



Burn Surge

An Annex of the Healthcare Coalition of Rhode Island Response Plan

As of 06/17/2022

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Promulgation Document

To all Recipients:

Promulgated herewith is the Healthcare Coalition of Rhode Island Response Plan’s Burn Surge Annex. This annex is intended to supplement the response and coordination processes outlined within the Response Plan with burn injury-specific context and considerations.

This annex (and the Healthcare Coalition of Rhode Island Response Plan) is not intended to either preclude or supersede any plans maintained by the Coalition’s members; rather, it is intended to provide clear guidance to members and stakeholders about the Coalition’s processes and how they may be employed in response to a large-scale incident involving burn injuries, around which they may further develop and refine their own respective plans, processes, and activities.

This annex will be reviewed by the Coalition’s membership on a regular basis. Lessons learned and best practices that are identified will be incorporated into a regular update process, coordinated by the Coalition’s Co-Chairs.

Sincerely,

Dawn Lewis
HCRI Co-Chair

Date

Philip Sheridan
(Acting) HCRI Co-Chair


Date

Verification of Plan Approval


The undersigned agree with the following Healthcare Coalition of Rhode Island Response Plan's Burn Surge Annex:



Hospitals Representative 15 Jun 22
Date



Emergency Medical Services Representative 6/14/2022
Date



Emergency Management Representative 6/13/2022
Date




Public Health Representative 6/13/2022
Date

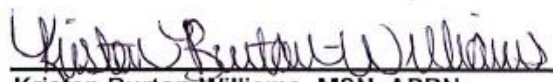
The Co-Chairs of the Healthcare Coalition of Rhode Island and the Coalition's Burn Surge Clinical Advisor have reviewed and authorized final approval of the Healthcare Coalition of Rhode Island Response Plan's Burn Surge Annex.



Dawn Lewis 6/13/2022
Date
HCRI Co-Chair



Philip Sheridan 6/13/2022
Date
(Acting) HCRI Co-Chair



Kristen Burton-Williams, MSN, APRN 6/14/22
Date
Director of Burn Nursing, Rhode Island Burn Center
HCRI Burn Surge Clinical Advisor

Record of Revision

The following revisions have been approved by the Co-Chairs of the Healthcare Coalition of Rhode Island, in concert with all appropriate stakeholders:

Revision Number	Date of Revision	Section and Summary of Changes

Record of Distribution

The following individuals and agencies have received this version of the Healthcare Coalition of Rhode Island Response Plan’s Burn Surge Annex:

Plan Recipient and Job Title	Agency	Date of Delivery	Copies Delivered

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Introduction

This is an annex of the Healthcare Coalition of Rhode Island (HCRI) Response Plan. For more information on the Coalition and its activities, including those both before and during disasters, please see the HCRI Preparedness Plan and the HCRI Response Plan, respectively.

Purpose and Scope

The purpose of HCRI's Burn Surge Annex is to outline current capabilities and capacity, expected actions, and other guidance and references to support the ability of the Coalition and its members to effectively respond to a large-scale incident involving a high volume of burn injuries among victims and patients.

As an annex to HCRI's Response Plan, this document is intended to supplement existing processes and policies implemented within the Coalition in support of an all-hazards approach to emergency response. This document is not intended to supplant or supersede any existing plans maintained by individual HCRI members, the Coalition, or the State of Rhode Island; instead, it has been designed to further reinforce existing mechanisms for response coordination with subject-specific (burn injury) considerations and activities.

Situation Overview

Burn Care Capabilities and Capacity

In general, all hospitals maintain some capability to administer care for minor burns. As burn injuries grow in complexity and severity, capabilities for appropriate care become more limited. Rhode Island has one American Burn Association-verified burn center within its borders, located at Rhode Island Hospital.

Rhode Island's other acute-care hospitals often maintain burn-care capabilities at lower scale. These capabilities have been supported by the Coalition through the procurement of burn care supplies (burn carts) for each hospital, which hospitals have been expected to maintain since their deployment.

Burn Center

- Rhode Island Hospital Burn Center (ABA-verified)
 - 5 ICU acute-care burn beds
 - 10 non-ICU (step-down) burn beds
 - Surge capacity: 22
 - Adult and pediatric

Additional lower-level capabilities, including those for wound care, can be found within various outpatient settings in the State. These capabilities will be especially valuable when considering longer-term, chronic care for burn patients, rather than high-acuity, immediate needs. (*See also* Concept of Operations > General Medical Care Operations > Rehabilitation and Outpatient Follow-up Services)

Region

The following burn-care capabilities can be found in Rhode Island's neighboring states:

Burn Center

- UMass Memorial (Worcester, MA) (**not** ABA-verified)
 - 2 ICU acute-care burn beds
- Brigham and Women’s Hospital Burn Center (Boston, MA) (ABA-verified)
 - 10 ICU acute-care burn beds
 - 15 non-ICU (step-down) burn beds
 - Surge capacity: 30
 - **Adult only**
 - Helipad
- Shriners Hospitals for Children (Boston, MA) (ABA-verified)
 - 12 ICU acute-care burn beds
 - 18 non-ICU (step-down) burn beds
 - Surge capacity:
 - **Pediatric only**
 - No helipad
- Sumner Redstone Burn Center (Boston, MA) (ABA-verified)
 - 7 ICU acute-care burn beds
 - 14 non-ICU (step-down) burn beds
 - Surge capacity: 32
 - **Adult, some pediatric (15 and older)**
 - Helipad
- Connecticut Burn Center at Bridgeport Hospital (Bridgeport, CT) (ABA-verified)
 - 5 ICU acute-care burn beds
 - 4 non-ICU (step-down) burn beds
 - Surge capacity: 18
 - **Adult and pediatrics**
 - Helipad

Eastern Regional Burn Disaster Consortium

The Eastern Regional Burn Disaster Consortium (ERBDC), which covers the American Burn Association’s Northeast Region, brings together 26 burn centers from Maine through Maryland, including the District of Columbia, that have joined together to assist one another in event of a burn mass casualty incident. ERBDC membership includes Rhode Island Hospital.

ERBDC can be contacted to request support in identifying available beds at burn centers throughout the northeastern US. They may be reached at their Burn Disaster Emergency Hotline: (866) 778-3659. (*See also* Attachment 1: Northeast Regional Burn Mass Casualty Incident Response Plan)

Region 1 Regional Disaster Health Response System

The Region 1 Regional Disaster Health Response System (RDHRS) is an initiative funded and supported by the Assistant Secretary for Preparedness and Response (ASPR), coordinated and led primarily by Massachusetts General Hospital (Boston, MA). Region 1’s RDHRS will work to coordinate the clinical and operational subject-matter expertise of key partners from throughout the New England region, facilitating a system by which this expertise can be rapidly shared to support states responding to disaster. In addition to information sharing, RDHRS may also be engaged to support interstate resource sharing and patient movement.

With respect to burn care specifically, the RDHRS has developed a rapidly deployable, easy-to-use, HIPAA-compliant disaster telemedicine platform. Through this system, clinicians can

submit specialty consultation requests and remote clinical experts can then provide essential clinical advice to assist in the triage and/or treatment of patients. This system has been tested with partners from the American Burn Association.¹ In the event of its activation and use, RIDOH will work to rapidly ensure the licensing of out-of-state clinicians accessed by HCRI members through this capability, as necessary. (*See also* Concept of Operations > General Medical Care Operations > Telemedicine)

Assumptions

The following assumptions have been made to support the development and operationalization of this annex:

- The Rhode Island Department of Health/HCRI will receive timely notification from local/State emergency management and/or public safety of an incident involving a high volume of burn injuries
- A mass casualty incident (MCI) will be declared on scene, and may be accompanied by the activation of the MCI feature of the Patient Tracking System (PTS)
 - If an MCI is not activated in PTS by on-scene responders, HCRI leadership will activate it and notify responders accordingly
- All acute-care hospitals in Rhode Island maintain a baseline capability to provide stabilizing care for burn patients
- Hospital emergency departments may experience an initial influx of patients from the incident who have self-transported or traveled by means other than EMS
- Initial presentations to hospital emergency departments may be lower acuity
- Patients with significant burn injuries represent a small subset of patients; however, due to their complexity and injury severity, they impose a disproportionate impact on healthcare systems
- Care for burn patients can require significant resources, potentially exceeding the capacity of those which are locally available in Rhode Island, particularly if there is a large number of victims/patients
- Hospitals on diversion at the time of the incident must accept patients transported from the incident, in accordance with the exception to hospital diversions for patients from an MCI, as outlined in the Rhode Island Hospital Diversion Plan
- Region 1's Regional Disaster Health Response System (RDHRS) has the ability to share subject-matter expertise on topics such as burn-specific clinical care, including in the form of telehealth and virtual consultation, to support the Rhode Island healthcare system's existing burn care capabilities
- Region 1's RDHRS has the ability to support HCRI and RIDOH in the interstate movement of patients to neighboring states in the region to maximize surge capacity
- The ERBDC is available to provide assistance in identifying available beds in ABA-verified burn centers throughout the northeastern US

Concept of Operations

Activation and Notifications

¹ Bluestream Health. "Bluestream Health Selected by the Region 1 Disaster Health Response System to Provide Telehealth Services to Hospitals in Emergency and Crisis Situations." Accessed 27 April 2021. <https://www.bluestreamhealth.com/bluestream-health-selected-by-the-region-1-disaster-health-response-system-to-provide-telehealth-services-to-hospitals-in-emergency-and-crisis-situations/>.

When the Rhode Island Department of Health and/or HCRI leadership learn of an incident involving a high volume of burn injuries, HCRI leadership will promptly issue notification to all HCRI members of the incident, providing the following information:

- General nature of incident
- Location
- Number of casualties
- Estimated time until transport
- Complicating factors that could require receiving facilities to take protective actions (e.g., decontamination)
- Status of HCRI's Response Plan activation (and relevant annexes)

This notification will be issued through established HCRI communications mechanisms, generally facilitated through the use of the Rhode Island Health Notification and Hospital Capacity Systems.

HCRI's Response Plan and any relevant annexes (e.g., Burn Surge, Pediatric Surge, Chemical Surge, Radiological Surge) will be activated in response to burn incidents involving any one or more of the following criteria:

- A volume of patients with burn injuries whose care requirements exceed locally available resources
- A hospital in Rhode Island requests assistance from the Coalition in managing patients with burn injuries
- At the discretion of HCRI leadership

Depending on the nature and scale of the incident, a conference call or video chat with responding HCRI members may be convened following this initial notification.

Roles and Responsibilities

Roles and responsibilities of HCRI members in response to an incident involving a high volume of burn injuries are as follow.

HCRI Leadership

- Upon learning of an incident involving a high volume of burn injuries (or its potential), issue prompt notification to all members, with specific actions for certain members (e.g., hospitals) to take immediately (e.g., identify number of available beds)
- Maintain situational awareness with Coalition members and stakeholders engaged in the response
- Coordinate resource requests within HCRI, facilitating member-member sharing
- Coordinate with ERBDC to identify available beds in ABA-verified burn centers throughout the region; as Rhode Island's one sole ABA-verified burn center, Rhode Island Hospital may be engaged in this coordination with ERBDC
- Coordinate with Region 1 RDHRS to support regional sharing of clinical expertise in support of burn care, situational awareness, and to ascertain the availability of resources in neighboring states, as well as to facilitate the transfer of patients across state borders

HCRI Burn Surge Clinical Advisor

- Provide subject-matter expertise in the clinical management of burn injuries to HCRI leadership and members

- Coordinate, as necessary, with regional subject-matter experts through RDHRS processes to share clinical expertise throughout Region 1

Hospitals

- Respond to information and resource-availability requests from HCRI leadership
- Enter, as possible, emergency department self-presenters from the incident into the Patient Tracking System, linking those patients to the MCI assigned to the incident
- Post-event, re-inventory burn carts and other burn-care supplies and replace items that were used (pre-event, the burn carts and other burn supplies should be inventoried on a quarterly basis)

Public Health

- Respond to information and resource-availability requests from HCRI leadership
- Provide liaison to RIDOH subject matter experts (e.g., radiological, occupational health)
- Through Emergency Support Function 8 at the State Emergency Operations Center, maintain situational awareness with partner state and local agencies
- Liaise with public health counterparts in neighboring states for situational awareness and resource sharing
- Maintain situational awareness with federal public health and medical partners (e.g., CDC, ASPR)
- Request, if necessary, burn-care supplies and assets from Strategic National Stockpile
- Facilitate and expedite, as appropriate, any emergency healthcare-worker licensure requests/activities to support the surging healthcare system
- Facilitate any regulatory actions necessary to accommodate the use of out-of-hospital care capabilities (e.g., alternate care sites, field hospitals) to support the surging healthcare system
- Support family-patient reunification efforts by ensuring access, as appropriate, to information regarding the location of transported patients, including that gained through coordination with the RDHRS and Eastern Regional Burn Disaster Consortium
- Work with the Rhode Island Emergency Management Agency (RIEMA) and federal partners to support federal and Emergency Management Assistance Compact (EMAC) requests for healthcare-related personnel and/or equipment

Emergency Medical Services

- Respond to information and resource-availability requests from HCRI leadership and/or RIDOH's Center for Emergency Medical Services
- Adhere to relevant burn treatment protocols and standing orders in the *Rhode Island Statewide Emergency Medical Services Protocols*
- If applicable, respond to incident in accordance with *Rhode Island Mass Casualty Plan*
- Ensure appropriate and consistent use of Rhode Island's Patient Tracking System (PTS) to document transport destinations for the incident's victims, supporting later family-patient reunification efforts

Emergency Management

- Respond to information and resource-availability requests from HCRI leadership
- Support the sourcing and sharing of non-medical resources with Coalition members
- Be prepared to establish and/or support the operation of a Family Reception Center (FRC)

- Work with RIDOH and federal partners to support federal and Emergency Management Assistance Compact (EMAC) requests for healthcare-related personnel and/or equipment

Community Health Centers

- Be prepared for the presentation of patients from the incident with minor injuries, including minor burns, and provide initial care
- Coordinate with HCRI leadership to help promote the availability of services, including behavioral health, wound care, rehabilitation, etc., among community health centers to the broader HCRI membership, thus ensuring sufficient awareness to facilitate patients' transitions from acute care to recovery
- Respond to information and resource-availability requests from HCRI leadership, including those intended to identify available capacity among community health centers to accept low acuity patients requiring outpatient care who may have been displaced or otherwise diverted from hospitals

Urgent Care

- Be prepared for the presentation of patients from the incident with minor-moderate injuries, including minor-moderate burns, and provide initial care
- Respond to information and resource-availability requests from HCRI leadership, including those intended to identify available capacity among urgent care centers to accept minor-moderate acuity patients, including those with burn injuries, who may have been displaced or otherwise diverted from hospitals

All Other HCRI Members

- Respond to information and resource-availability requests from HCRI leadership

General Medical Care Operations

Burn Injuries Overview

A burn injury usually results from an energy transfer to the body. There are many types of burns caused by thermal, radiation, chemical, or electrical contact.

