

Joint Theater Trauma System Clinical Practice Guideline

BURN CARE

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<input type="checkbox"/> Minor Changes (or)	<input checked="" type="checkbox"/> Changes are substantial and require a thorough reading of this CPG (or)		
<input type="checkbox"/> Significant Changes	Multiple updates on burn care in theater; PI monitoring plan added		

- 1. Goal.** The goal of this CPG is to provide practical, evidence-based, recommendations for optimal care of burn casualties who generally fall into one of two categories: military casualties who most frequently sustain burns related to an explosion and can be rapidly evacuated out of theater for definitive care; and local national patients, often children, who commonly sustain burns from accidents, who present for care at military medical facilities with no possibility of definitive care beyond that provided in theater.
- 2. Background.** Optimal treatment of burn patients is a very labor intensive process which can consume enormous personnel and logistical resources. Despite the best efforts of providers at each level of care, the mortality for burn casualties, who cannot be evacuated out of the combat theater, is significantly higher than that experienced in stateside facilities ([Table 1](#)). Experience among US military treatment facilities in the past 9 years reveals no survivors among local nation casualties in OIF and OEF 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, and can threaten the clinical outcome of non-burn patients. These factors must be considered and are incorporated into this CPG to assist the physician in making patient management decisions unique to the deployment environment. Review of Chapter 28: Burn Trauma in the Emergency War Surgery manual is also recommended. ¹
- 3. First and foremost, remember that burn casualties may have one or more other serious injuries that may be more immediately life threatening than the burn injury.** Perform primary and secondary surveys as for any trauma patient. Avoid becoming distracted by the appearance of burned tissues.
- 4. Burn Patient Admission Orders ([Appendix A](#)) and the JTTS Burn Resuscitation Flow Sheet ([Appendix B](#)) should be utilized for every patient with partial and/or full-thickness burns >20% TBSA, especially if the patient may transfer to another facility.** This simple act greatly facilitates optimal treatment along the continuum of care. ²
- 5. Guidelines for Coalition Casualties Who Can Be Evacuated from Theater.**
 - Assess and protect the airway, noting that emergent intubation is rarely necessary in burn casualties, thereby allowing time to complete the primary survey and prepare for controlled intubation, if and when necessary.
 - When the determination is made to intubate the burn patient, use a large-bore endotracheal tube (ETT), especially if inhalation injury is suspected or noted on bronchoscopy. Size 8 ETT or larger is preferred as the larger ETT tube facilitates subsequent bronchoscopy and pulmonary toilet, and decreases the risk of later airway occlusion due to casts comprised of blood, mucous and debris.

Guideline Only/Not a Substitute for Clinical Judgment

June 2012

Joint Theater Trauma System Clinical Practice Guideline

- c. Secure ETT with cotton umbilical tape which allows for adjustment as edema develops following resuscitation; standard adhesive type ETT holders do not work around burned skin. Consider securing ETT with stainless steel wire secured around pre-molar tooth prior to long range transport, particularly in patients with extensive facial burns.
- d. Calculate the patient's burn size using Lund and Browder chart ([Appendix C](#)). Remember that Superficial (1st degree) burn is not included in the estimation of TBSA used for fluid resuscitation.
- e. Initiate fluid resuscitation using the Rule of Tens (10 mL/hr x %TBSA) for patients with burns involving 15% TBSA or greater. The 'Rule of Tens' offers a simplified method of estimating initial fluid rate for thermal injuries and provides values generally between those calculated by the Modified Brooke Formula and Parkland formula. The Rule of Tens is applied for patients weighing between 40 and 80kg. For patients weighing more than 80 kg, add 100 mL/hr to LR rate for each 10 kg >80 kg.
- f. **Avoid fluid boluses** as additional volume contributes to edema. Preference is given to increasing the rate of intravenous fluids to maintain adequate urine output (UOP).³
- g. **Monitor UOP closely and decrease or increase the LR infusion by approximately 20-25% per hour to maintain a UOP of 30-50 mL/hour**
 - 1) Placement of a Foley-type catheter with calibrated chamber is essential. Burns to the glans or penis are not a contraindication for urinary catheter placement. Suprapubic catheter placement is rarely, if ever, required in burn patients and should be avoided in the presence of abdominal burns.
 - 2) Both Under- and Over-resuscitation can result in serious morbidity and even mortality; patients who receive over 6 mL/kg/%BSA burn in the first 24 hours are susceptible to severe complications including ALI, ARDS, and compartment syndromes of the extremities and/or the abdomen.
- h. Hour-to-hour fluid management is critical, particularly during the first 24 hours. Use the Burn Resuscitation Flow Sheet ([Appendix B](#)) to record both fluid intake and UOP.
- i. Monitor bladder pressure for casualties with large burns (> 40% TBSA) and those who receive a large resuscitation (> 6mL/kg/%TBSA).
- j. **Keep the patient warm.** Burn casualties are at high risk of hypothermia due to loss of skin function, particularly in patients with burn size greater than 20% TBSA.
- k. Whenever possible, **debride burn wounds in the operating room (OR)**, thereby providing a clean, warm environment to both examine the wounds and place sterile dressings. Use chlorhexidine gluconate (Hibiclens[®]) or similar antiseptic cleanser and remove all blistered or sloughing skin. This process may be facilitated with the use of scrub brushes and/or gauze sponges.
- l. **Burns to Head and Face:** Shave and debride face. Ear burns are prone to chondritis. Avoid pressure from ETT ties and apply Sulfamylon[®] cream to ear burns BID; apply Bacitracin ointment to face burns QID.

Guideline Only/Not a Substitute for Clinical Judgment

June 2012

Joint Theater Trauma System Clinical Practice Guideline

- m. If available, consult ophthalmology for all patients with facial burns or corneal injury verified by Wood's lamp exam. Examination for corneal injuries or globe trauma should be done early, before facial edema makes exam more difficult than necessary.
 - 1) Apply Bacitracin ophthalmic ointment to eye lids QID.
 - 2) Apply Erythromycin ophthalmic ointment in the eyes QID.
- n. In patients with circumferential burns of the extremity, consider performing escharotomy early, based upon pulse exam. Consider fasciotomy if pulses remain undetectable after escharotomy.
- o. Wrap burns on scalp, trunk, neck, and extremities in sterile gauze (Kerlix[®] or similar) soaked with 5% Sulfamylon[®] solution. Moisten dressings TID and as needed to keep dressings lightly moist or damp, but not so wet to prevent maceration.
- p. Alternatively, burns may be dressed with silver nylon dressings (e.g. Silverlon[®], SilverSeal[®]) covered with sterile gauze, moistened with sterile water. One of the advantages of this type of burn dressing is the ability to leave dressing in place for extended periods of time (3-5 days) which is advantageous during the evacuation process.
- q. Burn patients, regardless of age, are prone to gastric ulceration and prophylaxis should be initiated with proton pump inhibitor or similar agent as available.
- r. Contact the US Army Institute of Surgical Research (USAISR) Burn Center as soon as possible at DSN 312-429-2876 (BURN) or commercial (210) 916-2876 or (210) 222-2876. You may also send email to burntrauma.consult@us.army.mil. Early consultation will facilitate coordination of care to include possible activation of Burn Flight Team to assist with movement back to CONUS. Inability to contact the Burn Center should not delay the evacuation process.

