



TRACIE
HEALTHCARE EMERGENCY PREPAREDNESS
INFORMATION GATEWAY

BURN MASS CASUALTY INCIDENTS: TRIAGE, ASSESSMENT, AND TREATMENT CONSIDERATIONS



CAIIMT14, National Interagency Fire Center

Burn Mass Casualty Incidents (BMCI) are infrequent but can quickly overwhelm local resources and exceed the capacity of the closest burn center to provide care. Patients will need to be cared for initially at non-burn facilities that may be called on to render immediate critical interventions and prolonged care until transfer to a burn center is deemed necessary and possible. **This ASPR TRACIE tip sheet offers an initial approach to burn injury evaluation and resuscitation at hospitals that do not normally provide burn care.** Close coordination with the referral burn center is advised. In BMCIs, a regional strategy for patient distribution will be required that should involve the receiving burn center as well as regional patient distribution structures such as Medical Operations Coordination Centers (MOCCs) and telemedicine capability.

Burn-Specific Patient Triage Considerations

The standard principles of trauma management always take precedence, but when triaging patients from a BMCI, providers should also be aware of the following:

- Initially, burn patients **without** associated trauma or respiratory injury are usually awake, alert, and oriented.
- Burn patients **without** associated injuries are normally tachycardic (unless they are on beta blockers) and typically normo/hypertensive. If this is not consistent with the patient presentation/vital signs, providers should strongly consider whether there are injuries in addition to burns.

RELATED RESOURCES

ASPR TRACIE Resource

- [Burns Topic Collection](#)

ABA Resources

- [ABA's Disaster Response Page](#)
- [Burn Mass Casualty Incidents, the Revised \(v.3\) Triage Tables during a Surge of Burn Injured Patients](#)
- [Patient Care Priorities for the First 24 Hours in Burn Mass Casualty for Non-Burn Physicians](#)

Western Region Burn Disaster Consortium & Partner Resources

- [Burn Buddy Badge](#)
- [Burn Injury Guidelines for Care](#)
- [Burn Injury Poster](#)

Other Resources

- [Crisis Standards of Care \(University of Utah Health \(free registration required\)\)](#)

- Common triage systems such as START and jumpSTART have limited applicability to burn patients as those with burn injuries may be classified as “green” because they are able to walk. This classification undertriages/ lowers their priority for assessment and transport.
- The American Burn Association (ABA) recommends the following categorization for burn patients (when burn is the only obvious injury and understanding that pre-hospital assessments may be difficult and overestimate the extent of burns and underestimate inhalational injuries that evolve):

Category	Signs
Green Patients	<10% total body surface area (TBSA) 2nd/3rd degree. No inhalation injury. Normotensive. Glasgow Coma Scale (GCS) >14.
Yellow Patients	10-20% TBSA 2nd/3rd degree. Suspected inhalation injury or possible intubation required. Normotensive. GCS >14.
Red Patients	>20% TBSA 2nd/3rd degree. Burns with trauma and/or airway compromise.

Patients with severe burns will likely require intensive surgical interventions and skin grafting. Fortunately, most surgical interventions (aside from escharotomies) occur after the first 48 hours, allowing time for initial resuscitation and transfer decision-making after a BMCI.

If the number of burn casualties overwhelms a facility, system, or region, crisis standards of care decisions may need to be made, and priority shifted to patients with a high chance of survival despite significant burns. Burn surgeons/burn care experts can provide consultation, including virtually, to help a referring hospital prioritize among large numbers of burn casualties and may use published decision tables as part of that calculus.¹

Pre-Hospital Care

Effective burn care begins with the rapid removal of the patient from the source of the burn and preventing further injury. Rapid activation of 911 and emergency medical services (EMS) procedures for burn care and mass casualty (including burn) patient distribution can ensure that the patients receive timely care and adequate resources. Intravenous access, maintaining body temperature, and initiating analgesia are important priorities of pre-hospital care. For major burns, cooling measures are discouraged as they can result in hypothermia.

Burn Patient Assessment and Treatment

There are a number of burn-specific considerations providers should have in mind when conducting primary and secondary assessments of patients. Following the Airway, Breathing, Circulation, Disability, Exposure (ABCDE) approach, providers should be aware of the following when assessing patients from a BMCI:

A – Airway Management

- Patients with closed space exposure to smoke/superheated gases (e.g., a house fire) are at highest risk of needing airway management.
- **Swelling is progressive**; a prolonged transport time or delay in reaching care may impact the airway and ability to intubate.

