

Guideline for Burn Care Under Austere Conditions: Special Care Topics

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GUIDELINES FOR BURN CARE UNDER AUSTERE CONDITIONS: PAIN MANAGEMENT

Introduction

Management of pain after a catastrophe that generates a large number of casualties that may have burns, traumatic brain injury, fractures, amputations, and significant soft tissue injuries will be problematic. In an environment of logistical uncertainty with limited to no resupply, it will be much worse. Supply may be rapidly outstripped by demand. What will

be available to treat our patients? In this scenario, drastic changes in pain management philosophy and algorithms will be necessary. Burn mass casualty events (BMCI) will alter what aspects of pain will be treated, and most troubling, the level at which pain is treated. The purpose of this paper is to outline the philosophy of pain management in austere environments and outline practical applications when resources are limited.

Rationale

The history of pain management in the western world and specifically the United States was elegantly summarized by Meldrum.¹ Philosophical, political, and religious interpretations of pain have driven the suffering of individuals for much of human history. In ancient times, physicians viewed pain as a sign of patient vitality and a measure of prescribed treatment efficacy. This practice changed in the 1800s when individual experience began to replace authoritarian dictates. Opium was the mainstay of Western pharmaceutical practice, as well as an instrument of political action, that is, the Opium Wars. Unfortunately, addiction problems were epidemic. The goal of pain relief was balanced by the fear of introducing addiction throughout the 20th century. Around 1945, a combination of governmental regulation, the availability of relatively safe and effective general and regional anesthesia, and the development and acceptance of other oral medications began to tilt the emphasis toward treatment. In 1999, 10 nations consumed 87% of the world's supply of morphine.²

Pain management is now its own specialty, and even though discussions continue, expectations for a significant level of comfort are the norm in the developed world. Pain management standards have been adopted by The Joint Commission.³ Treating pain is a rational decision. It is humanitarian, reduces cardiovascular, respiratory, and endocrine complications, and there is some indication that adequate

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This work was performed by members of the American Burn Association dedicated to disaster preparedness. They donated their time and efforts to create this document under the auspices of the American Burn Association.

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The opinions or assertions contained herein are the private view of this author, and are not to be construed as official or as reflecting the views of the Department of the Army or the Department of Defense.

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1559-047X/2016*

DOI: 10.1097/BCR.0000000000000369

analgesia may help prevent posttraumatic stress disorder.⁴ Despite the current culture of aggressive treatment, the hard truth remains that pain does not kill. With limited resources, there will be limited supplies, and the need to reassess current thinking.

Triage and palliative care will drive pain treatment needs. Saffle and Palmieri discussed predictors of burn survival and how this could be applied in a mass casualty setting.^{5,6} They developed and updated a table that could be used to suggest allocation of resources in that environment. One of the realities that accompany such triage is the intentional withholding of treatment from patients solely for the lack of resources, a concept completely foreign to most providers. This article endorses the concept of triage and promotes a consensus approach to developing an objective framework for these difficult decisions. This is particularly important in disaster pain management. Triage and pain management planning must consider the competing goals of situational awareness, patient care, resource management, transparency, consistency, proportionality, and accountability.⁷ Consensus driven medical treatment is as important for the physical and moral health of those providing, as it is those receiving care.

The nondisaster current practice of controlling pain to a level of 2–3/10 on a Verbal Numeric Rating Scale for procedural, background, and breakthrough pain will not be sustainable in a BMCI. The actual plan implemented will need to be based on the location of the event, number and type of casualties, health care personnel and resources at hand, and potential for resupply. Whatever treatment parameters are set, it is vital that they are adhered to uniformly until resupply can occur. One example for a resource-limited environment may include: treatment of acute injury or procedural pain with available intravenous (IV) narcotics with treatment of background and breakthrough pain with intramuscular (IM) or per os (PO) agents and accepting 6–8/10 pain level as an appropriate norm.

