditure by seventh day post injury. Give 15% of calories as protein.	
GENERAL MEDICAL MANAGEMENT GOALS			
NEUROLOGIC	Intracranial Pressure (ICP)	< 20 mm Hg	See page 2
	Cerebral Perfusion Pressure (CPP)	> 60 mm Hg	

HEMODYNAMIC	Mean arterial pressure (MAP)	Maintain CPP	<ul style="list-style-type: none">• Hypotension (SBP < 90 mm Hg) worsens mortality and outcome• Provide a rapid physiologic resuscitation utilizing Normal Saline, Hypertonic Saline, or colloids.
	Central venous pressure (CVP)	> 5 mm Hg	
	Cardiac index (CI)	> 2.5L/m/m²	
PULMONARY	Oxygen saturation (SpO₂ %)	> 93%	Aggressively avoid hypoxemia
	PaCO₂	30-35 mm Hg	First 24-48 hours of care
HEMATOLOGIC	INR	< 1.5	Transfuse fresh frozen plasma
Consider titrating components using thromboelastography (TEG)	Platelets	> 100,000/mm³	Transfuse platelets
	Hemoglobin	> 10 g/dL	Transfuse packed red blood cells
METABOLIC	Glucose	> 80 & < 150 mg/dl	Have low threshold for insulin drip
RENAL	Serum osmolality	> 280 & < 320 mOsm	<ul style="list-style-type: none">• sOsm = (2 x Na) + (Glucose/18) + (BUN/2.8)• See sodium disorders on page 2
	Serum sodium	> 135 & < 150 mEq/L	
INTRACRANIAL PRESSURE MANAGEMENT			
GENERAL MEASURES	Keep head in neutral position, avoid of tight cervical collars and circumferential ETT ties, elevate the head of the bed to 30-60 degrees.		
SEDATION	<ul style="list-style-type: none">• Propofol (Diprivan) preferred during first 72 hours (see above for dosing).• Confirm level of sedation when intracranial pressure increases.		
TEMPERATURE	Consider cooling measures (Tylenol, cooling blanket) even for <i>modest</i> temperature elevations (100-101° F).		
INTRACRANIAL HYPERTENSION MANAGEMENT	<ul style="list-style-type: none">• Treat elevations ≥ 20 mm Hg sustained for > 5 minutes.• Always consider repeat CT scan with ICP elevations refractory to medical therapy.		
TITRATE TO EFFECT GOAL: ICP < 20 mmHg	1. Deep sedation/analgesia	Propofol/fentanyl/midazolam (see above for dosing).	
	2. Chemical paralysis	Cisatracurium (Vecuronium): Loading dose 0.2 mg/kg IV. Maintenance infusion 1-3 mcg/kg/hr IV.	
	3. Modest hyperventilation	<ul style="list-style-type: none">• PaCO₂ 30-35 mmHg during evaluation or evacuation.• Discontinue after 24-48 hours.	
	4. Hypertonic saline	<ul style="list-style-type: none">• Recommended during the first 24-48 hours.• 3% NS 250-500 cc bolus over 15 minutes (child 5 cc/kg).• 3% NS infusion 40 cc/hr (child 0.5 cc/kg/hr).	
	5. Mannitol	<ul style="list-style-type: none">• Avoid in dehydration and hypotension.• 1 gm/kg IV fast push, then 0.25 gm/kg push q4h.	
	6. Ventricular drainage	When open, ventriculostomy may drain as much as 10-20 cc/hr.	
	7. Decompressive craniectomy	Discuss indications with neurosurgeon on call.	
CEREBRAL PERFUSION PRESSURE MANAGEMENT (CPP = MAP – ICP)			
GOAL > 60 mm Hg	1. Ensure euvolemia	Utilize endpoints of resuscitation (exam, vital signs, urine output, CVP, PCWP, CI).	
	2. Control the ICP	Beware of mannitol use in hypovolemic patients.	
	3. Consider pressors	Dopamine preferred, 0.5 mcg/kg/min IV.	
ACUTE CLINICAL DETERIORATION (e.g. Mental status change, unilateral dilated pupil, new focal neurological deficit, progressive or refractory ICP elevation)			
1. Confirm level of sedation	UNCAL HERNIATION SYNDROME (Commonly seen in head trauma) <ul style="list-style-type: none">• Unilateral dilating pupil → progression to fixed and dilated• Altered mental status → progression to comatose• Contralateral babinski → contralateral weakness → bilateral flexor or extensor posturing• Tachycardia/hypertension → bradycardia/hypertension → bradycardia/hypotension		
2. Verify oxygenation and ventilation			
3. Hyperventilate bag with 100% O₂; goal PaCO₂ 20-30 mmHg			
4. Re-bolus 3% saline or mannitol			
5. Repeat CT/call neurosurgery			
6. Consider damage control crani			