6. Guidelines for Patients Who Cannot be Evacuated from Theater (Local Nationals.)

- a. Background: Care provide at Level II and Level III facilities is not envisioned to be definitive care, for either US forces, coalition forces or patients of any nationality. Care at Level II and Level III facilities is provided in the context of a continuum of care. Definitive care for US service members is provided at CONUS Level V facilities. Coalition forces are passed along the evacuation chain to a point at which they will return to their home nation health care facilities. Host national patients, just like US forces and coalition partners, are provided care in the context of the capacity of definitive care for which they are eligible to receive. Unfortunately, the definitive care available to host national patients fails to compare to the definitive care available for US and coalition forces. Decisions made for the care of host national patients are to be made in light of the continuum of care which is available.
- b. The principle differences in management of host nation patients compared to military casualties are: 1) the inability to transfer local national patients to a definitive treatment facility (burn center), and 2) the treatment of pediatric burns patients.
- c. **Triage local national casualties with full thickness burns of 50% or greater TBSA as expectant and provide adequate comfort care measures.** (Estimate burn size as accurately as possible using a Lund and Browder chart as found at [Appendix C](#)).

Guideline Only/Not a Substitute for Clinical Judgment

June 2012

- d. **Remember** that inhalation injury, co-morbidities, and extremes of age, in addition to the burn size itself, increase mortality. Take these factors into consideration as treatment plans are initiated.
- e. For patients with combined partial and full thickness burns of 50% TBSA or greater, with less than half of the burn being full thickness, initiate resuscitation and allow the partial thickness component to declare itself as it is sometimes difficult to determine the full extent of the full thickness burn at the time of initial presentation. After approximately 48-72 hours, reassess the patient to more accurately estimate the percentage of full thickness burn.
- f. For patients with a less than 50% TBSA burn, proceed with resuscitation and plan for early excision and grafting to maximize chance of survival.
- g. Neither allograft (cadaveric skin) nor xenograft (pig skin) are currently available in theater. The extent of excision should be guided by the amount of autograft (donor skin) available. Do not excise wounds and leave open. If patients arrive with open burn wounds, surgically debride/excise and apply a NPWD until a clean, healthy wound bed is observed.
- h. Meshing of split thickness skin grafts will maximize available donor skin. Rarely is there a need to mesh skin wider than 2:1; meshing wider than 3:1 is not recommended.
- i. Utilize dilute epinephrine solution (1:10,000) to infiltrate subcutaneous tissue by clysis prior to harvesting of donor skin with dermatome. This process will minimize blood loss at the donor site(s). Likewise, dilute epinephrine solution provides topical vasoconstriction and hemostasis following excision of burns to help minimize blood loss.
- j. Take the patient to the OR for staged excisions and grafting of the full thickness burns with a goal of complete excision within one week of injury. Consider using a Negative Pressure Wound Dressing (NPWD) over fresh graft with intervening non-adherent layer (e.g. Dermanet[®] or negative pressure Silverlon[®]) and leave in place for 3-5 days.
- k. Following NPWD removal, use Sulfamylon[®] moistened gauze dressings for approximately 5-7 days before transitioning to a topical agent such as Bacitracin[®] or polymicrobial ointment.
- l. Once the grafts are healed, continue to keep patient clean, using showers when available.
- m. **Early ambulation and physical therapy**, with range of motion of all affected joints, is critical to the long-term functional outcome in burn patients.
- n. **Early and continuous nutrition is vital to wound healing.** Use of a nasogastric feeding tube and supplementation with high protein, low fat tube enteral feedings is strongly encouraged, even when the patient is able to eat. Utilize nutritionist whenever available and supplement diet with a daily multivitamin.

7. Added considerations for Pediatric Burn Patients.

- a. Airway patency can be lost early in small children with facial or extensive burns as modest mucosal edema can quickly compromise the small airway; carefully securing the ETT and adequate sedation is important to prevent unplanned extubation.

Joint Theater Trauma System Clinical Practice Guideline

- b. Peripheral or intraosseous vascular access may suffice initially, but central venous access is more reliable if burn resuscitation is needed; lines should be sewn in place.
- c. Children presenting for care 24-48 hours following burns injury generally do not require a formal fluid resuscitation, rather fluid should be administered based on clinical need. When formal resuscitation is required, the Modified Brooke formula (2 mL/kg/%TBSA divided over 24 hours, with one-half given during the first 8 hours) is a reasonable starting point. As with adults, any formula only provides an initial point at which to start the resuscitation, which must be adjusted based on response.
- d. Very young children do not have adequate glycogen stores to manufacture glucose throughout resuscitation. Small children (e.g. < 20 kg) should have a maintenance rate of D5LR administered and this amount is subtracted from their resuscitation rate of LR.
- e. Some clinicians do not wait for 24 hours to begin using colloid for resuscitation in children with burns over 20% TBSA. If used earlier than 24 hours, 5% albumin is initiated at 1x maintenance rate and subtracted from the LR resuscitation rate; the rate of colloid infusion is maintained while LR infusion is adjusted based on resuscitation endpoints.
- f. Monitoring of resuscitation in children, like adults, should be based on physical examination, input and output measurement, and analysis of laboratory data. Physical evidence of effective resuscitation includes an alert sensorium, full peripheral pulses, warm distal extremities; urine output target should be a glucose-negative urine output of 1 cc/kg/hr; serum sodium should be monitored every 8 hours during first 72 hours to monitor for both hyper- and hyponatremia.
- g. Children with burns over 20% should have a Foley-type catheter placed using size 6 Fr for infants and 8 Fr for most small children.
- h. Children with burns under 20% usually do not need a calculated resuscitation. They can be given 1.5x calculated maintenance rate and have diapers weighed for urine output. If they can eat, they should be allowed access to bottle feeds PRN. Some of these children can be supported enterally, with nasoenteric infusions of WHO resuscitation formula.
- i. Cellulitis is the most common infectious complication and usually presents within 5 days of injury. Children can become quite toxic if this is untreated. Prophylactic antibiotics do not eliminate this complication, and are therefore not indicated.
- j. Nutrition is critical for pediatric burn patients, just as in adults: Nasogastric feeding may be started immediately at a low rate in hemodynamically stable patients and tolerance monitored. Targets are 1.5 measured or calculated BMR calories and 2.0 gm/kg/day protein. May start with standard pediatric enteral formula (e.g. Pediasure®) targeting 30-35 kcal/kg/day.
- k. Children may rapidly develop tolerance to analgesics and sedatives, dose escalation is commonly required.
- l. Late effects of burns: When burned at a young age, many children will develop disabling contractures. These are often very amenable to correction which may be performed in theater with adequate staff and resources. Opportunities for pediatric surgical care provided by Non-Governmental Organizations (NGOs) such as the Shriners Hospital may be considered on a case-by-case basis and requires the coordinated efforts of all involved. It is important to remember that US government evacuation assets (Airevac or CCATT) cannot be utilized to transport local

Guideline Only/Not a Substitute for Clinical Judgment

June 2012

Joint Theater Trauma System Clinical Practice Guideline

national patients for this purpose, nor do NGOs provide direct transportation; patients must be able to utilize commercial air transport to and from the CONUS based civilian facility.

