



## Trauma Center Practice Management Guideline

**DISCLAIMER:** These guidelines were prepared by Trauma Services at Mission Hospital. They are intended to serve as a general statement regarding appropriate patient care practices based upon available medical literature and clinical expertise at the time of development. They should not be considered to be policy, nor are they intended to replace clinical judgment or dictate care of individual patients.

<b>Title: Burn Guidelines</b>	
<b>Guideline Number: 2PC.TSG.0032</b>	Effective: March 2, 2021 Last Reviewed: Initial Guideline
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### **Policy:**

Trauma Center Practice Management Guideline for the care of the burn injured patient is applicable to MH Mission Hospital, LLLP and other locations where services of the hospital are being provided.

### **Purpose:**

To rapidly identify, treat and manage trauma injured patients who may have burn injuries.

### **Guideline Statements:**

1. Burn wounds trigger local and systemic physiologic abnormalities that increase in intensity with wound size and depth.
2. Burns have distinct local and systemic response characteristics.
  - a. Local response:
    - i. In addition to direct coagulation of skin and subcutaneous fat, local response includes microvascular vasoconstriction and thrombosis in peripheral unburned tissue.
    - ii. This process is thought to be exacerbated by long periods of hypotension, hypothermia and wound infection and should be considered during the initial evaluation with extensive partial-thickness burns.
  - b. Systemic response:
    - i. Complex changes and damage may include neurohormonal changes, fluid loss, hypoproteinemia and hypotension.
    - ii. During initial first days after large injury, hypodynamic state with decreased cardiac output and metabolic rate is common.
    - iii. Hypermetabolic physiology follows with rising energy expenditure and cardiac output and is proportional to burn size.

- c. Special populations:
  - i. Older adults have age-related physiologic changes and comorbidities that may contribute to the severity of injury and development of complications. Age-related changes contribute to decreased physiologic reserve in many organ systems and alterations in wound healing.
  - ii. Pediatric patients have unique anatomical and physiological concerns in regards to burns, including:
    - 1. Small diameter of airway making occlusion by edema more likely and prophylactic intubation may be required.
    - 2. Trachea is shorter and more susceptible to right mainstem bronchial intubation, ensure endotracheal tube security.
    - 3. Young infants may have less mature renal concentrating ability and may require more fluid per kilogram than older children. Monitor for fluid overload.
    - 4. Seizures may occur in young children secondary to acute hyponatremia, hypotonic fluids should be avoided initially.
    - 5. Higher energy needs and can quickly become catabolic, early nutritional support may be needed.
    - 6. Large surface area to mass ratio leading to increased risk for hypothermia, monitor closely.
    - 7. Infants and toddlers have relatively thin skin and burns are more likely to be full-thickness.
    - 8. Vascular access may be a challenge. Short-term placement of intravenous or intraosseous lines through burn wounds is acceptable if required initially.
    - 9. Growing children may require frequent revision of initially good surgical results as skin grafts do not keep pace with skeletal growth.
- 3. Pre-arrival:
  - a. Activation of the trauma team should occur per activation criteria (See 2PC.TS.02020 – Code Trauma/Trauma Alert/Trauma Alert Geriatric Triage Criteria – Adult and Pediatric )
    - i. Trauma consult for all other burns at the discretion of the ED physician and prior to transfer to burn center. Recommendations for transfer to burn center include:
      - 1. Partial-thickness and full-thickness burns greater than 10% of the total body surface area (BSA) in patients under 10 years or over 50 years of age
      - 2. Partial-thickness and full-thickness burns greater than 20% BSA in other age groups
      - 3. Partial-thickness and full-thickness burns involving the face, eyes, ears, hand, feet, genitalia, or perineum or those that involve skin overlying major joints
      - 4. Full-thickness burns greater than 5% BSA in any age group
      - 5. Significant electrical burns including lightning injury (significant volumes of tissue beneath the surface may be injured and result in acute renal failure and other complication)
      - 6. Significant chemical burns
      - 7. Inhalation injury
      - 8. Burn injury in patients with preexisting illness that could complicate management, prolong recovery, or affect mortality
      - 9. Any burn patient in whom concomitant trauma poses an increased risk of morbidity or mortality may be treated initially in a trauma center until stable before transfer to a burn center.
      - 10. Burn injury in patients who will require special social and emotional or long-term rehabilitative support, including cases involving suspected child abuse and neglect
      - 11. Pediatric considerations:
        - a. Children with burns seen in hospitals without qualified personnel or equipment for their care should be transferred to a burn center with these capabilities
  - 4. Primary survey and secondary survey: The initial priorities for the management of a burn patient are similar to those for any injured patient. Life-threatening conditions (such as airway compromise, respiratory

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insufficiency, and/or inadequate circulation) must be rapidly recognized and stabilized. Serious associated injuries must be identified and major burns should receive prompt fluid resuscitation.