After determining the optimal pain management plan, providers should estimate the stores needed to provide treatment for a projected number of casualties for an estimated period of time. This requires knowledge of the quantities of medication used to treat patients under normal circumstances. Unfortunately, neither the United Nation's Essential Medicines and Medical Supplies Policy and Guidance of 2011 nor the World Health Organization's (WHO) List of Essential Medical Supplies of March 2011 make any recommendations as to what amount of medication should be transported into a disaster situation for treatment of a specific population or

even give a tool to estimate treatment requirements in general.^{8,9} However, there is literature supporting that approximately 70 mg morphine is needed to treat up to 20% TBSA burns and 150 mg to treat $\geq 30\%$ TBSA burns daily.^{10,11} Many of the latter included patients coming from a combat theater with other concurrent injuries similar to those that would be expected in a mass casualty setting.

Most hospitals currently operate with minimal pharmaceutical reserves. Utilizing computer-monitored inventory programs, supplies are reordered as they are consumed and restocked daily. This is an efficient mechanism for managing inventory and costs, but does not lend itself to disaster preparation. Community pharmacies use similar programs. In a survey on disaster resupply of antibiotics, 60% of hospital expected resupply to be available from the Strategic National Stockpile (SNS) within 48 hr of onset of an incident.¹² Analgesic supply cannot be assumed to be more plentiful than antibiotics. This expectation is not likely to be met in a true mass casualty situation.

How do medical providers actually address pain relief according to the treatment paradigm most appropriate for the local circumstances? A standard national formulary exists for the SNS. Drugs appropriate for burn treatment include ketamine, fentanyl, morphine, methadone, hydrocodone, gabapentin, and lorazepam. Each has a specific unique indication. Ketamine, a dissociative anesthetic with cardiovascular stimulation and limited respiratory depression side effects, can be used for operative and postoperative pain management. It is available in IV and IM forms and can be administered subcutaneously for local anesthetic or as an infusion if there is no IV access.¹³ Fentanyl in IV or intraoral form is ideal for immediate pain management and procedural pain. Morphine has multiple uses and IV, IM, and PO routes of administration. Methadone gives an option for long duration with less potential for addiction. Hydrocodone gives a step-down option. Gabapentin addresses neuropathic pain and decreases overall narcotic use in adults and children.^{5,14} Finally, a benzodiazepine such as lorazepam IV and PO will decrease anxiety and prevent hallucinations in adults with the use of ketamine.¹⁴

Other narcotics that not typically used and not found in the SNS may be available as well. There are several drugs in the agonist/antagonist category that could be beneficial, as they have less potential for respiratory depression and abuse. Butorphanol, 1:5 equivalence to morphine, can be administered IM and IV. Interestingly, it also has an option for intranasal administration which might be beneficial if

IV sites cannot be established quickly.¹⁵ Nalbuphine, with a 1:1 morphine equivalence, falls in this category with similar properties, but without the option for nasal administration. Buprenorphine (Suboxone) has sublingual, transdermal, and injectable dosages with a morphine equivalence of 1:40, but may cause withdrawal symptoms if administered concurrently with other narcotics. In a resource-limited situation, any available narcotic can be used.¹³

Regional anesthesia can be very useful. The complete block of pain in an extremity can provide relief for procedures while preserving pulmonary function. Another advantage is the ability to reset pain receptors that have been sensitized because of prolonged exposure to noxious stimuli. These all result in a decrease in overall pain perception. Problems will include availability of required supplies, risk of infection from indwelling catheters, and the availability of personnel with the technical expertise to perform and manage the procedures.^{15,16}

Nonnarcotic adjuncts to pain management should be used aggressively as well. Gabapentin has been shown to decrease the narcotic requirement, improve pain management, and sometimes assist in decreasing pruritis in children and adults.^{14,17} Pregabalin has been shown to decrease acute pain, pruritis, surface pain, and procedural pain, but not affect opioid consumption in adult burn survivors.¹⁸ The liberal use of antianxiolytics should be considered. There is clear evidence that clonidine can decrease pain as well as anxiety, and amitriptyline may decrease pain and improve sleep and overall affect as well.¹⁴

The use of cannabis for medical and recreational is legal in several states. The federal government has not made any concurrent change in applicable federal statutes and use and possession remain illegal. In this situation, however, there may be a rational argument for including it in a treatment plan. Cannabis is known to have very potent dissociative properties by having a direct effect on the amygdala and thus pain perception.¹⁹ In a situation where narcotics are being reserved for acute and interventional pain, cannabis may fill treatment gaps.