8. Avoiding Common Pitfalls.

- a. **Sew and/or staple all venous and arterial catheters in place** as tape does not adhere to burned skin; uses of circumferential tape or bandages to secure lines may further impede circulation related to edema formation.
- b. Avoid excising uninfected full thickness burns before having donor skin to cover the wound.
- c. Pseudomonas colonization followed by infection is associated with a high rate of graft loss and poses a real threat to recovery. Liberal use of dilute Dakin's solution to cleanse burn wounds suspicious for pseudomonas is recommended. Delay grafting procedures until topical pseudomonas is controlled.
- d. Transition from aggressive care to comfort care is a difficult decision, especially when the care team has worked exhaustively to maximize survival.
 - 1) Initial burn may appear survivable, but graft loss, topical infections, or conversion of donor site(s) to full thickness wounds may transform a potentially survivable injury into a non-survivable injury. Be aware of this possibility and the potential change to an expectant category.
 - 2) The attending surgeon should elicit objective input from medical colleagues, nurses, and hospital leadership in making the decision to transition to comfort care as it will solidify the process and assist with closure, especially for those engaged in the care of the patient for extended periods.
 - 3) Consider inhalational injury in relationship to the TBSA burned when deciding whether to treat the patient or classify the patient expectant; a patient with a 40% TBSA burn and inhalational injury will likely not do as well as a patient with a 40% TBSA burn without inhalational injury.
- e. Whenever resources are available, perform extensive dressing changes in the OR (not ICU or ICW), especially early in the treatment process when wounds remain open:
 - 1) Process provides for optimal pain control (with airway protection as needed)
 - 2) Improves ability to inspect and examine wounds
 - 3) Provides clean and warm environment
 - 4) Improves overall outcome

9. Additional Recommendations for Care of the Complicated Burn Patient.

- a. Recommendations for **Fluid Resuscitation**:
 - 1) At 12 hours post-burn, calculate the *projected* 24-hour resuscitation, assuming IVF rate is 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 previously described and listed in the *Emergency War Surgery Handbook*.

Guideline Only/Not a Substitute for Clinical Judgment

June 2012

- b) Measure bladder pressures every 4 hours.
 - c) When available, utilize central venous pressure monitoring with subclavian or IJ catheter, along with central venous O₂ saturations. (Goal CVP 8-10cm H₂O, ScvO₂ 60-65 %.) If CVP readings are not at goal, increase fluid rate. If CVP 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 CVP 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), utilize recommendations for treatment of hypotension.
 - 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 20-25%.
- 2) After 24 hours, decrease LR infusion rate to maintenance levels, if possible, and continue albumin until the 48-hour mark.
- 3) Combat casualties with burns often present with multi-system injury, to include soft tissue injury secondary to blunt or penetrating blast related trauma and/or inhalational injury which all affect resuscitation requirements. This fact may result in marked increased fluid needs above and beyond standard burn resuscitation formulas.
- b. Recommendations for management of **Hypotension**:
- 1) The optimal minimum blood pressure for the burn patient must be individualized. Some patients will maintain adequate organ perfusion (as suggested by adequate UOP) at MAPs lower than 70 mm Hg, therefore clinically significant hypotension must be correlated with UOP. If the 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) Reevaluate the patient for volume depletion and reassess for a possible missed injury or ongoing bleeding. If not detected, initiate vasopressin 0.02-0.04 units/min IV drip; do not titrate.
 - b) Monitor CVP. If CVP is below goal (8-10 cmH₂O), increase IV fluid rate.
 - c) If CVP at goal of 8-10 cmH₂O), add norepinephrine (Levophed[®]) 2-20 mcg/min IV.
 - d) If further pressors are necessary, consider dobutamine 5 mcg/kg/min IVD (maximum dose of dobutamine is 20 mcg/kg/min). Consider also addition of epinephrine or phenylephrine (Neosyneprine[®]).
 - e) If the patient exhibits catecholamine-resistant shock, consider the following diagnoses:
 - Missed injury and/or on-going blood loss.

Joint Theater Trauma System Clinical Practice Guideline

- 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 administration of bicarbonate or THAM.
 - 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 management of patients with **Inhalational Injury**:
- 1) Inhalation injury is further exacerbated by retained carbonaceous particles and chemicals. Remember, inhalation injury is a chemical injury that will benefit from removing the chemical irritant.
 - 2) If patients are noted to have visible carbonaceous material (soot) in their airways, attempt to remove via bronchoscopically-guided lavage. Irrigate judiciously, as irrigation may worsen injury by transporting injurious substances to new, uninjured parts of the lung
 - 3) Patients diagnosed with Inhalation Injury with accompanying ulceration or sloughing of the airways should be given aerosolized heparin 5000 units per endotracheal tube every 4 hours; mix heparin with albuterol, as heparin can induce bronchospasm.
- d. Inhalational injuries which involve hydrogen fluoride (HF) can be a byproduct of combustion with standard fire suppression system devices. Exposure to HF may result in rapidly progressive or fatal respiratory failure despite minimal external evidence of trauma or inhalation injury. Service members who present with this exposure typically have shortness of breath, cough, or hypoxia; there must be a high level of suspicion for HF inhalation. Treatment is supportive. If hypocalcemia is present, administer calcium gluconate (1.5 ml of 10% Ca Gluconate in 4.5 ml water) nebulized q4hr until normalization of serum calcium levels. In the absence of significant burns, consider steroids if symptoms do not improve. Bronchopneumonia can develop within the first week. Long term, PFTs should be done with/without methocholine challenge to determine reactivity of the airways, for which steroids (systemic and inhaled) can be beneficial. Recommendations for **Abdominal compartment syndrome**:
- 1) Massive fluid replacement (> 6 mL/kg/% burn within 24 hours) may lead to abdominal compartment syndrome (increased bladder pressure, increased airway pressures, decreased UOP, hypotension) as well as extremity compartment syndromes.⁴
 - 2) Observation of pressures > 25 mm Hg warrants early consideration of therapeutic paracentesis which may provide partial relief of elevated intra-abdominal pressure related to sequestration of fluid.
 - 3) The decision to pursue decompressive laparotomy must factor in the severe morbidity of the procedure in patients with burns to the abdominal wall.⁴ If the patient requires a decompressive laparotomy, perform a standard celiotomy followed by a temporary abdominal closure. If the abdominal wall skin is burned, adhesive drapes such as those used with negative pressure wound dressings will likely not adhere to burned

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June 2012

skin. Use of a Bogotá bag or similar sterile plastic material sewn to the skin edges may be preferred.

e. Recommendations for **Escharotomy**:

- 1) The requirement for escharotomy or fasciotomy usually presents in the first few hours following injury. If the need for either procedure has not been identified within the first 24-48 hours, then circulation is likely to remain adequate without surgical intervention. Elevation of the burned extremities 30-45° can often decrease edema and improve circulation.
- 2) A patient with previous escharotomy or fasciotomy may require extension of the incision(s) to restore circulation. This situation can occur if excessive volume of intravenous fluid is given in transit between the time of initial escharotomy and patient arrival at the next medical facility in the evacuation chain.
- 3) During each stop along the evacuation route, 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, no further intervention should be necessary. In the absence of palpable pulses, use Doppler ultrasound to assess distal circulation. Absent Doppler signals or pulses that are diminishing on serial exam 30 minutes to one hour apart should prompt consideration of either escharotomy or fasciotomy. 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.
- 4) 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. On completion of mid lateral or mid medial 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.
- 5) For upper extremities, place the hand in the anatomic position (palm facing forward) and make an incision in the mid radial or mid ulnar line. Ulnar incisions should stay anterior (volar) of the elbow joint to avoid the ulnar nerve, which is superficial at the level of 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.
- 6) 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.

- 7) If bilateral extremity incisions do not restore circulation, re-evaluate the adequacy of the patient's overall hemodynamic status. 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 between 30 and 50 mL/hr.

f. Recommendations for **Fasciotomy related to burns:**

- 1) In the absence of an electrical burn and/or an underlying fracture, fasciotomies on burned extremities are rarely indicated or performed. Optimal fluid resuscitation utilizing the recommendations in this CPG and prompt escharotomy usually mitigates the need for fasciotomy. Due to the frequency of extremity injuries seen among combat casualties, fasciotomies on burned extremities may be required for a small percentage of patients, include those with:

Penetrating projectile wounds and delayed revascularization

Polytrauma that results in massive resuscitation

Crush injuries

In the absence of crush injury, fractures, multiple trauma, over-resuscitation, electrical injury or revascularization, fasciotomies on burned extremities increase morbidity and mortality and are generally not indicated. High altitude as associated with aeromedical evacuation is not, in and of itself, a contributor to the development of compartment syndrome in a burned extremity, and therefore is not an indication for a fasciotomy. Fasciotomy for burns should only be performed for the clinical diagnosis of compartment syndrome, and if available, confirmed by measurement of compartment pressures.

If long range air evacuation is imminent, and there is concern for a delayed compartment syndrome that could go unrecognized in flight, consideration should be given to delaying evacuation, provided the patient's overall condition will allow it. Following the patient with serial exams and/or compartment pressures in a facility where fasciotomies can be immediately performed if necessary, is a reasonable clinical option. Evacuation can proceed once the clinical exam and/or compartment pressures have stabilized and the patient is no longer assessed to be at risk for delayed compartment syndrome or 4 compartment fasciotomies have been performed.

- 2) 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.

10. Performance Improvement (PI) Monitoring.

a. Intent (Expected Outcomes).

- 1) All patients suffering second and/or third degree burns of $\geq 20\%$ TBSA will have the Burn Flow Sheet initiated and completely documented at the first MTF providing treatment and all subsequent MTFs until their arrival at a definitive care MTF in CONUS.

Joint Theater Trauma System Clinical Practice Guideline

- 2) All patients suffering circumferential extremity full thickness burns with known or suspected development of neurovascular compromise of the involved limb will have appropriate escharotomy performed.
- b. Performance/Adherence Measures.
 - 1) All patients who suffered second and/or third degree burns of $\geq 20\%$ TBSA had the Burn Flow Sheet initiated and completely documented at the first MTF providing treatment and all subsequent MTFs until their arrival at a definitive care MTF in CONUS.
 - 2) All patients who suffered circumferential extremity full thickness burns with known or suspected development of neurovascular compromise of the involved limb had appropriate escharotomy performed.
- c. Data Source.
 - 1) Patient Record
 - 2) Joint Theater Trauma Registry (JTTR)
- d. System Reporting & Frequency.

The above constitutes the minimum criteria for PI monitoring of this CPG. System reporting will be performed annually; additional PI monitoring and system reporting may be performed as needed.

The system review and data analysis will be performed by the Joint Theater Trauma System (JTTS) Director, JTTS Program Manager, and the Joint Trauma System (JTS) Performance Improvement Branch.

11. Responsibilities. It is the trauma team leader's responsibility to ensure familiarity, appropriate compliance and PI monitoring at the local level with this CPG. It is the responsibility of the nurse assigned to the trauma patient to ensure the Burn Flowsheet ([Appendix B](#)) is initiated and completed.

12. References:

- ¹ *Emergency War Surgery Handbook, Chapter 28.*
- ² Ennis JL, Chung KK, Renz EM, Barillo DJ, Albrecht MC, Jones JA, Blackbourne LH, Cancio LC, Eastridge BJ, Flaherty SF, Dorlac WC, Kelleher KS, Wade CE, Wolf SE, Jenkins DH, Holcomb JB. Joint Theater Trauma System implementation of burn resuscitation guidelines improves outcomes in severely burned military casualties. *J Trauma*. 2008;64(2):S146-51; discussion 151-2.
- ³ Chung KK, Salinas J, Renz EM, Alvarado RA, King BT, Barillo DJ, Cancio LC, Wolf SE, Blackbourne LH. Simple derivation of the initial fluid rate for resuscitation of severely burned adult combat casualties: in silico validation of the rule of 10. *J Trauma*. 2010;69(1):S49-54.
- ⁴ Markell KW, Renz EM, White CE, Albrecht ME, Blackbourne LH, Park MS, Barillo DA, Chung KK, Kozar RA, Minei JP, Cohn SM, Herndon DN, Cancio LC, Holcomb JB, Wolf SE. Abdominal complications after severe burns. *J Am Coll Surg*. 2009;208(5):940-7; discussion 947-9.

Guideline Only/Not a Substitute for Clinical Judgment

June 2012

- ⁵ Zierold D, Chauviere M. Hydrogen Fluoride inhalation injury because of a fire suppression system. *Military Medicine*. 2012;177(1):108-112.

Approved by CENTCOM JTTS Director,
JTS Director and CENTCOM SG

Opinions, interpretations, conclusions, and recommendations are those of the authors
and are not necessarily endorsed by the Services or DoD.

[Return to Background](#)

Table 1. US Burn Mortality in American Burn Association Verified Burn Centers.

