

# BURN MASS CASUALTY

## Introduction

The care of major burns is multidisciplinary and often includes potentially complex surgical and rehabilitation services. Though the numbers vary year-to-year, there are about 75-80 [American Burn Association \(ABA\) verified burn centers](#) in the United States plus around the same number of centers that have not achieved verification status, providing approximately 1,900 burn beds in the entire nation combined. With such limited specialized inpatient burn resources, every hospital needs to be prepared to provide initial stabilization and treatment of burn patients and coordinate their ongoing care needs.

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A burn mass casualty incident (BMCI) poses challenges for the hospital and healthcare system, due to discrepancy in knowledge and expertise and the assumption that burn injuries must be treated by burn clinicians. It is important to note that:

- Even small numbers of burn patients can quickly overwhelm local healthcare system resources.
- Treatment of serious burns can be very labor intensive, but less serious burn injuries can be treated in place with burn care provider consultation.
- Burn patients are typically stable initially unless they need airway management.
- Surgery on burn patients does not need to occur until days after injury.
- All hospitals can stabilize a critical burn patient for 72-96 hours.
- Burn center consultation and engagement will be critical to managing patients and prioritizing transfers. This may include telemedicine consultation.

### Related Resources

ASPR TRACIE's [Burns Topic Collection](#) includes numerous resources to assist hospitals with their BMCI planning. The [Burn Mass Casualty Incidents: Triage, Assessment, and Treatment Considerations](#) document offers an initial approach to burn injury evaluation and resuscitation at hospitals that do not normally provide burn care.

The ABA has five disaster response regions in the U.S. (and a sixth in Canada), each with a coordinating burn center and hotline phone number.<sup>1</sup> If a BMCI overwhelms local resources,

<sup>1</sup> <https://ameriburn.org/quality-care/disaster-response/>

the regional lead centers can help coordinate available burn center beds and assist with patient prioritization. This may involve coordination of patient transfers across multiple ABA regions. There is also a national database of burn centers and burn beds that can be accessed in the event an incident affects more than one center. Notably, the ABA regions do *not* correspond with the ten Federal Emergency Management Agency (FEMA) regions. Hospitals should understand state and regional plans for BMCI prior to an incident.

#### Related Resources

ASPR TRACIE's article, [The Big Picture: Using the Nevada Hospital Association's Burn Watch Board to Understand Capacity](#), describes a tool that can help track availability of burn beds.

The logistics of transportation and time dictate that not every patient who would normally be hospitalized in a burn center will have access to one in a BMCI. Aircraft and ambulances may need to cover long distances to support burn patient transfers, which will be reserved for the highest priority patients. Those with less serious injuries, particularly those who do not require extensive skin grafting, may be effectively cared for in non-burn centers (sometimes designated and referred to as “burn surge” facilities)<sup>2</sup> with virtual<sup>3</sup> and potentially in-person support from trained nurses and physicians.

No matter what regional resources are available, preventing deaths and complications from burn injuries requires effective and efficient initial care at the first receiving hospital. Every hospital must have adequate supplies, trained staff, and consultation/transfer mechanisms in place prior to an incident.

Planning for a BMCI means very different things depending on:

- The size of the facility
- The role of the facility in the community (e.g., trauma level, only hospital in area)
- Local risks (e.g., rail lines, wildfire) identified through hazard vulnerability assessments
- Burn services provided and proximity to nearest burn center
- Initial response complexity (e.g., number of agencies involved)
- Emergency medical services (EMS) resources and patient distribution

After determining the initial planning thresholds, the hospital emergency manager and medical director for emergency preparedness/emergency services should engage their referral burn center(s) (ideally a primary and backup) to determine its:

- Daily and surge capacity
- Plans for coordination during a BMCI
- Plans for telehealth/virtual consultation and support for routine burn referrals as well as during a mass casualty incident (MCI)
- Relationship with other hospitals in the area that will care for inhalational injuries and less severe burns

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<sup>2</sup> <https://www.health.state.mn.us/communities/ep/surge/burn/index.html>

<sup>3</sup> <https://healthcare.utah.edu/burn-center/services/telemedicine>

- Preferences for dressings and topical burn treatments

This chapter assumes the hospital is *not* a burn center though the principles of space, staff, stuff, and systems are consistent with hospital surge frameworks.