Recommendations

- Continue to coordinate with hospital, community, state, and federal disaster planning agencies
- Know where all available supplies are located and how to secure and access them
- Take an active role in recommending analgesic medications effective in burn injury for inclusion in the SNS

- Develop a strategy that optimizes analgesic medication administration consistently to provide the most good for the greatest number of patients
- Be prepared to use any medication available for pain treatment and be prepared to think outside the box to use other resources that may mitigate pain after burn injury

GUIDELINES FOR BURN CARE UNDER AUSTERE CONDITIONS: NUTRITION

Introduction

Large burn injuries increase calorie and protein requirements (hypermetabolism) requiring higher calorie, protein, and other nutrient intake for wound healing. The hypermetabolic effect of burns directly correlates with the burn extent, which in turn impacts caloric requirements. Large (>20% TBSA) burns cause metabolic changes requiring supplementation.^{20,21} Patients on mechanical ventilation, severe oral or facial burns, or those with larger burns will likely not reach increased nutrient goals orally.^{20,21} In these instances, the use of enteral, and occasionally parenteral, nutrition is standard practice. However, in an austere environment patients who sustain very large burns may not receive aggressive treatment or intervention.⁵

While specialized nutritional formulas are convenient and designed to meet nutrient needs, there are many and varied alternatives when commercial formulas are not available—particularly in emergency situations. Every region has different resources and cultural preferences for nutrition. U.S. hospitals have disaster plans that will be implemented if needed and will drive many nutritional options and interventions. The WHO and its regional offices (eg, Instituto Nutricional de CentroAmérica y Panamá—www.incap.org.gt) can provide detailed information about local foods, nutrient contents, and other resources.^{22,23} The purpose of this paper is to describe reasonable approaches to nutrition supplementation in a BMCI

Rationale

Those with large burns require above-average intake of many nutrients—particularly calories and protein. The WHO recommends an initial calorie target of 2100 kcal for adults under nonemergency conditions, with increases as needed for any additional medical stress.^{23,24} Individual targets can be set by clinicians. The Society of Critical Care Medicine

and the American Society of Parenteral and Enteral Nutrition recommend providing at least 50 to 60% of caloric goal during the first week after injury.²⁵ In reality, the duration of the transition to crisis standards of care and local resources will determine (and probably limit) nutrition support options.²³ Sterile processing and delivery systems may not be possible under emergency conditions, or may not be reasonable due to facility limitations and high costs associated with sterilization. All foods should be prepared and delivered under clean conditions.

Oral Intake

Individual hospital disaster plans and resources will directly affect feeding options. Those with burns <10% (except for facial burns) do not generally have increased requirements. Individuals with smaller (eg, 10–20%) burns generally can meet their caloric needs by increasing the amount of regular foods consumed and/or altering food quality for higher protein value.⁵ Patients should be allowed to eat and drink whenever possible based on triage treatment plans and individual patient tolerance. They can generally meet nutrient needs with their usual intake (assuming preexisting diet is adequate).