Age Group	0.1-9.9	10-19.9	20-29.9	30-39.9	40-49.9	50-59.9	60-69.9	70-79.9	80-89.9	≥90	Total
birth - 1.9	0.0%	0.2%	2.1%	4.5%	6.6%	10.9%	50.0%	42.1%	73.3%	60.0%	0.7%
Died/Total	1/6655	3/1926	8/389	7/157	5/76	5/46	12/24	8/19	11/15	3/5	63/9312
2 - 4.9	0.2%	0.1%	3.2%	5.7%	7.9%	12.5%	22.6%	31.3%	54.5%	76.2%	1.6%
Died/Total	7/3449	1/1086	11/341	9/159	6/76	6/48	7/31	10/32	12/22	16/21	85/5265
5 - 19.9	0.1%	0.2%	1.2%	3.3%	9.3%	9.9%	18.3%	30.9%	39.3%	55.9%	1.5%
Died/Total	11/7346	4/2441	10/838	13/400	20/216	15/151	19/104	21/68	24/61	38/68	175/11693
20 - 29.9	0.2%	0.8%	2.2%	3.7%	11.3%	17.0%	31.5%	42.3%	62.7%	77.6%	2.4%
Died/Total	11/5998	16/2065	16/720	12/324	24/212	23/135	28/89	22/52	32/51	52/67	236/9713
30 - 39.9	0.3%	0.7%	4.3%	7.7%	14.2%	26.5%	37.9%	52.7%	66.7%	82.9%	3.4%
Died/Total	18/6346	15/2287	35/811	33/426	33/233	41/155	36/95	49/93	46/69	58/70	364/10585
40 - 49.9	0.6%	1.4%	5.6%	14.9%	27.4%	36.6%	42.9%	58.8%	76.5%	85.5%	4.9%
Died/Total	31/5635	28/1957	41/738	55/368	61/223	53/145	45/105	40/68	39/51	65/76	458/9366
50 - 59.9	1.1%	3.0%	9.8%	22.7%	38.7%	56.3%	69.6%	81.6%	78.0%	84.4%	8.0%
Died/Total	36/3378	36/1198	50/510	58/255	55/142	63/112	39/56	40/49	32/41	54/64	463/5805
60 - 69.9	2.5%	8.6%	17.5%	36.0%	65.9%	72.4%	71.0%	88.6%	87.5%	76.1%	12.8%
Died/Total	45/1835	67/776	64/366	50/139	56/85	42/58	22/31	31/35	21/24	35/46	433/3395
≥70	7.2%	25.5%	52.7%	69.6%	80.1%	95.6%	94.6%	87.1%	91.9%	91.5%	27.6%
Died/Total	170/2348	281/1101	207/393	179/257	109/136	109/114	70/74	61/70	34/37	43/47	1263/4577
Total	0.8%	3.0%	8.7%	16.7%	26.4%	37.0%	45.6%	58.0%	67.7%	78.4%	5.1%
Died/Total	330/42990	451/14837	442/5106	416/2485	369/1399	357/964	278/609	282/486	251/371	364/464	3540/69711

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Joint Theater Trauma System Clinical Practice Guideline

APPENDIX A 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 the other ITR forms.

(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, SDU, ICW 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** _____

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PATIENT IDENTIFICATION (For typed or written entries not: 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 Reactions:
	Height: _____ Weight (Kg): _____ Diet: _____

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Joint Theater Trauma System Clinical Practice Guideline

MEDICAL RECORD – PROVIDER 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 1 hr for burn > 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 6 hrs while sedated
- 9.5. _____ Oral care Q 4 hrs; 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 hrs 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. Start initial infusion of Lactated Ringers (LR) at _____ mL/hr IV (10 x % TBSA >40 kg <80 kg) (Add 100 mL/hr for every 10 kg > 80 Kg)
- 11.2. Titrate resuscitation IVF as follows to maintain target UOP (Adult: 35-50 mL/hr; Children: 1.0 mL/kg/hr)
 - o Decrease rate of LR by 20% if UOP is greater than 50 mL/hr for 2 consecutive hrs
 - o Increase rate of LR by 20% if UOP is less than 30 mL/hr (adults) or pediatric target UOP for 2 consecutive hrs
- 11.3. If CVP > 10 cm H₂O and patient still hypotensive (SBP < 90 mm Hg), begin vasopressin gtt at 0.02 – 0.04 Units/min
- 11.4. Post burn day #2 (Check all that apply)
 - _____ Continue LR at _____ mL/hr IV
 - _____ Begin _____ @ _____ 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 _____

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

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Joint Theater Trauma System Clinical Practice Guideline

MEDICAL RECORD – PROVIDER ORDERS

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BURN PATIENT ADMISSION ORDERS (Page 3 of 5)

12. IVF (% TBSA ≤ 20%): ____ LR ____ NS ____ D5NS ____ D5LR ____ D5 .45NS ____ + KCI 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 TID 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 mmHg
15.12. ____ nebulizer/MDIs: ____ Albuterol ____ Atrovent ____ Xopenex Unit Dose Q 4 hrs

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 not: 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 Reactions:			
	Height: _____			
	Weight (Kg): _____			
	Diet: _____			

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Joint Theater Trauma System Clinical Practice Guideline

MEDICAL RECORD – PROVIDER 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 MAAS 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 MAAS 3-4; may give 1-4 mg IVP Q 2-4 hours for acute agitation.
- 16.4. _____ Fentanyl gtt at _____ mcg/hr titrate up to 250 mcg/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 MAAS \leq 2. If further analgesia/sedation is indicated, start medications at $\frac{1}{2}$ of previous dose and titrate for a MAAS 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. _____ Tylenol _____ mg / Gm PO / NGT / PR Q _____ hrs PRN for fever or pain
- 16.12. _____ Morphine PCA; Program (circle one): 1 2 3 4
- 16.13. _____ Zofran 4-8 mg IVP Q 4 hrs PRN for nausea/vomiting
- 16.14. _____ 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 _____

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PATIENT IDENTIFICATION (For typed or written entries not: 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 Reactions:
	Height: _____ Weight (Kg): _____ Diet: _____

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Joint Theater Trauma System Clinical Practice Guideline

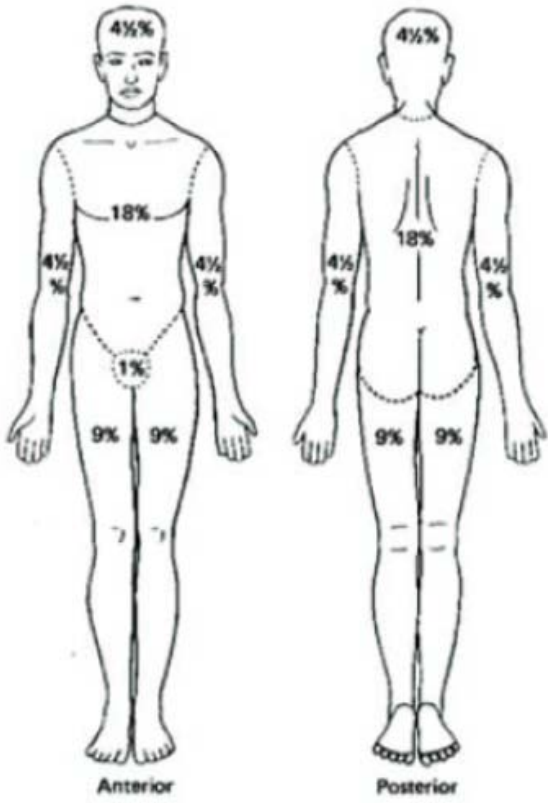
MEDICAL RECORD – PROVIDER ORDERS

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

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BURN PATIENT ADMISSION ORDERS (Page 5 of 5)