## Supplies

Most serious burn patients and all with significant inhalational injuries will require intubation and ventilation, ideally with humidified oxygen. Hospitals that have planned for traumatic MCIs should have an adequate quantity of airway management supplies available for a BMCI. Usual vascular access and general patient care supplies are applicable, though several categories of supplies require special attention:

1. **Pharmaceuticals** – Burn patients require aggressive ongoing analgesia and sedation. [The DASH Tool](#) can help forecast needs, but if patients are not transferred, the initial receiving hospital may need substantially more medications for continuing care. Adequate stock of tetanus boosters should be available. Cyanide antidote kits may be helpful to treat patients with closed space smoke exposure who are acidotic or critically ill, but these kits are expensive.
2. **Intravenous (IV) fluids** – Lactated Ringer’s solution is generally preferred and should be available in adequate quantities for at least the initial 48 hours of care. IV bags for medication drips will also be needed.
3. **Topicals** – The area referral burn center may have preferences for specific topical antibiotics, but it may be prudent to stock a variety for different purposes. In general, bacitracin is useful as an easy to apply initial topical agent that is also well-suited to the outpatient setting. It is preferred for use on the face, is inexpensive, and allows easy inspection of the underlying skin. Silver sulfadiazine is also a commonly used topical antibiotic, but it must be applied more thickly, is opaque, and dressings must be changed more frequently. This requires closer monitoring and more effort. In a burn surge situation, adequate staff may not be available. Also, if the hospital will be sending a patient to another center, the opaqueness makes the wound more difficult to evaluate. A third topical antibiotic, mafenide acetate, is particularly helpful for full-thickness burns. However, application of mafenide acetate cream is very painful, requiring the use of additional resources and staff. Furthermore, when used alone topically, mafenide acetate can predispose patients to fungal infections. If available, burn dressings with impregnated silver may be directly applied to the wound and do not require additional topical agents. Topical disinfectants (e.g., chlorhexidine) must also be available to healthcare providers in a BMCI.
4. **Dressings** – Sterile sheets should be available for initial patient care. Dry, sterile, surgical/burn gauze dressings (which do not shed fibers the way standard gauze can)

### Related Resources

Completing the modules of the Disaster Available Supplies in Hospitals ([DASH](#)) Tool can help a hospital determine the specific number of casualties that will anchor their planning. This number may need to be adjusted depending on local hazards, understanding that even small, relatively low-risk communities can experience [mass burn incidents](#) and that recent tragic [wildfire](#) and [rail](#) incidents had the potential to be far worse.

may be used directly on the topical agents or usual absorbent gauze can be used on top of petrolatum-impregnated, nonstick dressings. Silver-impregnated dressings are the gold standard for burn care but are more expensive. If distributors are unable to provide adequate silver-containing dressings following a BMCI, they may be requested through the [Strategic National Stockpile](#).

5. **Thermal management** – Patients with large areas of burned tissue have difficulty regulating body temperature. Providing foil “hats,” blankets, warm-air or water blanket systems and increasing ambient temperature in the care area may be necessary to keep burn patients warm enough. This is particularly critical for infants and small children and those with large areas of affected skin. IV fluid warmers can also maintain adequate body temperature.
6. **Surgical supplies** – Even if the hospital does not provide surgical services, surgical instruments for debridement (e.g., iris scissors, pickups) and escharotomy (e.g., scalpels, cautery) should be available. Most initial debridement is via washcloths, soap (e.g., chlorhexidine), and water and does not require any specific instruments.

Most of these products are relatively affordable and have long shelf lives. Substitution is not easy, and these supplies are not rotated through usual hospital stock for non-burn injuries. Some hospitals store these products on dedicated burn response carts. In a crisis situation, plastic food grade wrap may be used with water-based gels or ointments to protect burned tissue prior to patient transfer.