Supplemental Enteral Nutrition (ie, Tube Feeding)

Patients with 10 to 20% burns may be able to increase oral intake (calories and protein) to allow for wound healing. Some may not eat enough to meet needs with their usual diet and may benefit from supplemental nutrition (ie, tube feeds). The decision to start tube feedings will depend on how well patients eat and whether feeding tubes are available, can be placed, and if appropriate formulas/blended food are available. Gastric or small bowel nutrition feedings may be used to provide nutrition.^{26–28} Gastric feeding tubes can be inserted without specialized equipment and are generally easier to initiate than small bowel feeds. Facility resources will dictate both the type and quantity of enteral supplements available. If commercially prepared formulas are not available, foods may be blended and given through the feeding tube. Adding soy, dairy products, or other protein-rich foods increases protein intake; pureed fruits (or juice) and vegetables (particularly green or dark yellow) will add vitamins.

Parenteral Nutrition

Parenteral nutrition requires highly specialized formulations, sterile mixing, and delivery needs and will probably not be appropriate under austere conditions.

There is minimal to no data about nutritional care during emergency or crisis situations. These suggestions represent a beginning and a way to approach the assessment of nutritional options and resources along with ways to provide nutritional interventions and support.

Recommendations

- Consult the facility Emergency Operations Plan and emergency care planners to identify the food and nutritional supplement resources to be used in a BMCI
- Provide meals per hospital Emergency Care Plans to those able to eat
- Consider feeding tube (gastric or small bowel) if able and start enteral feeds if resources allow using whatever food is available
- Patients with <10% burns can generally be managed with increased caloric consumption in their regular diet; patients with >20% TBSA burn, mechanical ventilation, or severe face burns are likely to require supplementation
- Initial target intake: 50 to 60% of estimated caloric and protein needs

GUIDELINES FOR BURN CARE UNDER AUSTERE CONDITIONS REHABILITATION:

Introduction

Burn rehabilitation is paramount in assisting the burn patient in returning to function. However, a 2009 consensus statement from the Burn Rehabilitation Summit describing “best practice” or “standards of care” of the burn patient admitted to and treated at one of the 156 verified burn centers in the United States revealed a lack of standardization of burn rehabilitation between the centers with little or no research to support one therapeutic practice over another.²⁹

The World Trade Center disaster in 2001 was an impetus to many countries, including the United States, to solidify disaster plans should there be another large-scale disaster with many burn patients.^{30,31} Edgar and colleagues further discussed the role of therapy after the 2002 Bali disaster, which involved the emergent care of 28 survivors, and in 2007 a postgraduate course at the annual American Burn Association (ABA) meeting focused on disaster response and included a section on therapy.^{32,33} Although the ABA course discussed sending therapists and supplies to then embattled Paraguay for

assistance, no practical information was provided about actual therapy practices that could potentially be used during a disaster.³⁴ Limited resources are available for guidance about stretching, exercising, or splinting during a disaster, and no papers have been published about the treatment of burn survivors in the austere environment. Therefore, the current paper is intended to provide some basic guidelines regarding the issue of burn rehabilitation care in disaster situations.

Rationale

The mainstays of burn rehabilitation are positioning, splinting, and exercise. Positioning after a burn injury is standardized and clearly described in the literature. Positioning may be accomplished by using specially designed equipment, or with simple, readily available devices such as pillows or sheets. Splints for the ankles, hands, elbows, or axillas are usually made with Orthoplast (Ortho Plast, Norcross, GA).³⁵ This material may not be available in a third world environment or may not be available in sufficient volume in a mass casualty event in a developed country. One alternative would be the use of socks in the palm to keep the hand from fisting or fusing in an extended position (Figure 1). Any form of padded plastic could also be substituted as needed. As soon as a burn survivor is medically stable, family members can facilitate sitting on the side of the bed and an eventual transition to standing and walking.³⁶ Training the survivor and their family in ongoing stretching and exercise will be essential to improve outcomes.

Positioning and Therapy Options

Following a burn injury, survivors who are bed-bound should be positioned with shoulders in 90 degrees of ABDuction (away from the body), with some horizontal ADDuction (forward) to avoid stretch on the brachial plexus (Figure 2). Elbows



Figure 1. Hand position with socks to avoid full fisting.