GLASGOW COMA SCORE	Eye Opening	Best Verbal Effort	Best Motor Effort
1	None	None	No response to pain
2	To Pain	Nonspecific sounds	Extensor posturing
3	To verbal stimuli	Inappropriate words	Flexor posturing
4	Spontaneously	Confused	Withdraws to pain
5	-	Oriented	Localizes pain
6	-	-	Follows commands
COMMON SODIUM DISORDERS SEEN IN HEAD TRAUMA			
Disorder	Na+	Diagnostic Clues	Treatment
SIADH	↓	Low S _{osm} , usually euolemic, ↑ U _{osm}	Restrict free water, administer hypertonic saline if severe
Cerebral salt wasting	↓	S _{osm} may be normal, ↑ UOP, signs of volume depletion & hemoconcentration, very high U Na	Replace volume with Normal Saline or hypertonic saline. Administer oral sodium. Beware of rapid sodium correction.
Mannitol use	↑	Polyuria, ↑ [Na ⁺] & S _{osm}	Hold mannitol if S _{osm} > 320.
Diabetes Insipidus	↑	Polyuria (> 250 cc/hr), ↑ [Na ⁺] & S _{osm} , U Sp Gr <1.005	DDAVP ≈ 2-4 µg SQ bid.
BRAIN DEATH DETERMINATION – Adhere to separate “Guidelines for Diagnosing Brain Death.”			

- b. Propofol (Diprivan) 5–10 mcg/kg/min IV is preferred for sedation.
 - c. Intermittent administration of narcotics is preferred over continuous intravenous drips for pain control.
5. If therapy for intracranial hypertension is needed prior to transfer:
 - a. Consider 23% NS 30 cc one time bolus IV over 15 minutes (child 0.5 cc/kg).
 - b. If 23% sodium chloride is unavailable, consider 3% NS 250-500 cc IV bolus (child 5 cc/kg) followed by continuous infusion 40 cc/h (child 5 cc/kg/hr).
 - c. If signs of herniation or severe edema are present, consider Mannitol 1 g/kg bolus IV, followed by 0.5 g/kg rapid IV push q4h.
 6. Antiepileptic medications for seizure prophylaxis:
 - a. Consider for all patients with intracranial hemorrhage, penetrating brain injury, seizure following the injury, or GCS 3–8.
 - b. Fosphenytoin (Cerebyx) is the preferred parenteral (IV or IM) medication:
 - i. Adults: load 1 gram IV over 10 minutes, followed by 100 mg IV q8h.
 - ii. Children: load 20 mg/kg over 10 minutes, followed by 2 mg/kg IV q8h.
 - c. Discontinue after 7 days if no penetrating brain injury, no prior seizure history, and no development of seizures since the injury.