Specific Burn Wound Care (Continued)

<p>Face & Ears</p> <p>____ Bacitracin ointment BID & PRN</p> <p>____ Sulfamylon cream to ears BID & PRN</p> <p>____ 5% Sulfamylon solution dressing changes Q AM and moisten every 6 hrs</p> <p>____ Bacitracin ophth ointment: apply OU Q 6 hrs</p>	 <p>Anterior</p> <p>Posterior</p>
<p>BUEs & Hands, BLEs, Chest, Abdomen & Perineum</p> <p>____ Silvadine cream Q AM & PRN (<i>deep partial & full thickness</i>)</p> <p>____ Sulfamylon cream Q PM & PRN (<i>deep partial & full thickness</i>)</p> <p>____ 5% Sulfamylon solution – change Q AM & moisten Q 6 hrs (<i>superficial burns</i>)</p> <p>____ Silver nylon dressing and moisten with sterile water approximately every 6 hrs PRN; dressings may be left in place for 72 hrs)</p>	
<p>Back</p> <p>____ Silvadine cream Q AM & PRN (<i>deep partial & full thickness burns</i>)</p> <p>____ Sulfamylon cream Q PM & PRN (<i>deep partial & full thickness burns</i>)</p> <p>____ 5% Sulfamylon solution dressings changed Q AM and moisten Q 6 hrs</p> <p>____ Silver nylon dressing and moisten with sterile water approximately every 6 hrs PRN; dressings may be left in place for 72 hrs)</p>	

18. Other Orders

18.1. _____

18.2. _____

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

Physician Signature _____

Date/Time _____

MEDCOM FORM 688-RB (TEST) MCHO) JUL 07 PREVIOUS EDITIONS ARE OBSOLETE MC V2.00

<p>PATIENT IDENTIFICATION (<i>For typed or written entries not: Name – last, first, middle initial; grade, DOB; hospital or medical facility</i>)</p>	<p>Nursing Unit Room No. Bed No. Page No.</p>
	<p>Complete the following information on page 1 of provided orders only. Note any changes on subsequent pages.</p>
	<p>Diagnosis:</p>
	<p>Allergies and Reactions:</p>
	<p>Height: _____ Weight (Kg): _____ Diet: _____</p>

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Joint Theater Trauma System Clinical Practice Guideline

APPENDIX B

JTTS Burn Resuscitation Flow Sheet, Page 1 of 3

Date				Initial Treatment Facility					
						Estimated fluid vol. pt should receive			
Name			SSN	Pre-burn est. wt (kg)	%TBSA	1st 8 hrs	2nd 16 hrs	Est. total 24 hrs	
Date & Time of Injury			BAMC/ISR Burn Team DSN 312-429-2876						
Tx Site/ Team	HR from burn	Local Time	Crystalloid Colloid	Total	UOP	Base Deficit	BP	MAP (>55) CVP	Pressors (Vasopressin 0.02-0.04 u/min)
	1 st								
	2 nd								
	3 rd								
	4 th								
	5 th								
	6 th								
	7 th								
	8 th								
Total Fluids:									
	9 th								
	10 th								
	11 th								
	12 th								
	13 th								
	14 th								
	15 th								
	16 th								
	17 th								
	18 th								
	19 th								
	20 th								
	21 st								
	22 nd								
	23 rd								
	24 th								
Total Fluids:									

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Joint Theater Trauma System Clinical Practice Guideline

JTTS Burn Resuscitation Flow Sheet, Page 2 of 3

Date									
							Fluid volume ACTUALLY received		
Name			SSN	Pre-burn est. wt (kg)	%TBSA	1st 8 hrs	2nd 16 hrs	Est. total 24 hrs	
Date & Time of Injury			BAMC/ISR Burn Team DSN 312-429-2876						
Tx Site/ Team	HR from burn	Local Time	Crystalloid / Colloid	Total	UOP	Base Deficit	BP	MAP (>55) / CVP	Pressors (Vasopressin 0.02-0.04 u/min)
	25 th								
	26 th								
	27 th								
	28 th								
	29 th								
	30 th								
	31 st								
	32 nd								
	33 rd								
	34 th								
	35 th								
	36 th								
	37 th								
	38 th								
	39 th								
	40 th								
	41 st								
	42 nd								
	43 rd								
	44 th								
	45 th								
	46 th								
	47 th								
	48 th								
Total Fluids:									

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Joint Theater Trauma System Clinical Practice Guideline

JTTS Burn Resuscitation Flow Sheet, Page 3 of 3

Date										
			Fluid volume ACTUALLY received							
Name		SSN	Pre-burn est. wt (kg)	%TBSA	1st 8 hrs	2nd 16 hrs	Est. total 24 hrs			
Date & Time of Injury			BAMC/ISR Burn Team DSN 312-429-2876							
Tx Site/ Team	HR from burn	Local Time	Crystalloid / Colloid	Total	UOP	Base Deficit	BP	MAP (>55) / CVP	Pressors (Vasopressin 0.02-0.04 u/min)	
	49 th									
	50 th									
	51 st									
	52 nd									
	53 rd									
	54 th									
	55 th									
	56 th									
	57 th									
	58 th									
	59 th									
	60 th									
	61 st									
	62 nd									
	63 rd									
	64 th									
	65 th									
	66 th									
	67 th									
	68 th									
	69 th									
	70 th									
	71 st									
	72 nd									
Total Fluids:										

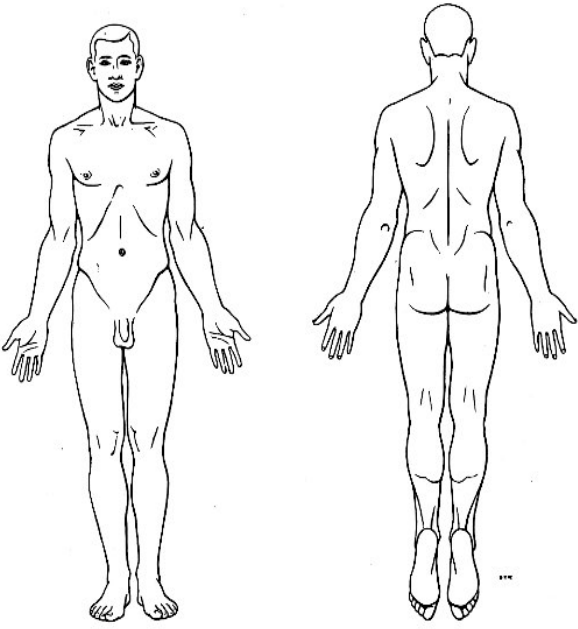
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Joint Theater Trauma System Clinical Practice Guideline