- **Thermal burns:** Burns due to external heat sources which raise the temperature of the skin and tissues and cause tissue cell death or charring. Hot metals, scalding liquids, steam, and flames, when coming in contact with the skin, can cause thermal burns.
- **Radiation burns:** Burns due to prolonged exposure to ultraviolet rays of the sun, or to other sources of radiation such as x-ray
- **Chemical burns:** Burns due to strong acids, alkalis, detergents, or solvents coming into contact with the skin and/or eyes
- **Electrical burns:** Burns from electrical current, either alternating current (AC) or direct current (DC)²

While this annex focuses on thermal burn injuries, HCRI is working to develop separate annexes to the Response Plan that address chemical and radiation injuries, respectively. Because there are incidents that could involve overlapping injury patterns (such as the detonation of a radiological dispersal device that combines conventional explosives with radiological material, victims of which could present with both thermal burns and radiological contamination), this

² Stanford Medicine. "Different Types of Burns." Accessed 23 May 2022. <https://stanfordhealthcare.org/medical-conditions/skin-hair-and-nails/burns/types.html>.

annex may be employed concurrently with those other annexes during such complex incidents. (See also Concept of Operations > Special Considerations > Combined injuries)

There are six types of thermal burns: scald, flame, contact, electrical, sun, and friction burns. A thermal injury occurs when tissue contacts a heat source such as liquid, flames, hot solids, steam, or electrical current. The duration of contact, the type of tissue involved, and the height of the temperature directly correlate with the amount of tissue destruction and injury. As temperature rises to > 44°C (111.2°F), protein structure is compromised.³

Thermal burns cause both local injuries and, if severe (> 20% of total body surface area [TBSA]), a systemic response. The local injuries can be roughly separated into three zones of injury analogous to a circular target pattern. The innermost injury is the **zone of coagulation or necrosis**, representing the area of irreversible cell death. Surrounding this is the **zone of ischemia or stasis**, representing an area of decreased circulation and an area at increased risk of progression to necrosis due to hypoperfusion or infection. The outermost area is the **zone of hyperemia**, representing an area of reversible vasodilation and an area that usually returns to normal. In clinical practice, burns are dynamic injuries that may progress over hours to days, making it difficult to accurately determine the various zones during the early course of the injury.

If the burn injury only involves the epidermis, it is classified as a **superficial or first-degree burn** and does not cause any significant impairment of normal skin function. If the injury extends into the dermis, it classifies as **partial-thickness or second-degree burn**. Partial-thickness burns may disrupt skin functions such as protection from infection, thermal regulation, prevention of fluid loss, and sensation. If the injury extends through both layers, this is a **full-thickness or third-degree burn**, and normal skin functions are lost.⁴

Large burns (>20% TBSA) also cause a systemic response from the release of inflammatory and vasoactive mediators. Fluid loss locally at the burn site, fluid shifts systemically, plus decreased cardiac output and increased vascular resistance, can all lead to marked hypovolemia and hypoperfusion called “**burn shock**.”⁵

Triage and Secondary Triage

Pre-hospital triage of burn injuries should be guided by relevant protocols in the *Rhode Island Statewide Emergency Medical Services Protocols*, as outlined in Protocol 04.07 (both adult and pediatric).⁶ Reference should also be made to Protocol 06.01, which outlines the START/JumpSTART triage protocol for mass casualty incidents.

Effort should be taken by emergency medical services (EMS) to avoid overwhelming any one hospital with patient transports. Upon initial arrival to the scene, EMS should contact the Host Hospital to notify it of the incident and to request a statewide hospital ED bed count to determine ED bed availability. If the Host Hospital cannot be reached, EMS should attempt to contact the Alternate Host Hospital; if neither Host Hospital can be reached, EMS should proceed to notify RIDOH’s Center for Emergency Preparedness and Response (24/7) at 401-222-6911.

³ Fairbrother, Long, and Hanes. “Optimizing Emergency Management to Reduce Morbidity and Mortality in Pediatric Burn Patients.” 2020. <https://www.ebmedicine.net/topics/trauma/pediatric-burns>.

⁴ Schaefer and Tannan. “Thermal Burns.” *StatPearls*. 2020. <https://www.ncbi.nlm.nih.gov/books/NBK430773/>.

⁵ Schaefer and Tannan.

⁶ Rhode Island Department of Health. *Rhode Island Statewide Emergency Medical Services Protocols*. 2021. <https://health.ri.gov/publications/protocols/StatewideEmergencyMedicalServices.pdf>.

Certain patients should be prioritized for early movement. Examples include burns covering more than 50% of TBSA; patients with inhalational injury (which can progress rapidly to acute respiratory distress syndrome and require advance ICU management and care); and patients with coincident trauma and burns.

(On-scene decedent management will not be addressed in this plan. For more information on decedent management, refer to the *Rhode Island Mass Fatality Incident Response Plan*.)

Patients presenting from fires that have occurred in closed spaces are at higher risk for inhalation injury. Early normal voice and oxygen saturation levels may not adequately predict a patient's true airway status. In fact, oxygen saturation may be spuriously high from concomitant carbon monoxide poisoning. While there is currently a move toward avoidance of unnecessary pediatric intubations, any suspicion of airway involvement should prompt careful evaluation. Clinicians should look for carbonaceous sputum, soot in the nares, or damage to the oropharynx. Patients with signs of inhalation injury should be considered for early intubation due to potential respiratory failure from airway edema and obstruction.⁷

According to the American College of Surgeons' Committee on Trauma and the American Burn Association (ABA), **burn injuries that should be referred to a burn center include**⁸:

- Partial-thickness burns of greater than 10% of TBSA
- Burns that involve the face, hands, feet, genitalia, perineum, or major joints
- Third-degree (full-thickness) burns in any age group
- Electrical burns, including lightning injury
- Chemical burns
- Inhalation injury
- Burn injury in patients with preexisting medical disorders that could complicate management, prolong recovery, or affect mortality
- Any patients with burns and coincident trauma (such as fractures) in which the burn injury poses the greatest risk of morbidity or mortality. In such cases, if the trauma poses the greater immediate risk, the patient's condition may be stabilized initially in a trauma center before transfer to a burn center.
- Pediatric patients with burns in hospitals without qualified personnel or equipment for the care of children
- Burn injury in patients who will require special social, emotional, or rehabilitative intervention

Secondary triage is typically conducted upon arrival at a patient's (initial) transport destination. Secondary triage should assess:

- Age of patient
- Clinical stability
- Extent (TBSA) and location of burns
- Associated trauma
- Associated inhalational injury
- Past medical history (e.g., diabetes, heart disease, respiratory disease)
- Current treatments and how they affect transport needs (e.g., mechanical ventilation, multiple intravenous medication drips)

⁷ Fairbrother, Long, and Hanes.

⁸ American Burn Association. Guidelines for Burn Patient Referral. <https://ameriburn.org/resources/burnreferral/>.

Secondary triage may identify the need for a burn center transfer or referral. Some patients may have catastrophic burns and an expected outcome that does not justify transfer, particularly in the setting of advanced age, comorbid conditions, and combined injury. These patients will need pain management and ongoing care at their current healthcare facility. Burn care experts should generally be involved in these triage decisions.

Additional information on triage and treatment of burn injuries can be found in the National Library of Medicine's Chemical Hazards Emergency Medical Management collection:
<https://chemm.hhs.gov/burns.htm>.

Transfers to Burn Centers

For guidance on preparing a burn patient for interfacility transfer, see Attachment 4.

Transfers from hospitals in Rhode Island to the Rhode Island Burn Center at Rhode Island Hospital can be requested through the LifePACT Transfer and Access Center, which can be reached at (401) 444-3000.

Transfers to burn centers outside Rhode Island will be coordinated through the ERBDC and Region 1 RDHRS, as appropriate.

Patient Tracking

Patient tracking in Rhode Island is performed through the use of Rhode Island's PTS. Use of this system is required of EMS for all patient transports. Information captured through this system includes each patient's

- Name
- Gender
- Age
- Prehospital triage disposition
- Description of injury/illness
- Transport destination

The MCI feature of PTS allows the user (e.g., an EMT) to group together several patients from a particular event; for instance, all patients involved in a large structure fire can be associated in PTS with an MCI, signifying the patients' involvement in the incident for tracking and record-keeping purposes. Data from this system will be integral in facilitating family-patient reunification (e.g., through a Temporary Reception Center).

In order to ensure the ability to implement effective family-patient reunification processes, hospitals are expected to enter self-presenting patients into PTS and appropriately associate them with the incident's MCI.

Tracking of patients transported from hospitals in Rhode Island to hospitals in neighboring states or throughout the region will be coordinated with the RDHRS and/or the Eastern Region Burn Disaster Consortium.

Treatment

Every hospital that receives trauma patients (acute care hospitals) should be prepared to provide stabilizing care for burn patients, including airway management, initial fluid resuscitation, and pain management.

