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Extreme Weather and Healthcare – Are you Ready for a Burn Disaster?

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> *"'The horror of that moment,' the King went on, 'I shall never forget.' 'You will, though,' the Queen said, 'If you don't make a memorandum of it.'"*
>
> Lewis Carroll, Through the Looking Glass, 1871

This quote reminds us of the importance of learning from historical lessons and utilizing existing evidence to prepare non-burn facilities that may be faced with the horror of a burn mass casualty incident (BMCI). This article provides an overview of North American burn disaster regions and related organizations and highlights the importance of planning and exercising for BMCIs, with an emphasis on telehealth and burn triage.

Burn Disaster Readiness: The Essentials

Burn injuries will increase as climate change-related wildfires and extreme heat incidents become more frequent. This underscores the importance of comprehensive preparedness strategies for both healthcare response teams and the communities they serve. Equipped facilities and trained team members are pivotal in mitigating harm and saving lives.

Burn Mass Casualty Incidents (BMCI) are infrequent but can quickly overwhelm local resources and exceed the capacity of the closest burn center to provide care. Patients will need to be cared for initially at non-burn facilities that may be called on to render immediate critical interventions and prolonged care until transfer to a burn center is deemed necessary and possible. While this initial non-traditional distribution of patients may address the burn bed deficit it cannot address the discrepancy in knowledge and expertise provided by burn center clinicians. Medical management by non-burn healthcare professionals—many of whom have limited amounts of knowledge and expertise in burn care— poses unique challenges. In addition, many burn centers are in metropolitan areas, leaving numerous patients in less urban areas without access to a burn specialty hospital. Healthcare providers may not be comfortable providing care for patients with burn injuries, partly

because they may not often see them. However, according to the 2022 American Burn Association (ABA) burn registry data, approximately 77% % of the reported total body surface area (TBSA) burns affect less than 10% of the body. In a disaster, the majority of patients in this TBSA category can either be released after initial treatment or be admitted, if needed, to more traditional hospital units, even if the facility is not a burn center. Non burn facilities can actually provide additional burn surge capability, especially when technologies such as telemedicine can be leveraged for virtual assistance.

REMEMBER

- All hospitals are capable of stabilizing a critical burn patient for 72-96 hours.
- Non burn facilities can care for less acute burn patients with support and resources.
- Priority patients can be safely evacuated to burn receiving facilities.

The Burn Disaster Preparedness Landscape

The American Burn Association (ABA) has divided the U.S. into five burn disaster regions; Canada serves as the sixth region. Each region has a coordinator/s responsible for maintaining BMCI planning and preparedness within their coverage area. Regions conduct frequent bed counts for situational awareness; these data points serve as the key coordination elements for triage and transport. There are less than 1,900 burn beds available in the U.S and nearly 140 burn centers (at the time this was published, 72 "verified" burn centers were located in the U.S. and one was located in Canada).

Burn bed counts include immediately available beds in addition to the surge capability for both adult and pediatric patients. As part of a pilot program that went live during the August 2023 Maui fires, bed counts for the Western Region are now available on the Nevada Hospital Association's watch board. Incorporation of all regions into the Nevada platform is forthcoming. This unprecedented tool will allow for increased situational awareness to inform decision making by local and state officials. In addition to identifying open beds, the watchboard can determine a hospital's readiness to accept critical patients. A color-coded system indicates whether a burn center is operating in conventional, contingency, or crisis mode. Moreover, it can swiftly adapt to changing situations, marking evacuated hospitals and incorporating new alternative care sites, mobile field hospitals, and other non-traditional care sites. Readers can email chris@nvha.net to request access to this watch board.

Burn surge preparedness includes essential readiness items for healthcare teams in addition to an understanding of burn-specific treatment considerations and pathophysiology. The ABA recently developed a national burn disaster plan which was implemented successfully during the Hawaii fires. This plan is still being finalized and will provide guidance on how to manage a burn surge incident in which the quantity and acuity of burn patients exceed the capability of state or multi state response agencies. Additional free resources available through the ABA include burn first aid for individuals and Guidelines for Burn Patient Referral.

Unfortunately, history teaches us to imagine the worst. During the recent fires in Maui the ABA Western Region was called on to activate and respond to a BMCI, provide just-in-time situational awareness and resources to local and state agencies, and support and assist with patient care at non-burn centers. Multiple burn bed counts showed immediate availability of almost 200 burn beds throughout the region with a surge capacity of greater than 300 if needed. The after-action report and improvement plan highlighted many strengths related to real-time bed counts, but also identified challenges surrounding the time variance between time zones, specifically for collection of critical data for the situational report. The recommendation was to establish an update method that works across time zones and that it be inclusive of basic non-protected health information (e.g., TBSA, age variance, and numbers of intubated vs. non-intubated patients). As a result, the Nevada Hospital Association watchboard now implements an on-line situational report containing essential data fields that can be accessed and completed by burn centers during actual incidents. The report can be updated to reflect changes in resources and capabilities allowing for broad situational awareness by multiple partners from the local to federal level. This report can also be utilized for exercises and training.