Note: do not use mannitol in hypotensive or under-resuscitated patients

DAMAGE CONTROL RESUSCITATION AT LEVELS IIB AND III

The leading cause of potentially preventable death on the battlefield is noncompressible hemorrhage. Following Tactical Combat Casualty Care (TCCC) guidelines, tourniquets and hemostatic dressings are being used by medics to treat compressible hemorrhage, thus truncal bleeding is the unmet problem. At the FST and CSH level many physicians use the standard ATLS guidelines, starting resuscitation with crystalloid, then moving to PRBC and only after liters of these fluids adding plasma. For the severely injured a new method of resuscitation utilizes objective criteria outlined below to initiate rFVIIa, thawed plasma and RBC use in the ED, within minutes of arrival. Crystalloid infusion is extremely limited. rFVIIa has recently shown improved hemostasis (decreasing blood loss by 23%) in combat casualties. Likewise increased use of plasma has recently been shown to improve mortality rates in combat casualties. These products are very safe in trauma patients and are currently in widespread use, both in military and civilian trauma patients. Conversely, excessive crystalloid has resulted in a greater incidence of abdominal compartment syndrome (16% vs 8%), multiple organ failure (22% vs 9%), and death (27% vs 11%) in a large series of civilian trauma patients. Administration of rFVIIa, PRBC, thawed plasma, platelets and cryoprecipitate and fresh whole blood at the FST and CSH, within the confines of the tactical situation, may decrease hemorrhagic morbidity and mortality of casualties with truncal hemorrhage.

ED/EMT RESUSCITATION

rFVIIa and plasma and PRBC (1:1 ratio) are indicated for any one of the following findings:

1. Truncal/axillary/neck or groin bleeding not controlled with tourniquets, HemCon dressings or QuikClot
2. Large soft tissue injuries not controlled with tourniquets, HemCon dressings or QuikClot
3. A proximal amputation or mangled extremity
4. > 1000 cc blood out of a chest tube, or > 200 cc/hr for 4 consecutive hours
5. Physical exam findings:

- a. decreased mental status from injury and shock
 - b. severe head injury
 - c. clinically coagulopathic
6. Objective physical exam or laboratory findings:
 - a. an INR ≥ 1.5
 - b. a base deficit ≥ 6
 - c. a Hgb ≤ 12
 - d. hypothermic from blood loss ($T < 96^{\circ}\text{F}$)
 - e. hypotensive from blood loss (SBP < 90 mm Hg) or a weak/absent radial pulse
 7. Need for fresh whole blood transfusion:
 - a. bilateral proximal amputations
 - b. large hemoperitoneum and significant shock

Casualties with any one of these parameters have > 25% mortality and should be given rFVIIa and RBC:thawed plasma in a 1:1 ratio as soon as possible.

OR RESUSCITATION

Most of the seriously injured casualties that receive hemostatic resuscitation in the ED will require the massive transfusion protocol, outlined in another CPG. In general this calls for coolers of products from the blood bank containing 6 units of PRBC, 6 units of plasma, 6 units of platelets and 10 packs of cryoprecipitate. Again crystalloid resuscitation is minimized, and rFVIIa is given when the INR is > 1.0 . THAM is administered to keep the pH > 7.2 and Ca^{++} is given after every 4 units of PRBC, and/or to keep ionized $\text{Ca}^{++} > 1.0$ (on the ISTAT). The goal of OR resuscitation is to normalize all laboratory parameters, patient temperature, INR and base deficit. The operating room must be kept as warm as possible, usually 108°F . Major resuscitations in the OR (20–40 units) frequently only receive 3–4,000 cc of crystalloid.

ICU RESUSCITATION

Patients treated in the above fashion frequently arrive in the ICU warm (98°F), a base deficit of -3 and an INR of 1. This is after receiving an average of 17 PRBC, 13 plasma, 20 cryoprecipitate, 18 platelets, 7.2 mg rFVIIa and 4 liters crystalloid. Occasionally the patients require ongoing plasma and rFVIIa resuscitation, for an elevated INR and volume deficit. These patients are put on 50 cc/hr of crystalloid and because they are much less edematous than after traditional resuscitation regimens are able to extubate within 10 hours on average.