After initial resuscitation, advanced burn care and/or surgery can be deferred for a few days while appropriate (secondary, tertiary) triage and transportation occur. During this time, basic antimicrobial burn dressings must be applied (e.g., bacitracin and petrolatum-impregnated gauze or silver-impregnated dressings, if available). It should be noted that after the first few days, complications are likely to increase if the patient is not appropriately treated at the receiving hospital or transferred to a specialty facility.

Further general guidance on the treatment of burn injuries can be found in Attachment 3.

Telemedicine

Telemedicine capabilities can serve as valuable force multiplier for a hospital receiving burn patients, particularly if existing burn care capability or capacity is limited.

Region 1's Regional Disaster Health Response System maintains telemedicine capabilities that can connect clinicians in Rhode Island with those from hospitals throughout the region. HCRI leadership will facilitate access through RDHRS to any hospital in Rhode Island requiring such consultation. The RDHRS platform may be accessed here: <https://www.rdhhs.org/rdhhs-disaster-telemedicine/>

Access to additional telemedicine capabilities that allow connection with ABA-verified burn centers throughout the region will be facilitated through the ERBDC.

Family-Patient Reunification

All hospitals are encouraged to maintain their own respective family reunification plans and processes to facilitate connecting family members with patients undergoing care at their facility following a mass casualty incident.

While HCRI will coordinate with RIDOH, the Rhode Island Emergency Management Agency, and other key stakeholders to quickly establish a centralized mechanism to receive inquiries from the public regarding the location of family members following transport to a hospital, hospitals should nonetheless be prepared to themselves receive a significant volume of these initial inquiries.

HCRI, in coordination with RIDOH (being the State's public health authority), will work to ensure that information collected through the Patient Tracking System regarding patient transport destinations is appropriately accessible to authorized parties, so as to facilitate locating individuals.

As necessary, depending on the scale of the incident, HCRI will coordinate with RIDOH in the activation and operation of a Temporary Reception (or Family Assistance) Center, in accordance with the Rhode Island Family Assistance Center Plan.

Rehabilitation and Outpatient Follow-up Services

Certain burn injuries may require rehabilitation and outpatient follow-up services. These services can include physical and/or occupational therapy, nutrition counseling, psychiatric support and other behavioral health services. These capabilities exist in both inpatient and outpatient settings. In an effort to preserve hospital capacity for those most in need of immediate acute care, outpatient options should be considered, which are most commonly found among community healthcare providers.

Additional information on Rhode Island-based rehabilitation, outpatient follow-up, and referral services can be found in Attachment 5.

The Model Systems Knowledge Translation Center (MSKTC), a national center operated by the American Institute of Research that translates health information into easy-to-understand language and formats for patients (and families and caregivers of patients) with spinal cord injury, traumatic brain injury, and burn injury, has developed and maintains an online repository of guidance and factsheets that may be of value to individuals navigating the post-acute care phase of burn injury recovery. This repository may be accessed here: <https://msktc.org/burn>.

Logistics

Medical surge capacity and capability are often determined by the presence and availability of resources within three main categories: space, staff, and supplies. This section provides an overview of the support HCRI can provide its members in maximizing the availability of space, staff, and supplies to respond to an incident involving a significant volume of patients with burn injuries.

Space

It may be necessary, based on the scope of the incident and the volume of patients produced, that receiving hospitals need to expand beyond their normal areas of care to accommodate an influx of patients.

Hospitals should refer to their respective medical surge plans to identify and implement appropriate strategies to maximize their surge capacity. In general, some of these measures might include:

- Activating surge units
- Discharging patients whose conditions will allow it, or transferring patients to other facilities/levels of care
- Canceling/postponing elective procedures
- Repurposing units and/or non-clinical areas to accommodate patient care
- Shifting patient triage to outside the building, allowing more space inside for patient care

HCRI's leadership will work to maintain situational awareness over capacities at each hospital, relying on the Hospital Capacity System as the primary means for sharing information on bed availability by type. HCRI leadership will work to support facilities' efforts to load balance patient volume throughout Rhode Island's healthcare system, helping to identify available beds, arranging clinical handoffs, and, where possible, locating available transportation resources. As necessary, HCRI leadership can engage the Eastern Regional Burn Disaster Regional Consortium and Regional Disaster Health Response System to request support in coordinating interstate patient movement, including to ABA-verified burn centers in neighboring states.

In the event that out-of-hospital surge capacity/capability (e.g., a field hospital) is needed, HCRI leadership will coordinate with the State's mobile medical assets, including RI DMAT/MRC, as well as any necessary engagement with RIEMA for the deployment of these assets or those from federal partners and/or other states.

Staff

Hospitals should refer primarily to their respective medical surge and emergency plans to identify and implement strategies related to increasing staff capacity. In general, these strategies could include:

- Reassigning staff from other units
- Recalling staff
- Activating contracts with staffing support agencies
- Shifting personnel between facilities of a health system

HCRI's membership maintains three memoranda of understanding to facilitate resource sharing between members, including personnel resources. They include the Inter-Hospital Memorandum of Understanding (MOU), the Inter-Health Center MOU, and the Rhode Island Long-Term Care Mutual Aid Plan. (Additional information on their use can be found in the HCRI Response Plan.) With respect to burn surge, any one of them may be leveraged to shift resources within Rhode Island's healthcare system to expand care capacity, but the Inter-Hospital MOU could play a role in the sharing of personnel resources between hospital facilities.

Another source of personnel support for HCRI members is through RI Responds – Rhode Island's cadre of medical volunteers, coordinated through RI DMAT/MRC. These personnel are credentialed healthcare professionals, many of whom work regularly within Rhode Island's healthcare system. HCRI members are encouraged to ensure that they have developed and implemented appropriate volunteer integration processes to allow the incorporation of these personnel into members' workforces.

RIDOH will work to facilitate the expedited emergency licensure of healthcare workers to allow personnel from outside Rhode Island to be rapidly integrated into healthcare facility workforces, as necessary and appropriate.

Additional strategies to surge staff include force multipliers through just-in-time (JIT) training by using personnel who have the aptitude to quickly learn, adapt, and assist. Cross-training before a disaster can effectively augment personnel pools in preparation for mass casualty incidents, but for logistical reasons may not be a viable option for smaller organizations. JIT training paradigms can augment targeted capabilities over relatively short time frames and can provide large groups of caregivers led by specially trained medical team leaders, allowing systems to manage large numbers of acute care patients. (For more information on available training, including just-in-time training, please see Plan Maintenance and Administration>Training and Exercises.)

Supplies

Burn care can consume a significant volume of supplies. All acute care hospitals in Rhode Island are encouraged to maintain burn supply inventories that include the following:

- Woven gauze
- Gauze bandage wraps
- Silvadene cream
- Bacitracin
- Ringer's lactate IV fluids
- Chlorhexidine solution (Hibiclens) or mild, non-drying soap (Dove, Camay)
- Sterile water/saline for irrigation, wound cleansing
- Tongue depressors
- Cotton-tipped applicators
- Sterile scissors

- Sterile gloves
- Sterile sheet (to prepare field for dressing change)
- Large and small burn dressings (multi-ply, absorbent)

Hospital burn carts, which are maintained by each acute care hospital in Rhode Island, include many of these types of supplies. The **full listing of standard burn cart contents** can be found in Attachment 6. Hospitals are expected to maintain the contents of these carts on a regular basis, updating and replacing supplies as needed.

Additional supplies that may be required in the administration of burn care are reflected in Attachment 7. This attachment can also be used as a tool to estimate an appropriate quantity of supplies necessary to provide care for a number of burn patients.

Hospitals should attempt to quickly acquire needed supplies (for immediate and anticipated supplies for the first few days of the response) from its own and/or system's warehouses and through outreach to their vendors. The MOUs outlined above that establish the framework for sharing resources among hospitals, health centers, and long-term care facilities in Rhode Island, may also leveraged to support interfacility sharing of non-personnel resources, to include both medical and non-medical supplies and equipment, as well as access to supplies through vendor relationships of other healthcare facilities.