Figure 2. Shoulder and arm positioning. The shoulder should be moved forward slightly. The elbow and wrist are straight and the palm should face upward if possible.

should be extended, forearms supinated, and wrists in neutral position.³⁷ This can be done with pillows or other readily available supports. Hands should be positioned with the knuckles partially bent to 45 to 70 degrees and with the fingers straight, especially if the burn is full thickness.³⁸ Full fisting should be avoided. Legs should be positioned slightly apart with knees straight and ankles at a right angle. This can be done with pillows against the end of the bed (Figure 3). Pillows should not be placed under the knees. This allows the knees and hips to get tight and will make standing more difficult.

Available family members or caregivers should be instructed in a stretching and range of motion program. Stretching is moving the burn limb slowly as far as the burn survivor is able and then maintaining that position to allow the skin to stretch.³⁹ This should be done for 20 or more minutes at least twice per day. The ultimate goal is full motion of affected joints or limbs. If pulleys are available, this is an



Figure 3. Foot positioning.

excellent way to facilitate stretching of the shoulder and elbow (Figure 4).

As soon as an individual is stable, family can assist with sitting on the side of the bed and advance to standing as the blood pressure tolerates. If the patient has been intubated for a period of time, they are likely to need more time in sitting, to increase their upright tolerance, before they are strong enough to walk. Once an individual can sit without being held upright or getting dizzy or faint, then standing can be attempted. Initial standing should be done with two people for safety because the burn survivor may be very unstable. When able to stand for 5 min,



Figure 4. Pulleys for stretching the shoulder.

and take steps in place, walking can begin. Holding a hand or pressing against a caregiver's shoulder can facilitate balance and increase distance walked. The survivor should increase walking distance each day. Those with only hand or arm burns should be encouraged to be up and out of bed as soon as possible to diminish the effects of bed rest. Those with leg burns, in particular those with burns below the knee, may have difficulty standing in place due to pain from increased blood flow. It may take them several attempts before being able to walk. The pain they will feel in their affected leg will diminish after 10 to 20 steps. Wrapping the legs with a compression bandage may help partially alleviate this pain.

Conclusion

Rehabilitation care for a burn survivor should ideally involve both physical and occupational therapy. In austere conditions, the combination of using available resources creatively and training the family to assist may provide the essentials to facilitate a successful outcome after a burn injury.

Recommendations

- Elevate limbs if they have significant swelling
- Position shoulders away from the body with elbows straight
- Position hands to avoid fisting
- Position legs away from the body with knees straight
- Position ankles at a right angle
- Stretch skin at least twice per day
- Train family to assist in therapy, if able
- Encourage sitting and walking as soon as possible

GUIDELINES FOR BURN CARE UNDER AUSTERE CONDITIONS: PEDIATRIC CONSIDERATIONS

Introduction

Children, particularly infants and children less than 5 years old, are an at risk population in austere circumstances.⁴⁰ Children are anatomically and physiologically different from adults, and these differences can predispose them to more severe physical and psychological sequelae in the event of a disaster. In war and austere situations, pediatric trauma patients have relatively higher mortality rates. These children are at risk during the acute event as they are less able to protect themselves from traumatic injury. Fear might prevent children from telling adults they

are injured, or spur them to hide from the danger rather than escape. In mass casualty events, children are dependent on adults for an escape route, making them more likely to be injured or killed.⁴¹

Children are also at risk for injury and illness in the chaotic period following an acute event, and often this presents as an austere circumstance. In the mid-1990s, Nicaraguan and Honduran children were displaced to refugee camps because of the Contra war. Infants represented 42% of all deaths in the refugee camps and children under 5 years represented 54% of deaths.⁴² Lack of clean water, proper sanitation, adequate nutrition, shelter, appropriate medical response, and treatment and psychological support places the child at risk for disease and injury. Lack of clean water is associated with diarrheal dysentery, cholera, typhoid, hepatitis A, polio, and helminthiasis. Furthermore, the potential absence of a parent to provide or advocate for these essential needs places the child at further risk for disease and injury. For example, unsupervised children could dip their hands into the water supply and could therefore be responsible for spreading diseases. Often, the children are most seriously affected by dehydration associated with these diseases.⁴³