Dose of rFVIIa:

1. The usual trauma dose is 100 mcg/kg rFVIIa IV push
 - a. this dose can be safely repeated as many as 3–4 times in 20 minute intervals or greater

Route:

1. rFVIIa can be given through an IV or an intra-osseous line.

Contraindications:

1. patient with active cardiac disease

Storage of rFVIIa:

1. Keep rFVIIa refrigerated at 2–8 degrees C/36–46 degrees F prior to reconstitution with sterile H₂O.
2. May store rFVIIa for up to 3 hours at room temperature (15–30 degrees C/59–86 degrees F) after reconstitution. If not maintained at these temperatures, the rFVIIa is rendered inactive.

Plasma:

See separate guidance on use of plasma from Joint Theater Blood Program USCENTCOM/CCSG.

Thawed plasma not used under the precise conditions listed here may cause serious harm to the patient (infection or transfusion reactions); thus, it should be administered only by those trained to do so.

Infuse 250 cc plasma IV or IO after the rFVIIa; this can be by drip or by IV/IO push. No more than two units of un-typed plasma should be administered under these conditions; thus, immediately send blood to lab for typing, as all subsequent transfusions should be done with type-specific plasma where possible.


Storage of Thawed Plasma (see separate guidance on use of plasma from Joint Theater Blood Program USCENTCOM/CCSG)

Plasma not stored under the precise conditions listed here may cause serious harm to the patient (infection or transfusion reactions) and should be properly discarded immediately.

1. FFP can stay thawed (Thawed Plasma) for up to 5 days but it must be relabeled as “Thawed Plasma” complete with a new expiration annotated and stored at 1–6 degrees C.
2. Thawed plasma for emergency use should be type AB or A; **DO NOT** allow more than 2 emergency plasma units to be administered until an ABO forward type or complete ABO type has been performed.
3. Administer plasma through standard blood administration set.
4. Use the HemaCool® Mobile Blood Storage Refrigerator/Freezer* or other refrigeration device to safely store these products (see further information as noted* below).

*HemaCool® Mobile Blood Storage Refrigerator/Freezer Model: HMC-MIL-1. NSN: 4110-01-506-0895
Helmer Rapid Plasma Thawer has a 4 plasma unit model (DH4) and an 8 plasma unit model (DH8). NSN for the DH4 is 6640-01-510-3136. There is no NSN currently for the 8-unit model.

MILITARY ACUTE CONCUSSION EVALUATION (MACE)


**Military Acute Concussion
Evaluation (MACE)**
 Defense and Veterans Brain Injury Center

Patient Name: _____

SS#: _____ Unit: _____

Date of Injury: ____/____/____ Time of Injury: _____

Examiner: _____

Date of Evaluation: ____/____/____ Time of Evaluation: _____

History: (I – VIII)

I. Description of Incident
 Ask:
 a) What happened?
 b) Tell me what you remember.
 c) Were you dazed, confused, "saw stars"? ☐ Yes ☐ No
 d) Did you hit your head? ☐ Yes ☐ No

II. Cause of Injury (Circle all that apply):
 1) Explosion/Blast 4) Fragment
 2) Blunt object 5) Fall
 3) Motor Vehicle Crash 6) Gunshot wound
 7) Other _____

III. Was a helmet worn? ☐ Yes ☐ No Type _____

IV. Amnesia Before: Are there any events just **BEFORE** the injury that are not remembered? (Assess for continuous memory prior to injury)
☐ Yes ☐ No If yes, how long _____


V. Amnesia After: Are there any events just **AFTER** the injuries that are not remembered? (Assess time until continuous memory after the injury)
☐ Yes ☐ No If yes, how long _____

VI. Does the individual report loss of consciousness or "blacking out"? ☐ Yes ☐ No If yes, how long _____

VII. Did anyone observe a period of loss of consciousness or unresponsiveness? ☐ Yes ☐ No If yes, how long _____

VIII. Symptoms (circle all that apply)
 1) Headache 2) Dizziness
 3) Memory Problems 4) Balance problems
 5) Nausea/Vomiting 6) Difficulty Concentrating
 7) Irritability 8) Visual Disturbances
 9) Ringing in the ears 10) Other _____

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**Military Acute Concussion
Evaluation (MACE)**
 Defense and Veterans Brain Injury Center

Examination: (IX – XIII)

Evaluate each domain. Total possible score is 30.

