

Burns

Aliases

None noted

Patient Care Goals

Minimize tissue damage and patient morbidity from burns.

Patient Presentation

1. Patient may present with:
 - a. Airway—stridor, hoarse voice
 - b. Mouth and nares—redness, blisters, soot, singed hairs
 - c. Breathing—rapid, shallow, wheezes, rales
 - d. Skin—estimate Total Burn Surface Area (TBSA) and depth (partial vs. full thickness)
 - e. Associated trauma—blast, fall, assault

Inclusion Criteria

Patients sustaining thermal burns

Exclusion Criteria

Electrical, chemical, and radiation burns [see Toxins and Environmental section]

Special Transport Considerations

1. Transport to most appropriate trauma center when there is airway or respiratory involvement, or when significant trauma or blast injury is suspected.
2. Consider air ambulance transportation for long transport times or airway management needs beyond the scope of the responding ground EMS.
3. Consider transport directly to burn center if partial or full thickness burns (TBSA) greater than 10%, involvement of hands, feet, genitalia, face, and/or circumferential burns.

Scene Management

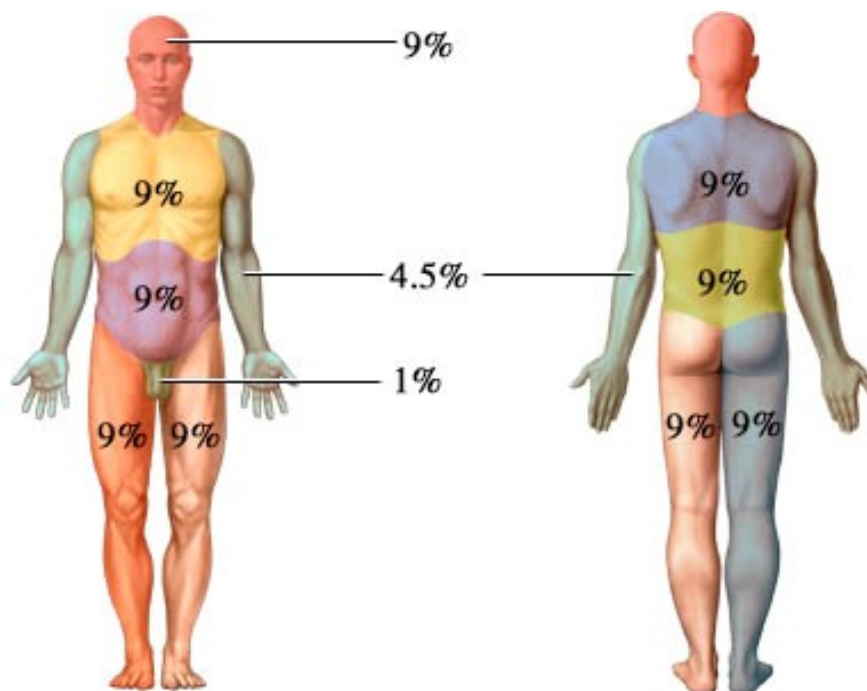
1. Assure crew safety:
 - a. Power off
 - b. Electrical lines secure
 - c. Gas off
 - d. No secondary devices
 - e. Hazmat determinations made
 - f. Proper protective attire including breathing apparatus may be required

Patient Management

Assessment

1. Circumstances of event—consider:
 - a. Related trauma in addition to the burns.
 - b. Inhalation exposures such as CO and cyanide (CN).
 - c. Pediatric or elder abuse.
2. Follow ABCs of resuscitation per the [General Trauma Management guideline](#).
3. If evidence of possible airway burn, consider aggressive airway management.
4. Consider spinal precautions for those who qualify per the [Spinal Care guideline](#).
5. Estimate TBSA burned and depth of burn.
 - a. Use "Rule of 9's"

Note: First-degree burns (skin erythema only) are not included in TBSA calculations.
6. Document pain scale.



Treatments and interventions

1. Stop the burning:
 - a. Remove wet clothing (if not stuck to the patient).
 - b. Remove jewelry.
 - c. Leave blisters intact.
2. Minimize burn wound contamination:
 - a. Cover burns with occlusive dressing (plastic wrap), dry dressing or clean sheet.
 - b. Do not apply gels or ointments.
3. Monitor SPO₂ , ETCO₂ and ECG cardiac monitor ; consider SPCO monitoring, if available.
4. Administer high-flow supplemental oxygen for all burn patients rescued from an enclosed space.
5. Establish IV access [*AEMT*], avoid placement through burned skin.
6. Evaluate respiratory status in patients with circumferential thoracic burns due to the risk for ventilatory compromise and potential need for escharotomy.
7. Evaluate distal circulation in circumferentially burned extremities due to increased risk of circulatory compromise and potential need for escharotomy
8. Consider early management of pain and nausea or vomiting.
9. Initiate fluid resuscitation. Use lactated Ringer's (preferred) [*AEMT*] or normal saline [*AEMT*]
 - a. Empiric (prior to TBSA estimations)
 - i. Less than 5 years old: 125mL/hr
 - ii. Age 6-13 years old: 250 mL/hr
 - iii. Adults (greater than 14 years old) 500mL/hr
 - b. If patient in shock:
 - i. Consider other causes, such as trauma or cyanide toxicity.
 - ii. Administer IV fluid [*AEMT*] per the [Shock guideline](#).
10. Prevent systemic heat loss and keep the patient warm.
11. Indications for early intubation [PARA]
 - a. Indications for Early Intubation:
 - i. Signs of airway obstruction: hoarseness, stridor, accessory respiratory muscle use, sternal retraction.
 - ii. Extent of the burn (TBSA burn > 40-50%).
 - iii. Extensive and deep facial burns.
 - iv. Burns inside the mouth.
 - v. Confined space burn with greater than 20% TBSA burn and facial burns
 - vi. Significant edema or risk for edema.
 - vii. Difficulty swallowing.