## Training and Exercises

Most healthcare providers rarely encounter major burns, but these injuries are dramatic and difficult due to their graphic and painful nature. That is where the importance of training and readily available resources to help guide resuscitation are most helpful.

### Considerations

No exercise can prepare a provider well for the sight of many patients with severe burns, the distress the patients are experiencing, and the smell of the burned tissues – all of which can contribute to narrowed cognitive bandwidth and increase the chance of treatment errors.

Every resuscitation area should have a quick-reference guide or poster for initial burn care.<sup>4</sup> Every emergency nurse and provider should be educated about basic burn management, ideally including didactic (perhaps from regional burn center experts) and simulation experience (e.g., the ABA Advanced Burn Life Support course).<sup>5</sup> Exercises for a burn disaster should allow providers to observe and participate in assessment and triage of patients. Having printed job aids and quick reference materials available for both initial resuscitation and ongoing (e.g., first 12 hours) patient management can help providers maintain focus on reassessment of key patient variables and initial wound care priorities. Secondary triage guidelines for mass burn

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<sup>4</sup> <https://wrap-em.org/index.php/wrap-em-exclusive/818-burn-injury-poster-2/viewdocument/818>

<sup>5</sup> <https://ameriburn.org/education/advanced-burn-life-support-abls/>

situations should be familiar to or at least available to providers for reference in conjunction with burn surgeon consultation as they may affect priority for transfer or care when resources are constrained.<sup>6</sup>

## Response

An effective response to a BMCI begins with proper EMS triage, treatment, and transport to the most appropriate facility. If there are multiple hospitals in the area, the hospital emergency manager should be familiar with BMCI plans and any dedicated pre-hospital or regional treatment supplies. As for other MCIs, the hospital staff should know how they will be notified of a BMCI.

Upon notification of a BMCI, the hospital should activate its MCI plan. Providers should wear barrier gowns and masks in addition to practicing standard precautions as an infection prevention measure. Ideally, sterile sheets should be placed on beds that major burn patients will be transferred onto. Blankets, patient warmers, IV fluids, and fluid warmers should be available. Dedicated burn care supplies should be mobilized along with additional medications for airway management, analgesia, and sedation. Adequate airway management equipment should be available. Additional ventilators or personnel to assist with ventilating patients may be needed.

### From the Field

Some hospitals have “bedside boxes” for initial airway management in spaces that are not usually designed for critical care to ensure all the necessary supplies for intubation are packaged together and available.

Initial triage should be set up as for any MCI. Burn patients are susceptible to over-triage (i.e., assigning too high a priority for care due to the impressive visual appearance and degree of patient distress). Triage providers should prioritize patients for critical care areas if they have any airway or respiratory symptoms, altered mental status, and/or severe (e.g., > 20% total body surface area) burns.

Once airway, breathing, and circulation are addressed, provide adequate pain and anxiety control and IV fluid support, and assess the burns for depth, surface area involved, and complicated features. Staff should be prepared to move patients to or from critical care areas after their initial assessment as it is common to initially over or underestimate severity and to have airway problems worsen over time. For closed space smoke exposures (e.g., building fire), consider potential carbon monoxide or cyanide toxicity (which may necessitate specialty treatment).

Following initial stabilization, consultation with a burn center should be established. In case a local burn center is overwhelmed by patients or calls and cannot assist, the ABA Regional

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<sup>6</sup> <https://ameriburn.org/quality-care/disaster-response/>

Coordinator and national ABA hotline numbers should also be available. The consultant can help determine which patients will need transfer and which can be managed locally.

Depending on the time to transfer and whether some patients will receive ongoing inpatient and outpatient care at the initial hospital, care should transition to ongoing management. It is essential to monitor patients during this time period (e.g., check vital signs, temperature, urine output, pain control, limb circulation, oxygenation/respiratory status, burn evolution) in addition to conducting initial wound care (e.g., removal of loose dead tissue and clothing; debridement of large blisters; gentle cleansing and dressing; and reassessment of depth, location, and potential for circumferential swelling). Tetanus status should be evaluated and boosters given at this time. Ensuring body temperature is maintained is a high priority, particularly for larger burns and children.