Airway/ Breathing	<ul style="list-style-type: none"> <li>100% NRB; assess &amp; treat smoke inhalation, consider carboxyhemoglobin or cyanide</li> <li>Consider early intubation for any burns to face, head, neck or anterior chest or signs of airway burn such as singed hair on head face or nose, charred oral/nasal mucosa, hoarse voice, stridor or carbonaceous sputum</li> <li>Anticipate difficult airway; consider activation of difficult airway team</li> </ul>																				
Circulation	<ul style="list-style-type: none"> <li>Obtain 2 large bore intravenous access sites (Alternates: I/O, central line)</li> <li>Calculate &amp; document TBSA (2° &amp; 3° only) per Modified Lund-Browder Chart (Table 1) or Rule of 9's (Figure 2). Adults and children with burns greater than 20% TBSA should undergo fluid resuscitation using estimates based on body size and surface area burned.                             <ul style="list-style-type: none"> <li>No ongoing resuscitation needed if burn less than 20% of TBSA</li> </ul> </li> <li>If electrical injury, consider 12 lead EKG</li> <li>Fluid resuscitation:                             <ul style="list-style-type: none"> <li>Lactated ringers preferred</li> <li>Actual fluid rate depends on the severity of the burn. If the initial resuscitation rate fails to produce targeted urine output, increase fluid rate until urine output goal is met</li> <li>Burn resuscitation fluid rates and target urine output by burn type and age</li> </ul> </li> </ul> <table border="1" data-bbox="360 890 1427 1234"> <thead> <tr> <th data-bbox="360 890 565 940">Category of Burn</th> <th data-bbox="571 890 831 940">Age and Weight</th> <th data-bbox="837 890 1172 940">Adjusted Fluid Rates</th> <th data-bbox="1179 890 1427 940">Urine Output</th> </tr> </thead> <tbody> <tr> <td data-bbox="360 949 565 1176" rowspan="3">Flame or Scald</td> <td data-bbox="571 949 831 1024"><i>Adults and older children (≥ 14 years)</i></td> <td data-bbox="837 949 1172 1024">2 ml LR x kg x % TBSA</td> <td data-bbox="1179 949 1427 1024">0.5 ml/kg/r 30-50 ml/hr</td> </tr> <tr> <td data-bbox="571 1033 831 1075"><i>Children (&lt;14 years)</i></td> <td data-bbox="837 1033 1172 1075">3 ml LR x kg x % TBSA</td> <td data-bbox="1179 1033 1427 1075">1 ml/kg/hr</td> </tr> <tr> <td data-bbox="571 1083 831 1176"><i>Infants and young children (≤30 kg)</i></td> <td data-bbox="837 1083 1172 1176">3 ml LR x kg x % TBSA *Plus sugar-containing solution at maintenance rate</td> <td data-bbox="1179 1083 1427 1176">1 ml/kg/hr</td> </tr> <tr> <td data-bbox="360 1184 565 1234">Electrical Injury</td> <td data-bbox="571 1184 831 1234"><i>All ages</i></td> <td data-bbox="837 1184 1172 1234">4 ml LR x kg x % TBSA</td> <td data-bbox="1179 1184 1427 1234">1 – 1.5 ml/kg/hr until urine clears</td> </tr> </tbody> </table> <p data-bbox="428 1234 837 1255">*LR= Lactated Ringers Solution; TBSA = Total Body Surface Area</p> <ul style="list-style-type: none"> <li>Consider indwelling catheter for accurate I&amp;O if required</li> <li>Titrate to urine output goal (UOP): 1-1.5mL/kg/hr</li> <li>Electrical burn: if myoglobinuria, UOP goal 75-100mL/hr; consider 12 lead EKG</li> </ul>			Category of Burn	Age and Weight	Adjusted Fluid Rates	Urine Output	Flame or Scald	<i>Adults and older children (≥ 14 years)</i>	2 ml LR x kg x % TBSA	0.5 ml/kg/r 30-50 ml/hr	<i>Children (&lt;14 years)</i>	3 ml LR x kg x % TBSA	1 ml/kg/hr	<i>Infants and young children (≤30 kg)</i>	3 ml LR x kg x % TBSA *Plus sugar-containing solution at maintenance rate	1 ml/kg/hr	Electrical Injury	<i>All ages</i>	4 ml LR x kg x % TBSA	1 – 1.5 ml/kg/hr until urine clears
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Disability	<ul style="list-style-type: none"> <li>Routine BGL checks; if AMS occurs or develops consider carboxyhemoglobin or cyanide poisoning</li> </ul>																				
Exposure	<ul style="list-style-type: none"> <li>Burn care should be limited to preventing further injury by removing clothing that is hot, burned, or exposed to chemicals.</li> <li>Avoid attempting to “cool” burns if large TBSA; exercise caution with wet dressings in large TBSA</li> <li>Avoid salves or topical agents if anticipating transfer; clean dry sheet</li> <li>Decontaminate PRN for chemical; 20 minutes is common decontamination time to stop chemical burning</li> </ul>																				
Secondary	<ul style="list-style-type: none"> <li>Complete physical exam, including vital signs with pulse oximetry and weight</li> <li>Classification of burns per Table 3</li> <li>Assess/administer tetanus status/prophylaxis</li> <li>Assess and treat pain with small, frequent doses of narcotic analgesia, anxiolysis as needed</li> <li>Systemic antibiotics are not given prophylactically; recommended perioperatively or with s/s</li> </ul>																				