Ensuring that we learn from historical events and move forward with new knowledge that assists us to plan, train, and educate accordingly is imperative, but that takes resources and commitment. As previously noted, it doesn't take many burn patients to overwhelm any system as these patients can be so resource intensive and transfer distances to burn centers so long. The goal would be to ensure all hospitals have the resources they need to care for burn patients and activation of mutual aid for specialty care is seamless. This is a goal on blue sky days, not just in an MCI as evidence indicates early, appropriate management improves outcomes.

Pediatric burn patients will have different treatment needs. In addition to guidance from the ABA, the Western Region Alliance for Pediatric Emergency Management (WRAP-EM) works closely with the ABA Western Region to ensure coordination across regional, state and multi state responses and employ a whole community approach. Additionally, the Pediatric Pandemic Network (PPN) has a Trauma/ Burn domain which curates, disseminates, and promotes resources to support a national framework for pediatric trauma and burn care. All these groups augment existing protocols, plans, and systems and provide an additional tool in the standards of care continuum.

Burn Planning and Exercises ("Make a Memorandum of it")

Planning

As extreme heat and wildfire events become more frequent, healthcare facilities should consider creating or updating their burn response plans. Doing so in collaboration with essential partners both within and external to your facility can ensure you integrate key elements of triage, care, regional coordination, and transport into all plans. Preparedness initiatives are all about relationships and support by local, state, and federal agencies. Remember Voltaire's quote, "The perfect is the enemy of the good" and stay focused on the core essentials, staff, stuff, space, and systems; try not to get caught up in the weeds. Additionally, identifying the experts and specialized resources that are available is imperative, especially when planning for vulnerable populations. The phrase "nothing about me without me" is a great reminder of the need to be inclusive when forming plans. The plan should be a living document and regularly reviewed and revised – particularly after incidents and exercises.

Caring for those with burn injuries is not enjoyed by everyone so finding a passionate leader or advocate is essential and the more diverse the team, the better. Embracing the kaleidoscope of other's characteristics, perspectives, experience, and talents can bring great value and lead to important conversations. The group meeting should be a safe space for discussion and ideas with a focus on maintaining authenticity in an "all teach-all learn environment." Getting the right people to the planning table resembles disaster response, from local on up the chain, engaging the whole community.

Reaching out to your regional burn center(s) for support in planning efforts is imperative and can help develop relationships and awareness regarding what each partner can contribute. Verified burn centers also have a commitment to outreach education and disaster preparedness initiatives within their coverage areas. The resulting relationship ensures hospitals have evidence-based resources and education to provide initial care for patients until transport to a burn center is possible.

As you refine your burn surge plans, look at ways to operationalize the information such as creating algorithms or other tools that can easily be accessed and used in response to a BMCI. There are several existing resources with best practice recommendations that can help providers through the initial management of one or many patients. When disaster strikes, it is difficult to recall everything we have read (or even written!) in a plan. But if we have some easy references that are posted on the wall or listed in portable materials (e.g., the Burn Buddy Badge or Burn Injury Poster) we can immediately direct our efforts in appropriate ways. This is especially helpful if infrastructure is damaged, and we don't have access to computer versions of the plan. The use of role cards with clear responsibilities is also helpful.

RELATED RESOURCES

ABA Resources

ABA's Disaster Response Page

Burn Mass Casualty Incidents, the Revised (v.3) Triage Tables during a Surge of Burn Injured Patients

Patient Care Priorities for the First 24 Hours in Burn Mass Casualty for Non-Burn Physicians

Western Region Burn Disaster Consortium & Partner Resources

Burn Buddy Badge

Burn Injury Guidelines for Care

Burn Injury Poster

Burn Surge Tabletop Exercise Toolkit

Burn Surge Planning Toolkit

ASPR TRACIE RESOURCES

DASH Burn Module

Healthcare Coalition Burn Surge Annex Template

Step-by-Step Guide to Implementing the Coalition Burn Surge Annex TTX Template (PDF)

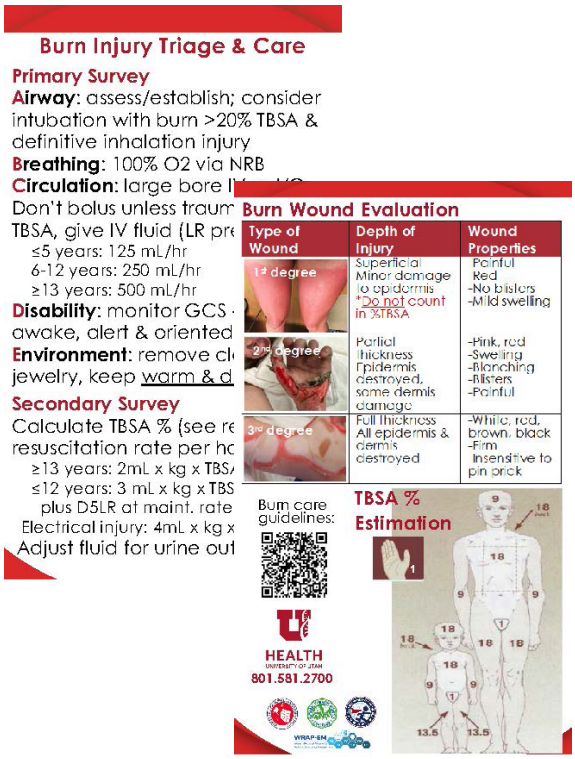
Using the ASPR TRACIE Burn Surge Templates to Enhance an HCC (PPT)

Once your plan is drafted it's important to make sure all of your staff and partners in response are aware of your plan. One way to do this is to host a workshop or walk through of the plan. You can also conduct mini trainings on sections of the plan during regular team meetings to ensure the right people are at the table. Determining operational priorities, goals, and objectives is essential to plan implementation and maintenance.