¹Taylor, S., Jeng, J., Saffle, J., et al. (2014). [Redefining the Outcomes to Resources Ratio for Burn Patient Triage in a Mass Casualty](#). Journal of Burn Care and Research. 35(1):41-45.

- **Supraglottic edema may occur without direct thermal injury to the airway** but secondary to the fluid shifts associated with burn injury and fluid resuscitation. This typically occurs in patients with injuries over 20% TBSA during ongoing resuscitation.
 - » Early airway intervention is best, with burn center consultation around TBSA (ideally using images to confirm burn extent).
- Hoarseness or stridor and swollen eyes or lips may indicate the need for intubation.
- An endotracheal tube that becomes dislodged may be impossible to replace due to obstruction of the upper airway by edema. Secure the endotracheal tubing (ETT) with ties passed around the head; do not use tape as it will not adhere to burned tissue.
 - » Tape should not be used on burned faces.
 - » Frequent suctioning may be required.
- Pediatric airways are smaller; less edema causes obstruction.

B – Breathing – Inhalation Injury to Lungs

- Airway injury below the glottis includes a history of enclosed space exposure and results in hypoxia (primarily) due to soot and lower airway inflammation. It is typically evaluated by bronchoscopy.
- The toxins/chemicals in smoke damage the pulmonary bronchial tree.
- Pathophysiology associated with injury below the glottis include sloughing of the epithelial lining of the airway, mucus hyper secretion, impaired ciliary activity, inflammation, surfactant inactivation, pulmonary edema, ventilation/perfusion mismatch, increased blood flow, spasm of bronchi and bronchioles, and impaired immune defenses.
- **Symptoms may progress for up to 72 hours after injury; the patient can rapidly develop hypoxemia and infection.** This can also contribute to multiple organ failure.
- Inhalational injury is **not** an indication for “prophylactic” intubation. Initial treatment is with humidified oxygen and close monitoring.
- Singed nasal/facial hair alone does not necessarily warrant intubation. Flashover burns that do not damage the airways may also cause singeing.

C – Circulation/Fluid Resuscitation

- Burn size estimation is a crucial component of acute burn management and guides referral to burn centers, fluid resuscitation parameters, hospital resource distribution, and other interventions.
- **Superficial (first-degree) burn injury is NOT counted in TBSA** but is typically the reason for burn surface area overestimation. Do not count areas of skin that are red but still have intact epidermis without blistering.

Resuscitation must be aimed at:

- Maintaining tissue perfusion and organ function.
- Avoiding complications of inadequate or excessive fluid therapy.

- The rule of nines or the rule of palms is typically used by non-burn providers to estimate TBSA. Generally, burn centers use the Lund and Browder method as it is the most accurate and compensates for variations of body shape with age.

- **Fluid management is critical to the survival of a burn patient.** Resuscitation fluid volumes depend on an accurate TBSA.

- Burns less than 10% TBSA (e.g., a full arm and hand) do not typically require fluid resuscitation.

- Pediatric patients less than 12 years of age need a dextrose source in *addition* to the lactated ringers (LR) resuscitation fluid to maintain blood sugar.

» The ABA recommends using D5LR.

» The D5LR maintenance rate is calculated using the 4/2/1 rule. This rate is not adjusted as increases will result in excess glucose being delivered.

- For burns over 20% TBSA, the initial fluid rates are as follows:

Age	Initial Fluid Rate
5 years of age and younger	125 mL/hr
6-12 years of age	250 mL/hr
13 years of age and older	500 mL/hr

- Once the patient's weight and percentage of TBSA burn is determined, the adjusted fluid rate is calculated as follows:

Age/Type of Injury	Adjusted Fluid Rate
12 years of age and younger	$3 \text{ mL} \times \text{kg} \times \% \text{ TBSA} \div 16 = \text{mL/hr starting rate plus D5LR at the maintenance rate using the 4/2/1 rule}$
13 years of age and older	$2 \text{ mL} \times \text{kg} \times \% \text{ TBSA} \div 16$
Electrical injuries	$4 \text{ mL} \times \text{kg} \times \% \text{ TBSA} \div 16$

- The single best monitor of resuscitation is urine output. Vital signs and level of consciousness (LOC) trending can also be helpful.

» Discard first urine after foley catheter placement, then observe hourly.

» Adjust LR resuscitation fluid according to urine output.

- Fluid loss associated with burn injuries is slow and progressive. Patients with burns usually do not develop shock within 60 minutes from time of injury unless there are associated injuries or medical conditions. Fluid boluses are not recommended unless there is an associated injury.