	<p>infection</p> <ul style="list-style-type: none"> <li>• Remove all rings, jewelry etc., for risk of swelling</li> <li>• If burns to face, careful eye examination before edema of eyelids develops to identify corneal burns</li> <li>• Evaluate the history of the injury to identify any inconsistencies that may indicate an inflicted injury and subsequent referral to social services</li> </ul>
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5. Wound care:

- a. 1<sup>st</sup> degree burns – Non-adherent pad or dry gauze may be applied for comfort, but not required
- b. 2<sup>nd</sup> degree burns –Non-adherent pad or dry gauze may be applied for comfort, or cover with clean sheet if larger area.
  - i. Ensure adequate pain control prior to wound care.
  - ii. Cleanse with sterile water
  - iii. If debriding required, debride with moist soft gauze
    1. If blister ruptured, debride. If intact and small, do not disrupt and keep clean, protected and moist.
  - iv. Based on severity, consider topical antimicrobials (e.g. Bacitracin, Neosporin).
  - v. Dressings should be changed daily or more frequently if excessive secretions.
  - vi. Longer term dressings may be considered per manufacturer’s recommendations or per wound care recommendations.

6. Hospital Course:

- a. Consider observing first and second degree burns
- b. Admit to trauma surgery (Pediatrics - Obtain pediatric specific consultation)
- c. Monitor for signs and symptoms of ARDS, MODS, abdominal or extremity compartment syndrome
- d. Special populations:
  - i. Older adult:
    1. Pain management should be initiated in smaller doses and titrated for comfort.
    2. Monitor for delayed wound healing and complications. Older patients may require more days of hospitalization.
    3. Fluid should be titrated carefully, however fluids should not be limited.
  - ii. Pediatric considerations:
    1. Child life should be involved early if not present on arrival
    2. Consider child maltreatment if patterns, signs of submersion burn or other concerns for inflicted injury and refer to social services per hospital policy

7. Disposition:

- a. Discharge:
  - i. Burns that can be treated on an outpatient basis:
    1. No concern for evolving airway edema
    2. Burn small enough that fluid resuscitation not needed
    3. Patient able to tolerate PO
    4. Pain well controlled
    5. Family support adequate to meet monitoring, wound care, and transportation needs
    6. Family clearly understands care plan and follow-up recommendations (including wound care, monitoring and transportation)
    7. No concern for abuse or neglect
  - ii. Consider trauma consult for burn evaluation
  - iii. Perform wound care
  - iv. Provide written burn discharge instructions
  - v. Consider pain control plan that minimizes opioid use

1. Pediatric consideration - Typical adequate pain control in children does not require the use of narcotics
- vi. Follow-up – Initial follow-up occurs in trauma clinical. Additional follow-up per wound care as necessary.
- b. Transfer:
  - i. Consider need for transfer to burn center
    1. Joseph M. Still Burn Center (Augusta) – 1-706-657-6661
    2. Wake Forest Baptist Medical Center – 1-800-277-7654
    3. Shriners’ (Pediatric) – 1-855-206-2096
  - ii. Evaluate need for escharotomy or intervention prior to transfer