Burn injuries are common in the aftermath of disasters, as accidents occur when improvised cooking, heating, and housing structure go wrong. In these cases, the injury should be recognized as an acute event on top of chronic stressors. These chronic stressors further confound the treatment of a serious burn in austere circumstances. Chronically malnourished children are susceptible to congestive heart failure with rehydration or blood transfusion. These children are at risk for severe anemia, high output failure, and electrolyte disturbances. Micro-nutrient deficiencies in iron, vitamin A, niacin, and thiamine can result in anemia, scurvy, pellagra, and beriberi. Cardiac muscle atrophy is associated with prolonged protein deprivation.^{43,44} The purpose of this section is to describe fundamental issues in disaster management in children.

Rationale and Key Issues

Identification of or formation of a local disaster management communication and authority structure is critical for assessment and distribution of available resources for children. Local leaders in a community can be vital in assisting medical personnel with for pediatric issues. They can identify children in need of medical attention for their burns, confirm caregiver identity, and locate local resources such as food, shelter, and medicine. However, they should

be reminded to address the maintenance of a safe environment for children during austere conditions, including, among other things, hygiene and fire safety.

Recognition of the difference in burn care between adults and children is important to provide the best care possible even in austere circumstances. Children differ from adults in physiology, BSA, lung development, fluid requirements, ability to heal, response to sepsis, susceptibility to infection, language skills, and socialization. BSA burned is calculated differently in children from adults. Children have a larger head and trunk to limb ratio than adults. Use of Lund-Browder charts or modified Rule of Nines charts or child's palmar size can assist in a more accurate calculation of the BSA burned.⁴⁴

The elements of oral and IV rehydration therapy and calculation guidelines are outlined in Guidelines for Burn Care Under Austere Condition: Fluid Resuscitation. If unable to secure IV access, intraosseous access can sometimes be easier to obtain than direct IV access. If presentation is very delayed and wounds are granulated or grossly infected, treatment of septic shock with rehydration may be necessary.

Children with burns are more vulnerable to dehydration and respiratory insufficiency secondary to infection and hypothermia than adults in a similar situation. Children have a higher BSA to weight ratio than adults, and risk hypothermia with exposure to cold environments. Hypothermia increases fluid requirements, the inflammatory response, and the necessary treatment taxes otherwise scarce resources. Infants have limited ability to thermoregulate. Protection of small children and infants from exposure to the elements is warranted, particularly in the presence of burn injury and during operative interventions. In some cases, this can be achieved by cosleeping with the mother, extra blankets, and avoidance of unnecessary baths.^{43,44}

All attempts should be made to proceed with oral/enteral intake, although this will be limited by ileus in larger burns. For baseline nutrition and fluids in nursing children, if the mother is not available, location of donor milk or a local wet nurse is useful. Breast milk varies in nutritional composition and electrolyte composition. Beyond the early postpartum period, average measurements list human milk sodium at 141 mg/L, potassium at 480 mg/L, and chloride at 452 mg/L. The nutritional content varies as well, depending on the mother, her nutritional state, and the volume of milk produced per day. Reported averages for breast milk contents list 3 to 5% fat, 0.8 to 0.9% protein, 6.9 to 7.2% carbohydrate as lactose, and caloric content as 60 to

75 kcal/100 ml.⁴⁵ For older children, oral rehydration and nutritional supplementation with high protein products such as peanut paste are central elements of resuscitation and acute care of the burned child in austere circumstances.