APPENDIX C

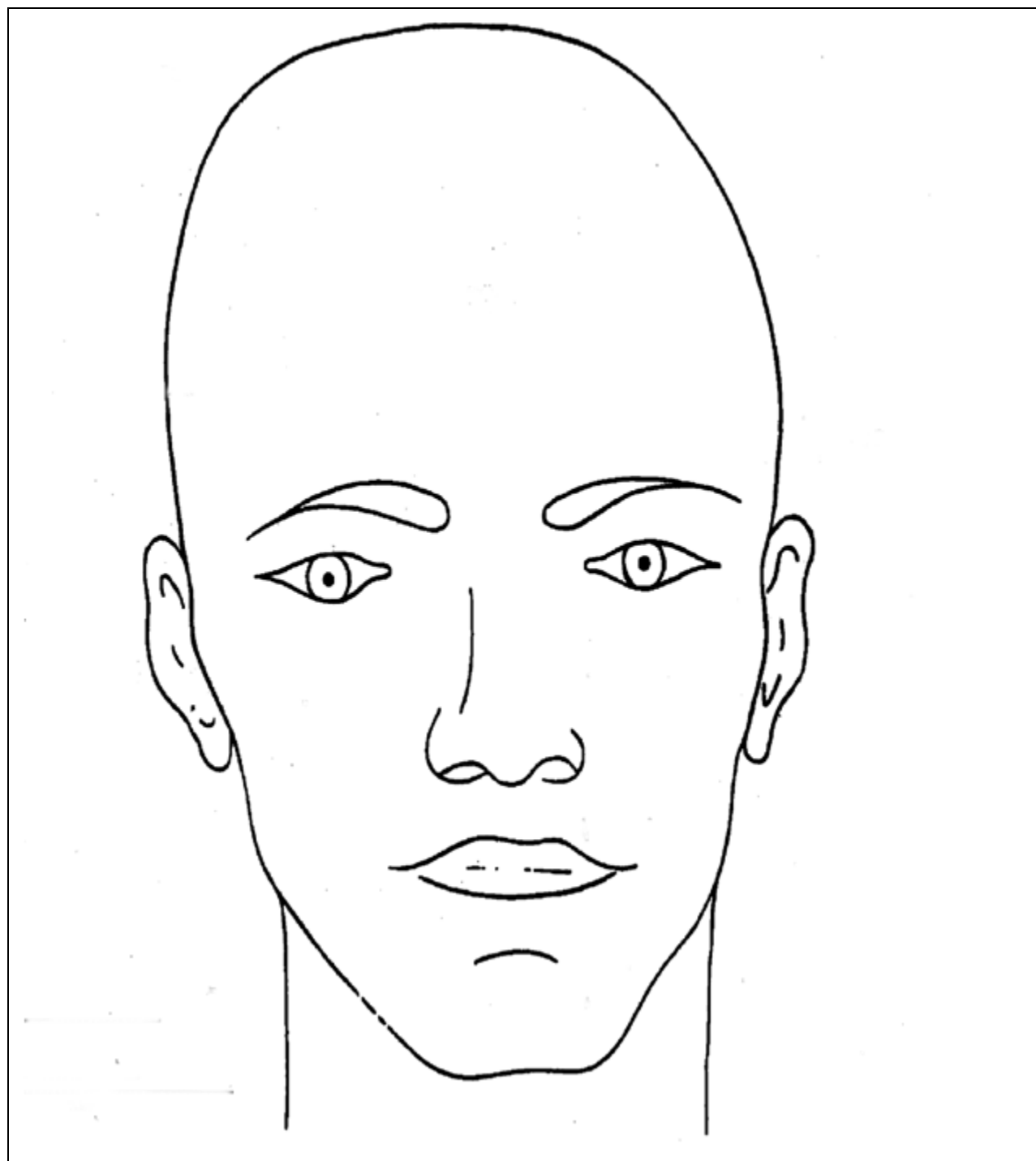
1. Adult Burn Estimate and Diagram

Total Area front/back (circumferential)		one side-- anterior	one side-- posterior	Do not include in total TBSA									
	Adult	adult	adult	1 st °	2 nd °	3 rd °	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:													

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June 2012

Adult Burn Diagram Head



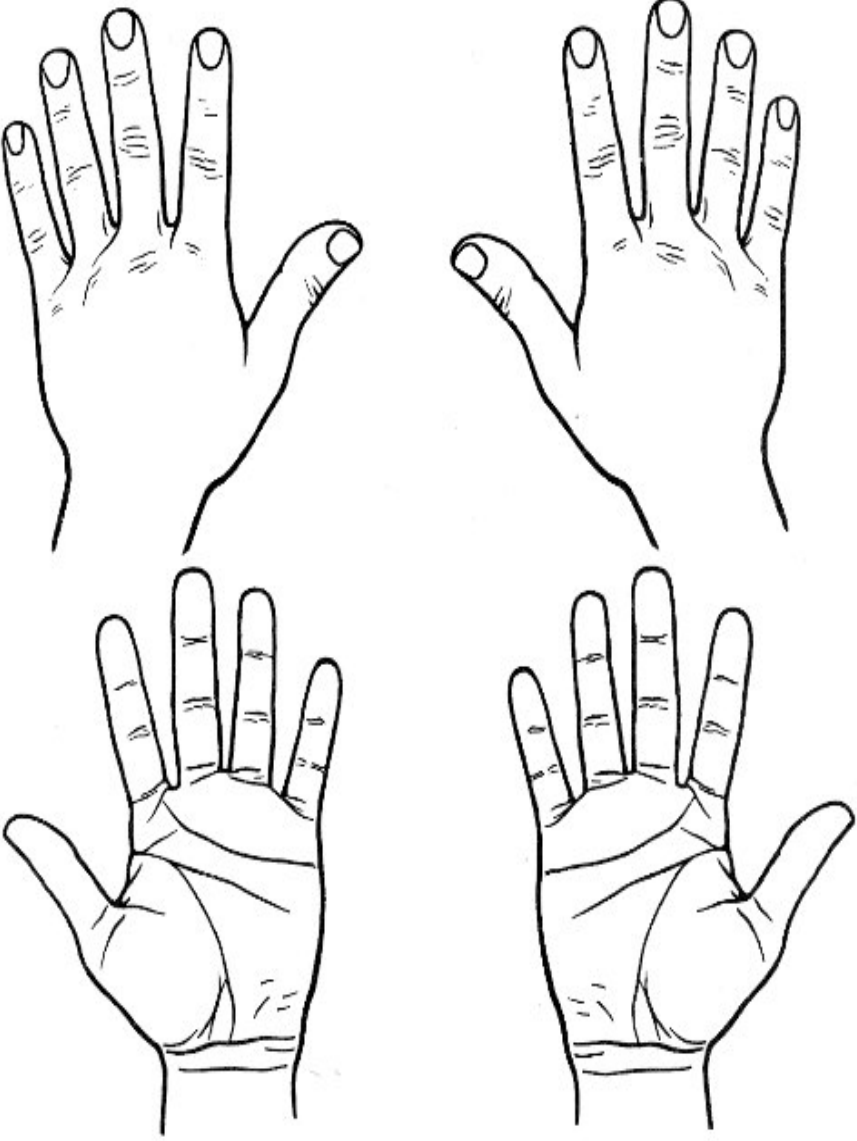
Date:	
Name:	