- viii. Signs of respiratory compromise: Inability to clear secretions, respiratory fatigue, poor oxygenation, or ventilation.
 - ix. Decreased LOC where airway protective reflexes are impaired.
12. **Inter-Facility Considerations**
- a. Weight Based IV Fluid Resuscitation
 - i. Adult Thermal and Chemical Burns
 - 2 ml LR x patient's body weight in kg x % second and third degree burns, with half of the 24-hour total (in mls) infused over the first 8 hours.
 - ii. Pediatric Patients
 - 3 ml LR x patient's body weight in kg x % second and third degree burns, with half of the 24-hour total (in mls) infused over the first 8 hours.
 - Patients less than 30kg: Addition of D5 at weight based maintenance rate
 - iii. Adults with High-Voltage Electrical Injuries (evidence of myoglobinuria) 4 ml LR x patient's body weight in kg x % second and third degree burns, with half of the 24-hour total (in mls) infused over the first 8 hours.
 - b. Foley Catheter Placement [**Critical Care**] for monitoring urine output
 - c. Urine Output Goals (Based on Ideal Body Weight)
 - i. Adults: 0.5 ml/kg/hour (or 30-50 ml/hour)
 - ii. Young Children (weighing \leq 30kg): 1 ml/kg/hour
 - iii. Pediatric (Weighing $>$ 30 kg): 0.5 ml/kg/hour
 - iv. Adult patients with high voltage electrical injuries with evidence of myoglobinuria: 1-1.5 mL/kg/hr (75 – 100 ml/hour) until urine clears.
 - d. Fluid Titration Based on Urine Output: Infusion rate should be increased or decreased up to 1/3 if urine output falls below or exceeds the desired level by more than 1/3 every hour

Special Treatment Considerations

1. If blast mechanism, treat per the [Blast Injury guideline](#).
2. Recognize that airway burns can rapidly lead to upper airway obstruction and respiratory failure.
3. Consider the potential for [cyanide poisoning](#) in a patient with depressed GCS, respiratory difficulty, and cardiovascular collapse in the setting of an enclosed- space fire. Give the antidote (hydroxocobalamin), if available, in this circumstance.
4. Recognize that carbon monoxide toxicity, particularly in enclosed-space fires, may affect the accuracy of pulse oximetry [see [Carbon Monoxide/Smoke Inhalation guideline](#)].
5. For specific chemical exposures (cyanide, hydrofluoric acid, other acids and alkali) [see [Topical Chemical Burn guideline](#)].
6. Consider decontamination and notification of receiving facility of potentially contaminated patient (e.g. methamphetamine (meth) lab incident).

Notes and Educational Pearls

- Onset of stridor and change in voice are sentinel signs of potentially significant airway burns, which may rapidly lead to airway obstruction or respiratory failure.
- If the patient is in shock within one hour of burn, it is not from the burn. Evaluate the patient carefully for associated trauma or cyanide toxicity.
- If the patient is not in shock, the fluid rates recommended above will adequately maintain patient's fluid volume.
- Pain management is critical in acute burns.
- ET CO_2 monitoring may be particularly useful to monitor respiratory status in patients receiving significant doses of narcotic pain medication.
- ECG cardiac monitor is important in electrical burns and chemical inhalations.
- TBSA is calculated only based on percent of second and third degree burns. First degree burns are not included in this calculation.

Quality Improvement

- Burn trauma is relatively uncommon. Providers should receive regular training on burn assessment

and management.

- **Associated NEMSIS Protocol(s) (eProtocol.01)**
- 9914085—Injury-Burns-Thermal

Key Documentation Elements

- Initial airway status
- Total volume of fluid administered
- Body surface area of second and third degree burns (TBSA)
- Pulse and capillary refill exam distally on any circumferentially burned extremity
- Pain scale documentation and pain management

Performance Measures

- Patient transported to most appropriate hospital, preferably a burn center
- Pain scale documented and pain appropriately managed
- Airway assessment and management appropriately documented

EMS Compass® Measures (for additional information, see www.emscompass.org)

- *PEDS-03: Documentation of estimated weight in kilograms.* Frequency that weight or length-based estimate are documented in kilograms
- *Trauma-01: Pain assessment of injured patients.* Recognizing that pain is undertreated in injured patients, it is important to assess whether a patient is experiencing pain
- *Trauma-02: Pain re-assessment of injured patients.* Recognizing that pain is undertreated in injured patients, it is important to assess whether a patient is experiencing pain
- *Trauma-04: Trauma patients transported to trauma center.* Trauma patients meeting Step 1 or 2* or 3** of the *CDC Guidelines for Field Triage of Injured Patients* are transported to a trauma center
 - Any value documented in NEMSIS eInjury.03 - Trauma Center Criteria * 8 of 14 values under eInjury.04 - Vehicular, Pedestrian, or Other Injury Risk Factor match Step 3, the remaining 6 value options match Step 4

References

1. American Burn Association. Advanced Burn Life Support (ABLS) Handbook; 2011.
2. Chung K, Salinas J, Renz E, et al. Simple derivation of the initial fluid rate for the resuscitation of severely burned adult combat casualties: in Silico validation of the rule of ten. *J Trauma*. 2010;69 Suppl 1:S49-54.
3. Fluid Rate charts (based on Parkland formula) and TBSA diagrams courtesy of the University of Utah Burn Center; 2014. As presented in [Appendix VI](#) – Initial Fluid Rate Chart for Burns.