Exercises

Over the past few years, the Western Region Burn Disaster Consortium's commitment to preparedness has led us to conduct regular burn disaster exercises, illuminating what strategies work and what do not. These lessons allow us to refine protocols through rapid cycle improvement and bolster our capabilities to navigate the complexities of burn incidents. When we are forced to move into a different level of care due to disaster, we are basically asking providers to take on complex decision making that they have likely never practiced in a chaotic and fluid situation, and yet expecting good results. It is not realistic to expect to make that paradigm shift without planning and practice.

To make exercise planning as easy as possible, the Western Region Burn Disaster Consortium and partners recently published a Burn Surge Tabletop Exercise Toolkit that includes an exercise plan template, pre- and post-exercise survey sample questions, an exercise evaluation guide template, facilitator tips, the exercise presentation template, and after-action report and improvement plan templates.



The Western Regional Burn Disaster Consortium's Burn Buddy Badge

These times are chaotic, and bandwidth is tight. Regardless of what is occurring we can't take ourselves too seriously. Incorporation of disaster exercise seasonal themes such as Valentine's Day or Christmas (e.g., BMCI with Santa) adds an unexpected (and potentially more engaging) element into training. Additionally, incorporation of training into existing meetings / training such as staff meetings, orientation, or skills day promotes a disaster ready culture.

Lessons Learned: Telehealth and Beyond

Incorporating telehealth has allowed our burn center to provide a direct approach to acute burn consultations. Using this approach enables us to efficiently assess patient wounds and ensure the patient receives the level of care they need in a timely manner, 24/7, no matter where they are located. Burn size estimation is a crucial component of acute burn management that guides referral to burn centers, fluid resuscitation, hospital resource distribution, and outcome prediction interventions. In Changing the Way We Think About Burn Size Estimation, Pham et. al found that TBSA miscalculations ranged from 5-339% regardless of provider training with < 20% TBSA burns being disproportionately overestimated and more than 75% of patients being "inappropriately transferred." In a burn disaster setting connecting hospitals receiving patients with burn subject matter experts would allow for specialty bed prioritization and allocation of scarce resources such as fluid and ventilators to be used appropriately. Importantly, virtual consultation with burn experts allows non-burn providers to care for burn patients in non-burn hospitals in order to deliver suitable care. Additionally, images shared with burn providers during the consultation can determine the hospital course, boosting the use of telehealth in burn disasters and integrating clinical expertise into jurisdictional response.

The Western Region Burn Disaster Consortium and partners recently conducted four regional virtual tabletop exercises over a 17-month period to test Healthcare Coalition Burn Surge Annexes required by the Hospital Preparedness Program cooperative agreement. More than 1,000 individuals from 25 states, the District of Columbia, and Canada participated. Identified gaps using data extracted from pre- and post-exercise surveys, polling, and discussion questions included the

need for continued education and resources in addition to increased awareness around telemedicine capabilities. An additional Utah two-day ESF 8 response exercise, which included EMS, healthcare, and coalition partners validated these same findings at a statewide level. This data highlights the need for improved every day or "blue-sky" readiness even with single specialty patients so that during a "black sky" incident evidence-based care can be delivered to those who need it most.

The future of telemedicine in burn disaster response looks promising, particularly as organizations such as the ABA, with its network of telehealth volunteers who work through ASPR's Regional Disaster Health Response System , implement comprehensive catastrophic telehealth plans. Other disaster regions (including the Western Region) have an application that can supplement existing telemedicine platforms within the coverage area during a larger incident that overwhelms local burn centers. However, addressing bandwidth issues in scarce resource areas remains a critical challenge. Reliability of telemedicine also depends on robust infrastructure, which can be severely compromised during disasters. Addressing these vulnerabilities and ensuring reliable connections is essential for the seamless transmission of medical data and real-time consultations. By developing resilient infrastructure and incorporating backup systems, healthcare providers can better maintain telehealth capabilities even in the aftermath of a disaster, ultimately improving the overall effectiveness of burn disaster response.

Closing Notes

It is a gift to do work that feels meaningful. The initial care given to the burn patient really impacts long term outcomes and, in a disaster, it will take a village. All of us are that village! Begin to engage in your ABA disaster regions and state disaster exercise planners and get the burn issues to the table, bringing your regional burn subject matter experts to provide operational input. Find out what your hospital is doing – they all should be involved in coalitions and regional planning as HPP funding is centered around that. Determine what resources and training are in place at your facility and what requires augmentation.