Patients who can be managed as outpatients should have their wounds appropriately dressed and receive supplies and prescriptions as required. Follow-up appointments to monitor burn evolution should take place about 48 hours after the incident if possible. In some BMCIs it may be possible to have a burn nurse or provider come to the affected area to assist with evaluation and follow up; this should be discussed with the referral burn center if indicated.

Ongoing virtual consultation and care support for patients remaining at the receiving hospital are imperative; related technology should be arranged if not already established. In some cases, the area burn center will be overwhelmed and ongoing virtual consultation may need to be arranged with another ABA center or burn hospital within the parent healthcare system.

Additional supplies should be obtained or requested as needed. Psychological support should be offered to all providers, patients, and family members, as the emotional impact of BMCIs can be severe and lasting. An event review should occur soon after the conclusion of emergency response activities followed by appropriate after-action and debriefing activities as required. Depending on the situation, ongoing individual support may be needed for a prolonged period after the incident.

## Care Coordination/Transfer Management

The usual receiving burn center or the ABA regional center can assist with secondary triage of the patients for transfer, depending on the resources available. This may require the burn center to assess patients waiting in multiple hospitals to determine who needs to be prioritized for transfer. Once priorities are established and the burn center agrees to accept the patients, transportation can be arranged.

Ideally, a consultant experienced in treating burn injuries can use telemedicine services to assess the burns. Sharing photos may also be possible using a Health Insurance Portability and Accountability Act (HIPAA)-compliant platform. Voice consultation alone is suboptimal but may be the best option available given the circumstances.

In some cases, the most severely burned may have a poor prognosis and may be a lower priority for transfer when inadequate transport resources are available.<sup>7</sup> Depending on the incident, patients may have isolated inhalational injury with limited thermal burns; these patients may be able to be managed at a tertiary care center rather than a burn center. In situations where the number of burn victims overwhelms the capacity of the burn center, but a hospital is not capable of managing the patient's needs (e.g., ventilator or other surgical needs), another tertiary or trauma center may be the best destination for the patient. Ideally, the regional burn plan specifies hospitals that will provide care for these overflow patients. A running list of patients, priority for transfer, and anticipated destination is important to avoid confusion. This level of incident requires coordination and decision-making mechanisms that are often inadequately practiced within the jurisdiction (e.g., state) or interstate region.

A regional EMS coordinating entity may be responsible for organizing and prioritizing transportation of the patients. If that capacity is not available, the hospital will need to work with jurisdictional and regional EMS agencies to arrange transportation. Transport may be dependent on time, distance, weather, and the commitments of EMS to the ongoing incident/community 911 needs. In some cases, use of an ambulance strike team (mobilized at the regional or state level) or use of ambulances/aircraft from the burn center's community may be the best option. In the event air assets are used, it may be helpful to bring a burn provider to the referring hospital, particularly if a small community hospital receives multiple burn victims. This type of support should be discussed regionally prior to an incident. The Nevada Hospital Association's Burn Watch Board can also be helpful to determine potential available beds in proximate states.

## Conclusion

Planning for a BMCI uses baseline systems for mass casualty incidents, but with supplies, training, and regional coordination that are specific to a burn response. Given the specialty care required by many burn patients but also the ability for many patients to be treated and released, hospitals need to devote adequate planning time to a BMCI scenario and understand their existing capabilities, local and regional plans, and resources while building relationships with their burn receiving centers and ABA regional centers.

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<sup>7</sup> Taylor, 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 and Kearns, R., Bettencourt, A., Hickerson, W., et al. (2020). [Actionable, Revised \(v.3\), and Amplified American Burn Association Triage Tables for Mass Casualties: A Civilian Defense Guideline](#). Journal of Burn Care and Research. 41(4):770-779.

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