In the event a resource is required that cannot be found among HCRI members, HCRI leadership – through established ESF-8 processes – will engage partners in the State (including the Rhode Island Emergency Management Agency [RIEMA]) to aid in locating the resource. Securing a resource that cannot be found in the State may require an interstate resource request (facilitated by RIEMA through the Emergency Management Assistance Compact) or a request to a federal agency (which would also be made in coordination with RIEMA). Similarly, HCRI leadership may engage through RIDOH the public health preparedness partners in neighboring states and/or the RDHRS for assistance in locating resources within the region.

Transportation

EMS resources to transport patients from the incident scene to hospitals are identified through processes outlined in the State of Rhode Island Intrastate/Interstate Mutual Aid Plan. If resources outside of Rhode Island are required, HCRI will coordinate with RIDOH's Center for Emergency Medical Services and RIEMA, as necessary, to determine their availability and request their use.

Interfacility patient transports (e.g., from one hospital to a burn center) are typically conducted by commercial ambulance. Rhode Island has one critical-care ambulance service in operation, with a limited number of vehicles and personnel available. Effort should be taken, therefore, to use this resource judiciously, only for those patients who require such level of care.

Critical-care EMS transports are available through LifePACT. LifePACT may be reached at 401-444-3000.

Air transportation (rotary wing) is available through the following sources:

- UMass Memorial Life Flight (Worcester, MA)
 - (800) 343-4354
- Life Star (Hartford, CT, and Norwich, CT)
 - (800) 221-2569
- Boston MedFlight (Bedford, MA, Lawrence, MA, and Plymouth, MA)

- (800) 233-8998
- SkyHealth (Ronkonkoma, NY)
 - (844) 759-4584

For mass paratransit resources (for ambulatory patients requiring minimal supportive care), the Rhode Island Public Transit Authority should be engaged through RIEMA.

Special Considerations

Behavioral Health

(Excerpted from Davydow, et al. *Psychiatric Morbidity and Functional Impairments in Survivors of Burns, Traumatic Injuries, and ICU Stays for Other Critical Illnesses: A Review of the Literature*. 2009. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2857565/>.)

Symptoms of acute stress disorder (ASD) and posttraumatic stress disorder (PTSD) are very common in the aftermath of severe burn injury ([Patterson et al. 1993](#)) with ASD being found in 11–32% of adult burn injury survivors in the acute care setting ([Esselman, Thombs, Magyar-Russell, and Fauerbach 2006](#)) and PTSD in 20–45% of adult survivors of serious burns when ascertained through diagnostic interviews. Over 25% of children have symptoms suggestive of the diagnoses of ASD and/or PTSD following severe burns ([Tarnoski, Rasnake, Gavaghan-Jones, and Smith 1991](#)).

Studies of adult survivors of serious burns have found that the prevalence of major depression was 4% during the acute hospitalization and clinically significant depressive symptoms ranged from 8–35%. After hospital discharge, the point prevalence of clinician-diagnosed major depression was 7–10% and symptoms suggestive of major depression ranged from 2–28% (varying based upon timing of assessment, questionnaire used, and threshold employed) ([Thombs, Bresnick, and Magyar-Russell 2006](#)). Comorbidity between PTSD and major depression in adult burn survivors appears highly prevalent ([Dyster-Aas et al. 2008](#)). Approximately 13% of pediatric burn survivors have clinically significant depressive symptoms ([Stoddard, Stroud, and Murphy 1992](#); [Pope et al. 2007](#)).

Behavioral Health Capabilities in Rhode Island/Region

Behavioral health capabilities in the State that may be leveraged in support of a response (or recovery from) a large-scale burn incident include those in both inpatient and outpatient settings. Rhode Island has two behavioral health hospitals: Butler Hospital, which primarily treats adult patients, and Bradley Hospital, which treats pediatric patients. While burn care capabilities within those two hospitals are especially limited, as they do not generally provide acute trauma or medical care, it is possible they may have personnel who can be deployed to acute care hospitals to augment their own in-house capabilities and capacity, or behavioral health patients from acute care hospitals can be transferred to these hospitals to maximize medical-surgical bed availability at acute care hospitals.

These additional resources should be considered when seeking to access burn-related behavioral healthcare capabilities in Rhode Island:

- Rhode Island Department of Behavioral Healthcare, Developmental Disabilities, and Hospitals
 - Disaster Behavioral Health Response Team
- Rhode Island Critical Incident Stress Management Team (for staff, responders)
- RIH Burn Survivor Support Group
- RIH Pediatric Expressive Therapy Group

- Phoenix Society for Burn Survivors (virtual)
- Arthur C. Luf Children’s Burn Camp (Union, CT) (ages 8-18)

It should be noted that many of these resources have virtual capabilities.

Pediatrics

(See also HCRI Response Plan’s Pediatric Surge Annex)

Pediatric patients can be difficult to triage. Pediatric patients with obvious external bleeding or soft-tissue wounds and those who are crying uncontrollably are often assigned triage categories higher than justified. Care should therefore be given to adhering to a standardized triage process, such as that outlined in JumpSTART (<https://chemm.hhs.gov/startpediatric.htm>).

Children have a larger surface area (BSA) per unit of body than adults and therefore require relatively more fluid during resuscitation after burn injury. The head has a higher percentage of body surface area compared to the lower extremities.

- The ratio of BSA (head:lower extremities) is highest at birth and decreases as the child grows
- The larger head surface area contributes to larger heat loss
- Pediatric skin is thinner and more permeable to toxins
- Children have limited glycogen stores, which can be rapidly depleted; they should receive a maintenance fluid of D5LR (lactated ringer’s and 5% dextrose), in addition to resuscitation fluids⁹

Combined Injuries

Depending on the nature of the incident, there may be other injury patterns among victims and patients than just thermal burns, such as broken bones from falls or compression injuries from fallen debris.

As noted earlier, HCRI is working to develop separate annexes to address **chemical and radiation injuries**, which may be employed concurrently with this annex if the situation requires it. General guidance on the coincidence of chemical and radiation injuries with thermal burns, and their clinical management, can be found in “Guidelines for Burn Care under Austere Conditions: Special Etiologies: Blast, Radiation, and Chemical Injuries”

(http://ameriburn.org/wp-content/uploads/2017/05/guidelines_for_burn_care_under_austere_conditions_.68.pdf).

Because victims of explosions frequently present with both thermal burn injuries and blast injuries, providers should consider the following in such patients:

1. Primary: due to the direct wave impacting the body surface. Injuries include tympanic membrane rupture, pulmonary damage, and hollow viscous injury.
2. Secondary: result when projectiles from the explosion such as flying debris hit the body, causing penetrating and blunt trauma.
3. Tertiary: result when the victim is thrown from the blast wind. Injuries include blunt and penetrating trauma, fractures, and traumatic amputations.
4. Quaternary: include all other injury types (heat, light, and/or toxic gases). The fireball may cause flash burns to exposed body parts (hands, neck, head) or may ignite clothing.

⁹ Minnesota Department of Health. “Pediatric Response Resources for Burn Surge Facilities.” *Minnesota Burn Surge Plan*. 2019. <https://www.health.state.mn.us/communities/ep/surge/burn/pedsorders.pdf>.