IX. Orientation: (1 point each)

Month:	0	1
Date:	0	1
Day of Week:	0	1
Year:	0	1
Time:	0	1

Orientation Total Score ____/5

X. Immediate Memory:
 Read all 5 words and ask the patient to recall them in any order. Repeat two more times for a total of three trials. (1 point for each correct, total over 3 trials)

List	Trial 1	Trial 2	Trial 3
Elbow	0 1	0 1	0 1
Apple	0 1	0 1	0 1
Carpet	0 1	0 1	0 1
Saddle	0 1	0 1	0 1
Bubble	0 1	0 1	0 1
Trial Score			

Immediate Memory Total Score ____/15

XI. Neurological Screening
 As the clinical condition permits, check
Eyes: pupillary response and tracking
Verbal: speech fluency and word finding
Motor: pronator drift, gait/coordination
 Record any abnormalities. **No points are given for this.**

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Military Acute Concussion Evaluation (MACE)

Defense and Veterans Brain Injury Center

XII. Concentration

Reverse Digits: (go to next string length if correct on first trial.
Stop if incorrect on both trials.) 1 pt. for each string length.

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
7-1-8-4-6-2	5-3-9-1-4-8	0	1

Months in reverse order: (1 pt. for entire sequence correct)
Dec-Nov-Oct-Sep-Aug-Jul-Jun-May-Apr-Mar-Feb-Jan
0 1

Concentration Total Score ____/5

XIII. Delayed Recall (1 pt. each)

Ask the patient to recall the 5 words from the earlier memory test
(Do NOT reread the word list.)

Elbow	0	1
Apple	0	1
Carpet	0	1
Saddle	0	1
Bubble	0	1

Delayed Recall Total Score ____/5

TOTAL SCORE ____/30

Notes: _____

Diagnosis: (circle one or write in diagnoses)

No concussion

850.0 Concussion without Loss of Consciousness (LOC)

850.1 Concussion with Loss of Consciousness (LOC)

Other diagnoses _____

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Military Acute Concussion Evaluation (MACE)

Defense and Veterans Brain Injury Center

Instruction Sheet

Purpose and Use of the MACE

A concussion is a mild traumatic brain injury (TBI). The purpose of the MACE is to evaluate a person in whom a concussion is suspected. The MACE is used to confirm the diagnosis and assess the current clinical status.

Tool Development

The MACE has been extensively reviewed by leading civilian and military experts in the field of concussion assessment and management. While the MACE is not, yet, a validated tool, the examination section is derived from the *Standardized Assessment of Concussion* (SAC) (McCreary, M., Kelly, J. & Randolph, C. (2000). *Standardized Assessment of Concussion* (SAC): *Manual for Administration, Scoring, and Interpretation*. (2nd ed.) Waukesha, WI: Authors.) which is a validated, widely used tool in sports medicine. Abnormalities on the SAC correlate with formal comprehensive neuropsychological testing during the first 48 hours following a concussion.

Who to Evaluate

Any one who was dazed, confused, "saw stars" or lost consciousness, even momentarily, as a result of an explosion/blast, fall, motor vehicle crash, or other event involving abrupt head movement, a direct blow to the head, or other head injury is an appropriate person for evaluation using the MACE.