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Joint Theater Trauma System Clinical Practice Guideline

Adult Burn Diagram Hands

 <p>DIAGRAM F</p> <p>Figure 25 (22)</p>	
Date:	
2 nd :	
3 rd :	
Total:	

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Joint Theater Trauma System Clinical Practice Guideline

2. Baby Burn Estimate and Diagram

Total Area front/back (circumferential)	Birth to 1 year	Do not include in total TBSA 1 st	2 nd °	3 rd °	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



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Joint Theater Trauma System Clinical Practice Guideline

3. Child Burn Estimate and Diagram

Total Area front/back (circumferential)	1 to 4 years	5 to 9 years	10 to 14 years	15 years	Do not include in total TBSA 1 st	2 nd °	3 rd °	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
1								
2								
3								

Guideline Only/Not a Substitute for Clinical Judgment

June 2012

Joint Theater Trauma System Clinical Practice Guideline

4. 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 (do not include superficial injury in this calculation). 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” (or become deeper) between assessments at one facility or during transport between two facilities.
- VI. Burn Fluid Resuscitation Calculations: Use the Rule of Tens to determine fluid requirements for the first 24 hours post-burn. (Rule of Tens: $10 \times \% \text{ TBSA} > 40 \text{ kg}$ and $< 80 \text{ kg}$; if $> 80 \text{ kg}$, add 100 ml/hr for every 10 kg $> 80 \text{ kg}$). At 8-12 hours post-burn, reevaluate resuscitation efforts and assess for potential over resuscitation. If fluid resuscitation needs exceed 6 ml/kg/%TBSA in 24 hours, 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 volume patients is administered,”
 - 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.

Guideline Only/Not a Substitute for Clinical Judgment

June 2012

Joint Theater Trauma System Clinical Practice Guideline

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 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 record 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 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 fluids 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.”

Joint Theater Trauma System Clinical Practice Guideline

5. Burn Flow Sheet Documentation

JTTS Burn Resuscitation Flow Sheet									
Date	[1]	Initial Treatment Facility	[2]						
			Estimated fluid vol. pt should receive						
Name	SSN	Pre-burn est. wt (kg)	%TBSA	1st 8 hrs	2nd 16 hrs	Est. total 24 hrs			
[3]	[4]	[5]	[6]	[7]	[8]	[9]			
Date & Time of Injury	[10]		BAMC/ISR Burn Team DSN 312-429-2876						
[11]	[12]	[13]	[14a] [14b]	[15]	[16]	[17]	[18]	[19]	[20]
Tx Site/Team	HR from burn	Local Time	Crystalloid Colloid	Total	UOP	Base Deficit	BP	MAP (>55) CVP	Pressors (Vasopressin 0.02-0.04 u/min)
1 st									
2 nd									
3 rd									
4 th									
5 th									
6 th									
7 th									
8 th									
Total Fluids:				[21]					
9 th									
10 th									
11 th									
12 th									
13 th									
14 th									
15 th									
16 th									
17 th									
18 th									
19 th									
20 th									
21 st									
22 nd									
23 rd									
24 th									
Total Fluids:				[22]					

		Fluid volume ACTUALLY received		
Pre-burn est. wt (kg)	%TBSA	1st 8 hrs	2nd 16 hrs	Est. total 24 hrs
		[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] refers to 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

		Fluid volume ACTUALLY received		
Pre-burn est. wt (kg)	%TBSA	1st 8 hrs	2nd 16 hrs	Est. total 24 hrs
		[d]	[e]	[f]

Page 3 (49-72 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] refers to 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:** Area Burned

[7] **1st 8 hrs:** ½ total calculated fluids per burn resuscitation formula (ABLS), given over 1st 8 hrs post-burn.

[8] **2nd 16 hrs:** Remaining ½ of the calculated fluids over the next 16 hrs.

[9] **Estimated Total Fluids:** Total fluids calculated for the first 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 Team providing care at specified hour.

[12] **Hour from burn:** "1st" hour is the first hour post burn. For example: pat. Arrives@ MTF 3 hrs post-burn. MTF will start their charting for "4th" hour. IVF & UOP totals from echelon I & II care, prior to arrival at the MTF, should be placed in "3rd" hour row.

[13] **Local Time:** current time being used by recorder

[14a] **Crystalloid (ml):** Total crystalloid volume given over last hour (LR, D5W, NS, etc.)

[14b] **Colloid (ml):** Total colloid volume given over the last hour (Albumin 5%-25%, blood products, Hespan, etc.) **Note when using Albumin:** With large resuscitations 5% Albumin should be started at the 12 hour mark and 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:** Acidemia indicator, lab value, if avail.

[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 hour total:** Total IVF & UOP for 1st 12 hours post-burn.

[22] **24 hour total:** Total IVF & UOP for 24 hours.

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June 2012

APPENDIX D

ADDITIONAL INFORMATION REGARDING OFF-LABEL USES IN CPGs

1. **Purpose.** The purpose of this Appendix is to ensure an understanding of DoD policy and practice regarding inclusion in CPGs of “off-label” uses of U.S. Food and Drug Administration (FDA)–approved products. This applies to off-label uses with patients who are armed forces members.
2. **Background.** Unapproved (i.e., “off-label”) uses of FDA-approved products are extremely common in American medicine and are usually not subject to any special regulations. However, under Federal law, in some circumstances, unapproved uses of approved drugs are subject to FDA regulations governing “investigational new drugs.” These circumstances include such uses as part of clinical trials, and in the military context, command required, unapproved uses. Some command requested unapproved uses may also be subject to special regulations.
3. **Additional Information Regarding Off-Label Uses in CPGs.** The inclusion in CPGs of off-label uses is not a clinical trial, nor is it a command request or requirement. Further, it does not imply that the Military Health System requires that use by DoD health care practitioners or considers it to be the “standard of care.” Rather, the inclusion in CPGs of off-label uses is to inform the clinical judgment of the responsible health care practitioner by providing information regarding potential risks and benefits of treatment alternatives. The decision is for the clinical judgment of the responsible health care practitioner within the practitioner-patient relationship.
4. **Additional Procedures.**
 - a. **Balanced Discussion.** Consistent with this purpose, CPG discussions of off-label uses specifically state that they are uses not approved by the FDA. Further, such discussions are balanced in the presentation of appropriate clinical study data, including any such data that suggest caution in the use of the product and specifically including any FDA-issued warnings.
 - b. **Quality Assurance Monitoring.** With respect to such off-label uses, DoD procedure is to maintain a regular system of quality assurance monitoring of outcomes and known potential adverse events. For this reason, the importance of accurate clinical records is underscored.
 - c. **Information to Patients.** Good clinical practice includes the provision of appropriate information to patients. Each CPG discussing an unusual off-label use will address the issue of information to patients. When practicable, consideration will be given to including in an appendix an appropriate information sheet for distribution to patients, whether before or after use of the product. Information to patients should address in plain language: a) that the use is not approved by the FDA; b) the reasons why a DoD health care practitioner would decide to use the product for this purpose; and c) the potential risks associated with such use.