Other injuries include crush injuries, inhalation injury, asphyxiation, and toxic exposures.¹⁰

The following considerations should be taken in the management of blast injuries:

- Blast injuries are not confined to the battlefield. They should be considered for any victim exposed to an explosive force.
- Clinical signs of blast-related abdominal injuries can be initially silent until signs of acute abdomen or sepsis are advanced.
- Standard penetrating and blunt trauma to any body surface is the most common injury seen among survivors. Primary blast lung and blast abdomen are associated with a high mortality rate. “Blast lung” is the most common fatal injury among initial survivors.
- Blast lung presents soon after exposure. It can be confirmed by finding a “butterfly” pattern on chest X-ray. Prophylactic chest tubes (thoracostomy) are recommended prior to general anesthesia and/or air transport.
- Auditory system injuries and concussions are easily overlooked. The symptoms of mild traumatic brain injury and posttraumatic stress disorder can be identical.
- Isolated tympanic membrane rupture is not a marker of morbidity; however, traumatic amputation of any limb is a marker for multi-system injuries.
- Air embolism is common, and can present as stroke, myocardial infarction, acute abdomen, blindness, deafness, spinal cord injury, or claudication. Hyperbaric oxygen therapy may be effective in some cases.
- Compartment syndrome, rhabdomyolysis, and acute renal failure are associated with structural collapse, prolonged extrication, severe burns, and some poisonings.
- Consider the possibility of exposure to inhaled toxins and poisonings (e.g., carbon monoxide, chloroacetophenone, methemoglobin) in both industrial and criminal explosions.
- Wounds can be grossly contaminated. Consider delayed primary closure and assess tetanus status. Ensure close follow-up of wounds, head injuries, eye, ear, and stress-related complaints.
- Communications and instructions may need to be written because of tinnitus and sudden temporary or permanent deafness.¹¹

Deactivation and Recovery

HCRI will continue to support its members as they navigate the recovery of a large-scale burn incident. When appropriate, HCRI will conduct a hotwash or after-action review with members that participated in the response to identify lessons learned and best practices from the incident.

Depending on the nature and scale of the incident, this support may include:

- Facilitating coordination with RIEMA and/or the Federal Emergency Management Agency to secure disaster recovery funding, if available
- Identifying and/or facilitating access to vendors to support members’ efforts to reconstitute supply inventories
- Identifying and/or facilitating access to resources and services available to members for staff assistance and support (e.g., counseling, therapy)

¹⁰ American Burn Association. *Advanced Burn Life Support Course*. 2018. <http://ameriburn.org/wp-content/uploads/2019/08/2018-abls-providermanual.pdf>.

¹¹ US Centers for Disease Control and Prevention. “Explosions and Blast Injuries: A Primer for Clinicians.” 2003. <https://www.cdc.gov/masstrauma/preparedness/primer.pdf>.

Plan Maintenance and Administration

This plan will be reviewed on a regular basis by HCRI members. Following its use in either exercises or real-world responses, this plan will be similarly reviewed to incorporate any lessons learned or best practices gained in the experience.

Training and Exercises

Rhode Island Hospital's burn center frequently conducts **Advanced Burn Life Support (ABLS)** training for physicians, nurses, physician assistants, nurse practitioners, therapists and paramedics, providing them the opportunity to participate in a live, hands-on class on emergency care of a burn patient through the first 24 hours. Additional information can be found here: <https://www.lifespan.org/centers-services/rhode-island-burn-center/providers-advanced-burn-life-support-abls>.

The State of Michigan Burn Coordinating Center has developed **topic-specific just-in-time training related to burn care** for pre-hospital and hospital personnel. These trainings may be freely accessed at any time at the following link: <http://michiganburn.org/index.shtml>.

HCRI will seek to test this plan through exercises on a regular basis, at least once every five years.

Attachments

1. General Burn-related Resources, Guidance, and References
2. Northeast Region Burn Mass Casualty Incident Response Plan
3. General Burn Care
4. Preparing a Burn Patient for Transfer
5. Burn Care Referral Services
6. Burn Cart Supply Inventory
7. Burn Care Supplies Projection

1: General Burn-related Resources, Guidance, and References

The following resources, guidance, and references provide additional information on burn injuries and their management:

Mass Casualty Burn Incidents

- American Burn Association. (2018). **Mass Casualty**. American Burn Association. *This webpage includes links to various resources designed to help manage burn capabilities in the event of a mass casualty event. This page is updated regularly and currently includes links to resources such as disaster plans, guidelines for providing care in austere conditions, and the American Burn Association Regional Map.*
- US Department of Health and Human Services, Office of the Assistant Secretary for Preparedness and Response. (2016). **Mass Burn Event Overview**. ASPR TRACIE. *This document provides guidance for healthcare coalitions, burn centers, state public health preparedness professionals, healthcare entities, and other stakeholders planning for a burn mass casualty incident.*

Hospital Planning

- Phua, Y., Miller, J. and Wong, S. (2010). **Total Care Requirements of Burn Patients: Implications for a Disaster Management Plan**. (Abstract only) *Journal of Burn Care and Research*. 31(6): 935-41. *The authors reviewed patient data from 2006-2009 to better understand their operative and ward-based needs. They found that they could use a formula based on burn surface area, mean depth, and burn type to predict total operating theater time, and that operative time required was greatest during the first week (nursing and related health hours remained relatively constant).*
- Kearns, R.D., Holmes, J.H. 4th, Alson, R.L., Cairns, B.A. (2014). (2014). **Disaster Planning: The Past, Present, and Future Concepts and Principles of Managing a Surge of Burn Injured Patients for those Involved in Hospital Facility Planning and Preparedness**. (Abstract only.) *Journal of Burn Care Research*. 35(1):e33-42. *The authors reviewed published plans, academic works, findings from actual disasters, and reports on disaster modeling to develop surge plan recommendations and a checklist for non-burn center hospitals to use before they are able to transfer burn patients. They focus on staff, supplies, and space.*
- Kearns, R.D., Marcozzi, D.E., Barry, N., et al. (2017). **Disaster Preparedness and Response for the Burn Mass Casualty Incident in the Twenty-first Century**. *Clinics in Plastic Surgery*. 44(3):441-449. *The authors outline planning and preparedness for a burn mass casualty incident. Planners should consider resources available and preparing to adapt space for rapid triage and discharge after an incident.*

Triage and Assessment

- University of Michigan State Burn Coordinating Center. (2012). **Emergency Burn Triage and Management**. *This website offers a breadth of burn care information as well as free just-in-time training modules for hospital staff on the management of burn patients.*

- Hettiaratchy, S., and Papini, R. (2004). **ABC of Burns: Initial Management of a Major Burn: I—Overview.** *BMJ.* 328(7455):1555-7.
The authors review how to take a history; conduct primary and secondary surveys of the injury; how to dress the wound; and when to refer patients to a burn center. They emphasize that initial management is similar to that of any trauma patient, and that assessment of the airway and breathing takes precedence over the burn injury.
- 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 Research.* 35(1): 41–45.
The authors used data from the National Burn Repository to develop a burn resource disaster triage table. They found that burn care has changed in the past decade and that inhalation injury significantly changes triage in a burn disaster.

Clinical Management

- Albanese, J., Burich, D., Smith, D., et al. (2015). **Clinical Guidelines for Responding to Chemical, Biological, Radiological, Nuclear and Trauma/Burn Mass Casualty Incidents: Quick Reference Guides for Emergency Department Staff.** *Journal of Business Continuity and Emergency Planning.* 8(2):122-133.
This paper describes clinical guidelines for hospitals to treat patients during chemical, biological, radiological, or other incidents leading to a mass casualty event in which many people must be treated for burns. The clinical guidelines aim to prepare hospitals for such events.
- Hettiaratchy, S., and Papini, R. (2004). **ABC of Burns: Initial Management of a Major Burn: II--Assessment and Resuscitation.** *BMJ.* 329(7457):101-3.
The authors review assessment of the burn area; resuscitation regimens; how and when to perform escharotomies; and how to classify and estimate burn depth.
- Rowan, M., Cancio, L., Elster, E., et al. (2015). **Burn Wound Healing and Treatment: Review and Advancements.** *Critical Care.* 19(1): 243.
This review article discusses advances in the care of burn patients. It focuses on burn wound pathophysiology and treatment, and discusses inflammation; resuscitation; wound coverage and grafting; and keratinocytes and stem cells with regard to wound healing.
- Romanowski, K.S., Carson, J., Pape, K., et al. (2020). **American Burn Association Guidelines on the Management of Acute Pain in the Adult Burn Patient: A Review of the Literature a Compilation of Expert Opinion and Next Steps.** *Journal of Burn Care and Research.* 41(6):1129-1151.
The authors reviewed the literature from 1968-2018 and brought together experts to discuss treatment of pain after burn injury. The group noted gaps in the current knowledge and research questions for future studies. They also created 20 guidelines on pain assessment, pharmacologic and nonpharmacologic treatments, and anesthesia.