#### **Quality Metrics:**

1. Per guideline monitoring process

#### **References:**

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**Table 1**

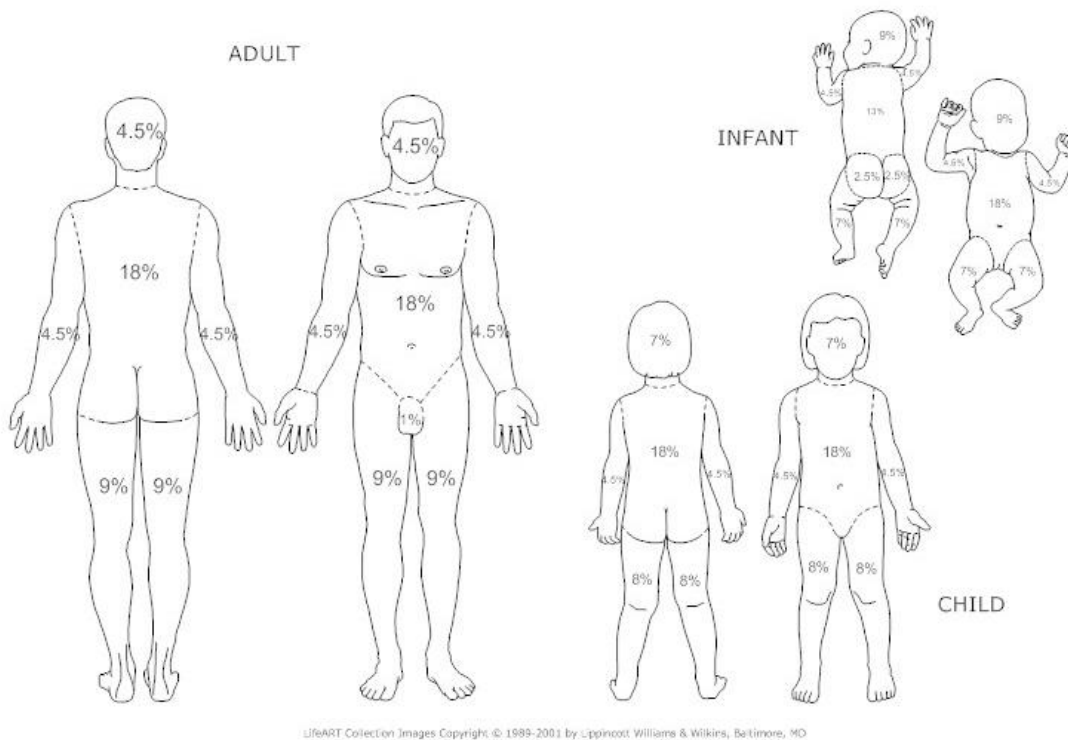
Modified Lund-Browder Chart:

Area*	Birth to 1 year	1 to 4 years	5 to 9 years	10 to 14 years	Adult
Head	9.5	8.5	6.5	5.5	4.5
Neck	1	1	1	1	1
Trunk	13	13	13	13	13
Upper arm	2	2	2	2	2
Forearm	1.5	1.5	1.5	1.5	1.5
Hand	1.25	1.25	1.25	1.25	1.25
Thigh	2.75	3.25	4	4.25	4.5
Leg	2.5	2.5	2.5	3	3.25
Foot	1.75	1.75	1.75	1.75	1.75
Buttock	2.5	2.5	2.5	2.5	2.5
Genitalia	1	1	1	1	1

\* Values listed are for one surface area and each individual extremity. Anterior and posterior surface area values are equivalent in estimating total body surface area (TBSA). For circumferential burns, multiply surface area burned by two.

**Figure 1**

Rule of 9's (Pediatric and Adult)



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**Table 3**

Classification of Burns:

Depth	Appearance	Sensation	Healing time
Superficial (epidermal)	Dry, red Blanches with pressure	Painful	3 to 6 days
Superficial partial-thickness	Blisters Moist, red, weeping Blanches with pressure	Painful to temperature and air and touch	7 to 21 days
Deep partial-thickness	Blisters (easily unroofed) Wet or waxy dry Variable color (patchy to cheesy white to red) Blanching with pressure may be sluggish	Painful to pressure only	>21 days, usually requires surgical treatment
Full-thickness	Waxy white to leathery gray to charred and black Dry and inelastic No blanching with pressure	Deep pressure only	Rare, unless surgically treated
Deeper injury (ie, fourth degree)	Extends into fascia and/or muscle	Deep pressure	Never, unless surgically treated

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