While enterally and parenterally administered medications are the mainstay of pain control following burn injury, they can be in limited supply in a mass disaster or austere circumstances. For burns, topical therapy can be enormously effective for pain reduction. First aid with cool water is the first step in pain control. Following this, application of a petroleum-based ointment such as bacitracin or petroleum jelly, or burn creams such as silver sulfadiazine with an occlusive dressing can greatly reduce the pain of a second-degree burn. Frequently applied ointments without a dressing to areas such as the face are also effective in reducing pain. Prevention of infection is important for pain control, as infected wounds are painful. Readily available or easily manufactured solutions such as Dakin's are useful. Homeopathic remedies such as honey can be used as astringents to reduce discomfort associated with swelling and some even have anti-infective properties.⁴⁶ Root and plant products such as aloe or tea tree oil are thought to improve healing from burns, but this is not always supported in the literature.⁴⁷ High-tech dressings using silver based delivery systems (such as Acticoat® (Smith and Nephew, London, UK) or Aquacel® (Conva Tec, Greensboro, NC) or Mepilex® (Mölnlycke Health Care, Norcross, GA)) require less frequent dressing changes and preserve medical personnel time and efforts, but can be in short supply during disasters.^{48,49} Decreasing the frequency of dressing changes also helps with pain control. Elevation of the burned area decreases swelling, pain, and the subsequent development of complications. Protecting the wound from exposure to the air and the environment is important in reducing pain and the risk of infection. Children have limited glucose stores and are susceptible to hypoglycemia with infection. Infection can present as hypothermia in a small child rather than fever, and limitations in laboratory analysis could force reliance solely on physical examination to assess progress.

As discussed in the pain guideline, use of ketamine for bedside procedures can be extremely useful in austere settings as airway protective reflexes and respiratory drive are better maintained.⁵⁰ Distraction techniques help reduce pain and anxiety around procedural interventions.

The decision to operate on a burned child in austere circumstances is not to be taken lightly. During disasters such as the Haitian earthquake, burn wounds in children can be complicated by fractures, infections, and/or extensive tissue damage

caused by crush injury or other trauma, and open amputations might be necessary. In neonates, many deep burns will heal with time, and conservative treatment with dressings could be sufficient. Anesthesia administration in a small child could be labor intensive if the available team is not used to pediatric cases. During operative intervention, limit blood loss using tourniquets and epinephrine clisis prior to excising burns and harvesting grafts. When definitive surgery is not available for wound closure, consider alternating judicious splinting with active range of motion to lessen contracture development.

Because children are dependent on parents, every effort should be made to pair children with parents or a responsible guardian. Security and safety in the unfamiliar disaster environment, although sometimes difficult to achieve, are important factors to protect the child from further harm or injury. Unsupervised children are vulnerable in these situations. Identification of unaccompanied children, particularly preverbal children, can be quite problematic. Assigning temporary names and specific caregivers to such children is useful. Documenting whatever is known about injury, recovery circumstances, and location is important, as this relocation information will otherwise inevitably be lost.

Triage using objective tools such as JumpSTART6 is helpful in a multicasualty situation. The presence of appropriately trained individuals to manage the burn child in a disaster or austere circumstance is highly desired. Assigning personnel that have pediatric training to manage these patients can help conserve time and resources and improve outcomes.⁵¹

Palliative care should be planned. It is important that the palliative care team act as a secondary triage system in a disaster setting. It is imperative that they are flexible and adapt to changing circumstances, particularly in regard to children.

Transfer the patient as soon as possible to an intact medical specialist system. Burn disaster situations where the main victims are children have occurred but are fortunately rare. Two recent episodes, the 2009 ABC daycare fire in Hermosillo, Mexico, and the neonatal nursery fire in Romania illustrate these.⁵² The children were distributed to multiple local hospitals, and a dozen severely injured children were further triaged to the Shriners Hospital system in the United States. Distribution of the children across the burn centers allowed full multidisciplinary team to care for each child without overly taxing the system. In the Romanian case, eight neonates were partially protected by incubators and survived the initial fire.

Even though the pediatric section of that hospital was damaged, eight burned low-birth-weight neonates were able to be transferred to a nearby, fully equipped pediatric hospital, where most of them were saved.