2: Northeast Region Burn Mass Casualty Incident Response Plan

Northeast Region Burn Mass Casualty Incident (BMCI) Response Plan	
<p>The American Burn Association (ABA)- designated Northeast Region¹ encompasses Burn Centers located along the east coast of the United States, extending from Maine through Maryland, including the District of Columbia</p>	
<p>For a BMCI occurring anywhere within the northeast region of the United States, the Eastern Regional Burn Disaster Consortium (ERBDC)² serves as a communications and coordination center to support Burn Center(s) by conducting a burn bed census and/ or assists with patient triage and transfer</p> <p>A BMCI is defined as any incident where capacity and capability significantly compromises patient care, as identified in accordance with individual BC(s), state, regional or federal disaster response plans</p>	
Requesting Assistance from the ERBDC for BMCI Response and Coordination	
<p>Upon request by referring BC(s) the ERBDC:</p> <ul style="list-style-type: none"> • Conducts a bed census of northeast BCs • Supports and assists with regional efforts for patient triage and transfer 	<p>Agencies requesting assistance include:</p> <ul style="list-style-type: none"> • ERBDC BC(s) • Any affected ABA BC(s) • ABA Regional Coordinator(s) • ABA Central Office/ President • Department of Health & Human Services (DHHS) or designee
<p>To request ERBDC assistance contact:</p> <ul style="list-style-type: none"> • Burn Medical Coordination Center (BMCC)³ at 1866-778-3659 • The Burn Center at Saint Barnabas, NJ, directly at 1973-322-5920 	<p>Upon notification NJ BMCC:</p> <ul style="list-style-type: none"> • Activates the out-of-state burn disaster plan • Conducts burn bed census of non-affected ERBDC BC(s) for 02, 12, 24H intervals, or as needed • Coordinates patient transfer between referring and receiving BC(s) if requested

Definitions

1. Northeast Region – one of five American Burn Association-designated regions. Refer www.ameriburn.org Homepage for a map of all regions.
2. Eastern Regional Burn Disaster Consortium (ERBDC) - a New Jersey-based incorporated consortium of twenty-seven burn centers from Maine to Maryland, including the District of Columbia who have joined together with four core mission goals to support disaster response efforts for one another throughout the northeast region.
3. Burn Medical Coordination Center (BMCC) – A coordination center located in New Jersey equipped with redundant communication technologies to support disaster response efforts for northeast region burn centers.

Revised: 07/10/2017

3: General Burn Care

Adapted from the American Burn Association's Just-in-Time Training Summary Sheet: Patient Care Priorities for the First 24 hours in a Burn Mass Casualty for Non-Burn Physicians (<https://ameriburn.org/wp-content/uploads/2020/03/austere-guidelines-just-in-time-training.pdf>)

Airway/Breathing

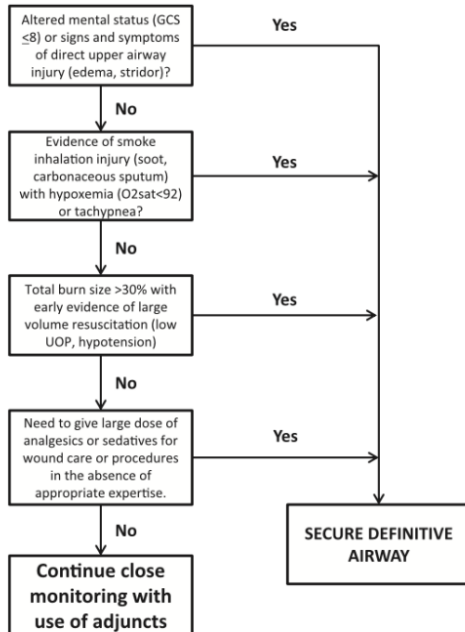


Figure 2. Proposed decision matrix for airway management during burn disasters.

Considerations:

If there is a lack of ventilators, separate the need for airway protection from the need for mechanical ventilation.

Utilize airway adjuncts where necessary.

May need to ration oxygen.

Conduct periodic airway/ventilator needs assessment rounds.

C-spine precautions as needed.

Circulation (Resuscitation)

1. Patients with burns less than 20% TBSA can be effectively resuscitated from burn shock using oral solutions; many patients with burns up to 40% TBSA can also be safely resuscitated in this manner.
 - a. There are many formulas for oral rehydration solutions, but all include clean water, glucose, and electrolytes.
 - b. Adults and children > 2 years should be allowed to take sips from a cup frequently, with the goal of consuming approximately 8 to 10 ounces every 10 to 15 minutes.
 - c. Very young children < 2 years should be given a teaspoon of fluid every 1 to 2 minutes.
 - d. Oral fluids should be given in amounts tolerated by the patient, accepting the occasional episode of nausea and vomiting as inevitable but not a reason to discontinue oral therapy.
2. For **adult** patients with thermal or chemical burns >20%, IV resuscitation, if supplies permit, should be utilized using the Modified Brooke-Parkland formula. In resource-constrained environments, IV resuscitation may need to be restricted to survivable burns >40%.

- a. Total mL 24-hour fluid requirement = 2mL LR x body weight in Kg x %TBSA
 - b. Administer 1/2 during the first 8 hours post injury and the second 1/2 over the following 16 hours
 - c. IV fluids should be increased/decreased hourly by 1/3, based on urine output (goal = 0.5cc/kg/hr)
 - d. Over-resuscitation can result in abdominal compartment syndrome
3. For **pediatric** patients with thermal or chemical burns >20% TBSA, IV resuscitation, if supplies permit, should be utilized using the Modified Brooke-Parkland Formula. In resource-constrained environments, IV resuscitation may need to be restricted to survivable burns >40% TBSA. For pediatric patients ≤30 kg, initiate IV fluids (D5LR) (see chart below for rates)
- a. Total mL 24-hour fluid requirement = 3mL LR x body weight in kg x %TBSA
 - b. Administer 1/2 during the first 8 hours post injury and the second 1/2 over the following 16 hours
 - c. IV fluids should be increased/decreased hourly by 1/3, based on urine output (goal = 1cc/kg/hr)
 - d. Over-resuscitation can result in abdominal compartment syndrome
4. For all **electrical** injuries >20%, IV resuscitation, if supplies permit, should be utilized using the Modified Brooke-Parkland Formula. In resource-constrained environments, IV resuscitation may need to be restricted to survivable burns >40% TBSA.
- a. Total mL 24-hour fluid requirement = 4mL LR x body weight in kg x %TBSA
 - b. Administer 1/2 during the first 8 hours post injury and the second 1/2 over the following 16 hours.
 - c. IV fluids should be increased/decreased hourly by 1/3, based on urine output (goal = 1cc/kg/hr)
 - d. Over-resuscitation can result in abdominal compartment syndrome

<u>Initial</u> Fluid Resuscitation Rates	
(for burns that clearly exceed 20% TBSA)	
Used in pre-hospital setting and during primary survey	
Key terms: Lactated Ringers (LR); Total Body Surface Area (TBSA)	
Age	Initial Resuscitation Rate
0-5 years	125 mL LR/hour
6-13 years	250 mL LR/hour
14 years and older	500 mL LR/hour
<i>Adapted from: American Burn Association 2018. ABLS Shock and Fluid Resuscitation</i>	

24 hour <u>Adjusted</u> Fluid Rates for Resuscitation		
Used after weight in kg and %TBSA measured		
Key terms: Lactated Ringers (LR); Total Body Surface Area (TBSA)		
Burn Mechanism	Age & Weight	Adjusted Fluid Rate
Flame/Scald/Chemical	Adults/Older Children (≥14yrs)	2 mL LR x weight in kg x %TBSA
	Children (<14 yrs)	3 mL LR x weight in kg x %TBSA
	Infants/young children (≤30kg)	3 mL LR x weight in kg x %TBSA Plus: D5LR at maintenance rate*

		(*young children have decreased glycogen reserve, monitor for hypoglycemia) this does not get titrated
Electrical Injury	All Ages	4 mL x weight in kg x %TBSA
<i>Adapted from: American Burn Association 2018. ABLIS Shock and Fluid Resuscitation</i>		

Pediatric Maintenance Fluid Rates (D5LR)	
For infants/children \leq30 kg	
4 mL/hr	For each kg up to 10kg
2 mL/hr	For each kg from 11-20 kg
1 mL/hr	For each kg >20 kg
<i>Adapted from: American Burn Association 2018. ABLIS Pediatric Injuries</i>	

Wounds

Recommendations adapted from “Guidelines for Burn Care Under Austere Conditions: Surgical and Nonsurgical Wound Management”

(<https://academic.oup.com/jbcr/article/38/4/203/4554850>).