Evaluation of Concussion

History: (I – VIII)

- I. Ask for a description of the incident that resulted in the injury; how the injury occurred, type of force. Ask questions A – D.
- II. Indicate the cause of injury
- III. Assess for helmet use. Military: Kevlar or ACH (Advanced Combat Helmet). Sports helmet, motorcycle helmet, etc.
- IV – V Determine whether and length of time that the person wasn't registering continuous memory both **prior** to injury and **after** the injury. Approximate the amount of time in seconds, minutes or hours, whichever time increment is most appropriate. For example, if the assessment of the patient yields a possible time of 20 minutes, then 20 minutes should be documented in the "how long?" section.
- VI – VII Determine whether and length of time of **self reported** loss of consciousness (LOC) or **witnessed/observed** LOC. Again, approximate the amount of time in second, minutes or hours, whichever time increment is most appropriate.
- VIII Ask the person to report their experience of each specific symptom since injury.

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Military Acute Concussion Evaluation (MACE)

Defense and Veterans Brain Injury Center

Examination: (IX – XIII)

Standardized Assessment of Concussion (SAC):

Total possible score = 30
Orientation = 5
Immediate Memory = 15
Concentration = 5
Memory Recall = 5

IX Orientation: Assess patients awareness of the accurate time

Ask: WHAT MONTH IS THIS?
WHAT IS THE DATE OR DAY OF THE MONTH?
WHAT DAY OF THE WEEK IS IT?
WHAT YEAR IS IT?
WHAT TIME DO YOU THINK IT IS?

One point for each correct response for a total of 5 possible points. It should be noted that a correct response on time of day must be within 1 hour of the actual time.

X Immediate memory is assessed using a brief repeated list learning test. Read the patient the list of 5 words once and then ask them to repeat it back to you, as many as they can recall in any order. Repeat this procedure 2 more times for a total of 3 trials, even if the patient scores perfectly on the first trial.

Trial 1: I'M GOING TO TEST YOUR MEMORY, I WILL READ YOU A LIST OF WORDS AND WHEN I AM DONE, REPEAT BACK AS MANY WORDS AS YOU CAN REMEMBER, IN ANY ORDER.

Trial 2 & 3: I AM GOING TO REPEAT THAT LIST AGAIN. AGAIN, REPEAT BACK AS MANY AS YOU CAN REMEMBER IN ANY ORDER, EVEN IF YOU SAID THEM BEFORE.

One point is given for each correct answer for a total of 15 possible points.

XI Neurological screening

Eyes: check pupil size and reactivity.
Verbal: notice speech fluency and word finding
Motor: pronator drift- ask patient to lift arms with palms up, ask patient to then close their eyes, assess for either arm to "drift" down. Assess gait and coordination if possible. Document any abnormalities.

No points are given for this section.

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Military Acute Concussion Evaluation (MACE)

Defense and Veterans Brain Injury Center

XII Concentration: Inform the patient:

I'M GOING TO READ YOU A STRING OF NUMBERS AND WHEN I AM FINISHED, REPEAT THEM BACK TO ME BACKWARDS, THAT IS, IN REVERSE ORDER OF HOW I READ THEM TO YOU. FOR EXAMPLE, IF I SAY 7-1-9, YOU WOULD SAY 9-1-7.

If the patient is correct on the first trial of each string length, proceed to the next string length. If incorrect, administer the 2nd trial of the same string length. Proceed to the next string length if correct on the second trial. Discontinue after failure on both trials of the same string length. Total of 4 different string lengths; 1 point for each string length for a total of 4 points.

NOW TELL ME THE MONTHS IN REVERSE ORDER, THAT IS, START WITH DECEMBER AND END IN JANUARY.

1 point if able to recite ALL months in reverse order.
0 points if not able to recite ALL of them in reverse order.

Total possible score for concentration portion: **5**.

XIII Delayed Recall

Assess the patient's ability to retain previously learned information by asking he/she to recall as many words as possible from the initial word list, without having the word list read again for this trial. DO YOU REMEMBER THAT LIST OF WORDS I READ A FEW MINUTES EARLIER? I WANT YOU TO TELL ME AS MANY WORDS FROM THE LIST AS YOU CAN REMEMBER IN ANY ORDER.