- Formulas only estimate fluid required. Burns vary in response.

RELATED RESOURCES

- [Rule of Nines](#)
- [Palmar Method](#)
- [Lund and Browder](#)
- [4/2/1 Rule](#)
- [Burn Size Estimation: A Remarkable History with Clinical Practice Implications](#)
- [Burn Evaluation and Management](#)

When resources are scarce, one intravenous (IV)/intraosseous (IO) line per patient should be inserted until the hospital determines adequate resources are available for all patients. Priority should be given to patients:

- With burns >20% TBSA if adults.
- With burns >10% TBSA if pediatric.
- With associated trauma and blood loss.

E – Exposure/Environment – Temperature Management

- Check the patient's temperature. This is the number one missed vital sign and helps determine care and interventions moving forward (e.g., using fluid warmers, changing dressing, managing patient exposure time).
- Hypothermia is a frequent consequence of burn injury. Patients lose the ability to regulate their temperature as the skin is damaged. Hypothermia causes vasoconstriction of the blood vessels and will decrease blood flow to already compromised areas of burn injury.
- Clinical studies have shown that there is excess lactic acid production in the presence of hypothermia and that hypothermic coagulopathy can follow. This significantly increases morbidity and mortality.
- Minimize patient exposure time/keep the patient covered.
- **All burn patients should be kept warm and dry.** Consider the use of IV fluid warmers and other warming devices such as blankets, warming pads/hot air blankets, and other devices.
- Do not use wet dressings as they can cause hypothermia.
- If blankets are not available, patients can be wrapped in plastic or mylar blankets for insulation and warmth.

Additional Treatment Considerations

The following additional considerations can help maintain a burn patient's safety and comfort during treatment and can help providers prioritize next steps:

- Telemedicine consultation, if available, is critical to assess the degree of injury, inform ongoing care, and prioritize transfer. Photos or telemedicine consultation should be used prior to dressing the wounds, if possible.
- Consider covering wounds with a topical treatment followed by non-adherent or dry dressings if waiting to transfer the patient to a definitive care site. Check with the burn center to learn if there is a preference for specific types of dressings.
- Do not use excessive pressure when handling wounds.
 - » Use flat surface of hands rather than fingertips.
 - » Support burned extremities from underneath rather than gripping.
 - » Elevate burned extremities.

Consider the following when providing pain management:

- Burns hurt due to exposed nerve endings and produce high visual anxiety. Patients often become anxious seeing their injuries (e.g., skin falling off) and healthcare providers can become distracted by very visual injuries.

- Patients will likely not be pain-free even with medications.
- Educating patients about why their burn hurts is important. A painful burn has intact sensation, which means it will heal. Knowing this may alleviate some anxiety and make patients feel better.
- Small amounts of opioids should be given frequently with reassessment.
- Adjunctive pain medications and anti-anxiety medications may be needed by many patients.
- The patient's respiratory status should be carefully monitored as excess medications can result in respiratory failure.
- Intravenous analgesia is the preferred route in severe burns. Intramuscular, subcutaneous, and oral analgesics are absorbed unreliably following burn injury due to fluid shifts and gastrointestinal stasis.
- Adhere to facility/agency protocols.

Psychological support is an important component of a hospital response to a BMCI.

- Disasters/burn injuries have a significant psychological impact on survivors, their loved ones, and responders.
- Psychological support, crisis counseling, and other supportive resources are essential to offer to those affected by the incident.

Adequate treatment of burn patients depends on adequate supplies. Hospitals may wish to use the [Disaster Available Supplies in Hospitals](#) (DASH) Tool to determine whether their supplies are likely to be sufficient.

Acknowledgments

ASPR TRACIE thanks the following subject matter experts for their review of this document (listed alphabetically: **John Hick**, MD, HHS ASPR and Hennepin Healthcare; **Annette Newman**, MS, RN, CCRN, Community Outreach/Burn Disaster Coordinator, Western Region Burn Disaster Consortium Coordinator and Western Region Alliance for Pediatric Emergency Management – Utah Coordinator; **Tina Palmieri**, MD, FACS, MCCM, Professor In-Residence and Burn Division Chief, Shriners Hospital for Children; **Judy Placek**, MSN, APRN, FNP-BC, CBRN, APP Specialty Care, Infectious Disease, Nebraska Medicine; and **Colleen Ryan**, MD, FACS, Surgeon, Sumner Redstone Burn Center, Massachusetts General Hospital and Shriners Hospital for Children – Boston and Professor of Surgery, Harvard Medical School.