1. If the burn injury has just occurred, remove smoldering clothing and flush for a few minutes with any readily available water source (cool to lukewarm temperature). This will stop the burning process and provide some pain relief.
 Caution: Avoid hypothermia, especially in patients with larger TBSA burns.
2. Identify and train a wound-care team.
3. Prepare a venue for wound care.
4. Determine availability of topical antimicrobials and plan their rational use.
5. Provide adequate analgesia and anxiolysis.
6. Silver sulfadiazine (Silvadene) cream is recommended when available (especially contaminated and/or deeper wounds) once daily.
 - a. Other topicals may be recommended with consult from burn center
 - b. Use caution in patients with sulfa allergies
7. Alternatives to creams/ointments
 - a. Silver-based dressings: e.g., Acticoat, Kerra Contact Ag, Silverlon, Mepilex
 - b. Aqueous solutions: e.g., Mafenide acetate solution, Dakin’s
8. For patients with minor burns (<10% TBSA), consider having them do their own wound care or help each other if resources are limited.

4: Preparing a Burn Patient for Transfer

The following is general guidance related to the clinical preparation of a patient for transfer from one hospital facility to another.¹²

- ❑ Ensure all patient(s) receive a medical screening exam, appropriate triage and stabilization within the capability and capacity of the facility
 - Primary goal is to minimize the risk of patient(s) deterioration during transport
- ❑ If advanced airway is required or anticipated, secure the airway prior to transferring the patient
 - Avoid having to place an advanced airway in the confined space of an ambulance or air ambulance.
- ❑ Ensure the Endotracheal Tube (ETT) is secure
 - ETT securement device
 - Tape (non-burned face only, if no other options)
 - Twill tape (burned face)
 - Hold ETT when moving the patient
 - Note depth of tube and verify unchanged after movement
- ❑ Elevate burned extremities where possible
- ❑ Do not use excessive pressure when handling wounds
 - Support burned extremities from underneath rather than gripping
 - Use flat surface of hands / forearms rather than fingertips
- ❑ Measure patient temperature in preparation for transport and every 2 hours if possible
 - If < 36° c (96.8° F) minimize exposure time, warm transport vehicle, use heating blankets and warm IV fluids if available and avoid cold surfaces
- ❑ Keep the patient warm and dry
 - Cover with two blankets or improvised cover such as plastic wrap/aluminum foil / plastic bag if unable to measure temperature during transport

¹² Adapted from the Western Region Burn Disaster Consortium's Burn Mass Casualty Operations Plan.

5: Burn Care Referral Services

In Development

6: Burn Cart Supply Inventory

The following list reflects the standard contents and configuration of burn carts deployed at acute care hospitals in Rhode Island. **The formulary was developed in the context of supplies necessary for the treatment of 4-5 patients with burns covering 5-10% TBSA.**

June 2022 feedback from HCRI Burn Surge Clinical Advisor:

- Normal saline not recommended for resuscitation, as there is a risk of acidosis from hyperchloremia
- Add regular bacitracin
- Increase par of King Kerlix 2- and 4-inch to at least 2 boxes each
- Remove sulfamylon cream

Product Description	Model #	Mfg.	# of Items
.9% Sodium Chloride 500ML	2F7123	Baxter	10
.9% Sodium Chloride 1000ML	2B1324	Baxter	10
Assorted ET Tubes 6,7,7.5,8mm			2 each
Asst angiocatheters			20
Bacitracin Ophthalmic	Pharm	Fougera	6
Bag Infuser disposal 1000ML	IN900012	MediChoice	2
Burn Reference Manual			1
Burn vests	10-9131, CSD	DeRoyal	3
Chlorhexidine (e.g., Hibiclens)		Mölnlycke	5
Cloth tape porous 1"	2950-1		3
Disp Laryngoscope sets	12-486000	RUSCH	2
Disposable Stethoscope	4-711		1
Drape Sterile Fenst.	697	Busse	12
Flexinet #6	CSD		2
Flexinet #7	CSD		2
Flexinet #8	CSD		2
Intersorb Burn Dsg 18 x 18	CSD		10
IV administration sets			20
Kling Kerlix 2 inch	8072	Kendall	1 Box
Kling Kerlix 4 inch	8074	Kendall	1 Box
Laceration Tray	Dyndl1061	Medline	3
Large Sterile Bowl	CSD		1
Magill Forceps (Adult)			1
Mask Isolation Yellow	47117	Kimberly Clark	1 Box
Medication Bag	5114	Ferno	1

Mepilex 8"x20"	287500	Mölnlycke	4
Paper Tape Micropore 1"	1530-1		3
Pedi Magill Forceps			1
Ringers Lactated 1000ML	2B2324	Baxter	10
Rule of Nine Charts			2
Silvadene Cream 400GM	Pharm		5
Sterile Bowl Blue	61000	Kendall	10
Sterile Gloves Size 7	7253	Triflex	3
Sterile Gloves Size 7.5	7254	Triflex	3
Sterile Gloves Size 8	7255	Triflex	3
Sterile Gowns	CSD		6
Sterile Hand Dressing		Exudry	3ea.
Sterile sheets	Laundry OR		6
Sulfamylon Cream 2 oz.	Pharm	Bertek	1
Super Sponge Gauze	2585	Kendall	2 Box
V Vach handheld suctions	98-50-00	V Vach	2
V Vach spare canisters	98-50-01	V Vach	2
Xeroform dressing 5X9	8884433605	Kendall	1 Box
Xeroform rolls			
Xlylocaine Tube	Pharm	Astra Zeneca	1

7: Burn Care Supplies Projection

This is a planning table that can be used to estimate an appropriate volume of burn care supplies necessary for the treatment of **ten patients with 50% TBSA burns for three dressing changes**.¹³ These quantities can be adjusted in scale to address various scenarios.

Item Description	Quantity	Notes
Wound Veil (24" x 36")	30 packets <i>Recommend adding an additional 5 packets when possible</i>	Two sheets per pack If Wound Veil is unavailable, Adaptic can be substituted
Mesh/woven gauze (18" x 18")	30 boxes <i>Recommend adding an additional 5 boxes when possible</i>	6 gauze per pack
Fluff roll or Kerlix (4.5 yd x 4.1 yd)	150 rolls <i>Recommend adding an additional 5 rolls when possible</i>	Estimated at 5 rolls per dressing
Kerlix sponges (4" x 4")	30 boxes <i>Recommend adding an additional 5 boxes when possible</i>	10 sponges per box
Tubular elastic dressing retainer #1 (otherwise known as "netting")	3-4 boxes	50 yds per box
Netting #3	3-4 boxes	50 yds per box
Netting #5	3-4 boxes	50 yds per box
Netting #8	3-4 boxes	50 yds per box
Netting #11	3-4 boxes	50 yds per box
Chlorhexidine 4% (960 mL) or a mild, non-perfumed soap (e.g., Dove, Camay)	15 bottles of chlorhexidine 30 bars of soap (1 per patient, per day) 30 bottles (1 oz.) of baby shampoo (1 per dressing change)	Can use 5 bottles of chlorhexidine per day for the 10 patients; pour out of central location, not in patient's room due to cross-contamination risk
Basin (large)	15	This number includes 5 extra basins, in case additional are needed
Scissors sharp/blunt	30 pairs	
Tape (1" x 10 yd)	30 rolls	
Elastic bandage (4" x 4.5 yd) (Ace wrap)	10 bundles (total of 100 Aces)	10 bandages per bundle

¹³ Adapted from the Western Region Burn Disaster Consortium's Burn Mass Casualty Operations Plan.