One point for each word remembered for a total of 5 possible points.

Total score= Add up from the 4 assessed domains: immediate memory, orientation, concentration and memory recall.

Significance of Scoring

In studies of non-concussed patients, the mean total score was 28. Therefore, a score less than 30 does not imply that a concussion has occurred. Definitive normative data for a "cut-off" score are not available. However, scores below 25 may represent clinically relevant neurocognitive impairment and require further evaluation for the possibility of a more serious brain injury. The scoring system also takes on particular clinical significance during serial assessment where it can be used to document either a decline or an improvement in cognitive functioning.

Diagnosis

Circle the ICD-9 code that corresponds to the evaluation. If loss of consciousness was present, then circle 850.1. If no LOC, then document 850.0. If another diagnosis is made, write it in.

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JTTS CLINICAL PRACTICE GUIDELINES FOR UROLOGIC TRAUMA

MONITORING & LAB EVALUATION	INDICATIONS & GUIDELINES
HEMATURIA	<ul style="list-style-type: none"> During trauma evaluation, place foley catheter unless contra-indicated. Perform RUG first if blood at the meatus, high riding prostate or other evidence urethral injury RUG- Obtain a KUB plain film first, then 14-16 fr foley, primed with contrast to rid air, is placed in the urethra past the balloon. 1-2 cc saline to fill the balloon snugly in the fossa navicularis. A pelvic film in a semi-lateral position is obtained after injecting approximately 30cc of straight contrast (con-ray) under steady, gentle pressure. Study is considered normal only if contrast enters the bladder without any extravastaion. If anterior urethral injury, plan to repair in OR. If posterior urethral injury, attempt to gently place a foley catheter. If unable, then place supra-pubic tube in EMT or in OR. If catheter passes, and gross hematuria noted, proceed with GU diagnostic evaluation for bladder injury or a renal/ureteral source. CT scan with delayed images \pm a CT cystogram is ideal imaging study (see technique description following).
LABS	<ul style="list-style-type: none"> CBC, Chem 10, PT, PTT, UA. Type and Screen or Type and Cross x 4 units.
GENERAL MANAGEMENT PRINCIPLES	
RENAL INJURY Penetrating renal injury = Abdominal exploration	<ul style="list-style-type: none"> Blunt trauma with gross hematuria or microscopic hematuria in a patient with a SBP <90, should be imaged with contrast enhanced CT. <u>Renal Injury Grading</u> Grade 1: Sub-capsular hematoma Grade 2: Small parenchymal laceration Grade 3: Deeper parenchymal laceration without entry into collecting system Grade 4: Laceration into collecting system with extravasation; vascular injury with contained hemorrhage Grade 5: Shattered kidney or renal pedicle avulsion Hemodynamically stable patients can usually be managed without operation. Vascular repair is indicated for salvageable kidneys with renal artery or vein injury. Ureteral stent may need to be placed for persistent urinary extravasation.
RENAL EXPLORATION DURING ABDOMINAL OPERATION	<ul style="list-style-type: none"> Absolute indications: persistent bleeding or expanding/pulsatile hematoma Relative indications: urinary extravasation, nonviable tissue (> 20%), and segmental arterial injury on pre-op study. Urinary extravasation from a grade IV parenchymal laceration or forniceal rupture can be managed nonoperatively in most patients.
RENAL REPAIR AND PARTIAL NEPHRECTOMY PRINCIPLES	<ul style="list-style-type: none"> Complete renal exposure, débridement of nonviable tissue, hemostasis by individual suture ligation of bleeding vessels, watertight closure (absorbable suture), drainage of the collecting system, and coverage/approximation of the parenchymal defect. Perform partial nephrectomy if reconstruction not possible: the collecting system must be closed and the parenchyma covered with omentum. Place ureteral stent for persistent urinary extravasation
NEPHRECTOMY	<ul style="list-style-type: none"> Total nephrectomy is immediately indicated in extensive renal injuries when the patient's life would be threatened by attempted renal repair: vascular control of renal pedicle prior to exploration is paramount. Damage control by packing the wound to control bleeding and attempting to correct metabolic and coagulation abnormalities, with a plan to return for corrective surgery within 24 hours is an option.

JTTS CLINICAL PRACTICE GUIDELINES FOR UROLOGIC TRAUMA

URETERAL INJURIES	<ul style="list-style-type: none"> • Hematuria not universal: a high index of suspicion must be maintained. • Can be diagnosed with IV contrast and a delayed KUB or CT • Middle and upper 1/3 ureteral contusion is treated by excision and ureteroureterostomy: mobilize injured ureter, sparing adventitia widely to prevent devascularization; débride ureter liberally until edges bleed; repair ureter (absorbable suture) under magnification with spatulated, tension-free, stented, watertight anastomosis, and drain. Consider omental interposition to isolate repair. • UPJ avulsion injuries should undergo re-anastomosis of the ureter to the renal pelvis. A stent and drains need to be placed. • Lower 1/3 ureteral injuries should be reimplanted into the bladder. Use a psoas hitch or Boari flap if required.
BLADDER INJURIES	<ul style="list-style-type: none"> • Most patients will present with gross hematuria. If CT is planned for other injuries, a CT cystogram (<i>use DILUTED conray</i>) should be performed. If no CT, obtain a plain film cystogram. (<i>need minimum 300cc to be adequate study</i>) • Cystogram: Obtain scout film. Fill bladder via foley by gravity with at least 350cc contrast (7 cc/kg for pedi). Obtain AP image ± Oblique view. Drain bladder completely and obtain AP image. Many bladder injuries are detected only on the post-drainage film. • Extraperitoneal extravasation of contrast can be managed with foley catheterization alone, unless: bone fragment projecting into the bladder, open pelvic fracture, or rectal perforation. Open repair is indicated in these cases (see below). • Intraperitoneal ruptures require open repair, two-layer closure with absorbable suture and perivesical drain placement. Last, place a large-bore suprapubic catheter and a urethral catheter to maximize bladder drainage of blood and clots.
POSTERIOR URETHRAL INJURIES	<ul style="list-style-type: none"> • Initial Management- Surgeon to attempt foley placement, consider urethrosopic-assisted stenting of the injury with a urethral catheter. • If unable to pass a urethral foley catheter, operatively place an open suprapubic tube. At the time of open s-p tube placement, inspect the bladder to rule out injury.
ANTERIOR URETHRAL INJURIES	<ul style="list-style-type: none"> • Diagnosis- As with posterior urethral injury, a high index of suspicion must be maintained in all patients with blunt or penetrating trauma in the urogenital region, and a RUG should be performed in any case of suspected urethral injury. • Anterior urethral injuries may also be associated with large hematoma or swelling from extravasated urine. In severe trauma, Buck's fascia may be disrupted, resulting in blood and urinary extravasation into the scrotum. • Management- Initial suprapubic urinary diversion is recommended after high-velocity gunshot wounds to the urethra, followed by delayed reconstruction.
EXTERNAL GENITALIA INJURIES	<ul style="list-style-type: none"> • Penis- superficial wounds can be irrigated and closed primarily. Corporal injuries are repaired by approximation of the tunical margins with absorbable sutures. Associated anterior urethral injuries should be closed primarily with a watertight, spatulated, catheter-stented technique and absorbable suture; posterior urethral injuries should be managed in staged fashion with suprapubic catheterization. • Scrotum/Testicle- Diagnosis by physical exam and ultrasound. Equivocal cases should be explored. Explore all testicles with overlying shrapnel on pelvic film or if there is a scrotal laceration and any abnormality on exam. Necrotic testicular tissue should be débrided and the capsule closed with running absorbable suture. In some cases, loss of capsule requires removal of intratesticular tissue to allow closure.

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