It is possible that with prolonged austere circumstances patients arrive in a delayed fashion from distant locations. Children can be extremely resilient and might have survived an injury with minimal medical care. In these cases, one might typically see a child with a chronically granulated wound, possibly complicated by severe contractures. These wounds, if open, could contain a high bacterial count, fungus, and possibly even mold. Ideally, rehydration should be performed after transfer to a full intensive care unit setting, as immediate septic shock could ensue. Delayed reconstructive operations for contractures are often successful, but are most safely performed when a full medical system is available.

Recommendations

- Keep children with a parent or designate a responsible adult to watch them
- Assign temporary names and guardians to unidentified preverbal children and preserve information on how and where they were found
- Keep the child warm using cosleep with the parent/guardian, extra blanket, avoid unnecessary baths
- Triage using objective tools such as Jump-START13 if a multicase situation
- Calculate BSA burned using Lund–Browder chart or palm size
- Use oral rehydration and oral/enteral feedings if possible
- For pain management, cover the wounds with dressings and ointments, avoid unnecessary dressing changes, elevate the burned area, alternate splinting and active range of motion, and use distraction techniques around procedures. Ketamine is a useful procedural sedative if available.
- Operative interventions are high risk in austere circumstances. Use open amputation for gangrene, and limit blood loss using tourniquets and epinephrine clisis
- Recognize sepsis: hypothermia and hypoglycemia could be sepsis; beware of resuscitating patients with old wounds without preparation for ensuing septic shock
- Transfer the patient to a burn center when possible

GUIDELINE FOR BURN CARE UNDER AUSTERE CONDITIONS: PALLIATIVE CARE

Introduction

The need for palliative care in mass casualty planning has become a necessity for disaster planners.⁵³ Rosoff argues that palliative care in the face of an overwhelming health care disaster is obligatory.⁵⁴ Even the Agency for Healthcare Quality and Research recognizes palliative care as a new component of disaster planning and published broad palliative care guidelines for mass casualty planning with scarce resources.⁵⁵ The Institute of Medicine in the “Summary of Guidance for Establishing Crisis Standards of Care for Use in Disaster Situations: A Letter Report” has also recognized the need to address palliative care needs during a large-scale emergency.⁵⁶

A BMCI is an event where the number and severity of patients could rapidly exceed both available human and material resources. While much has been done to enhance burn surge capabilities in the United States, the number of designated burn beds available in ABA-verified burn centers may be inadequate for an inpatient surge.^{5,49} Inevitably, some patients will sustain nonsurvivable injuries. In the resource-restricted environment surrounding a BMCI, it is important to develop a palliative care plan for these patients.

But what is “palliative care”? The WHO defines palliative care as “an approach that improves the quality of life of patients and their families facing problems associated with life-threatening illness, through the prevention and relief of suffering by means of early identification and impeccable assessment and treatment of pain and other problems, physical, psychosocial and spiritual.”⁵⁷ The International Association of Hospice and Palliative Care (IAHPC) defines palliative care as “the care of patients with active, progressive, far-advanced disease, for whom the focus of care is the relief and prevention of suffering and the quality of life.”⁵⁸ These definitions are consistent with that of the National Consensus Project for Quality Palliative Care published in the *Clinical Practice Guidelines for Quality Palliative Care*.⁴⁸ The guidelines state, “The goal of palliative care is to prevent and relieve suffering and to support the best possible quality of life for patients and their families, regardless of the stage of the disease or the need for other therapies.” While these definitions may be useful in the development of palliative care guidelines for mass burn casualty response, they have been written with a presumption that there will be adequate resources available in appropriate health

care settings for the number of injuries generated by an incident. These guidelines also do not take into account the need to prepare for patient admissions apart from the disaster itself.

Crisis standards of care would be extremely useful, but in many jurisdictions have not been developed. The Institute of Medicine has a national guidance framework of crisis standards stating that standards:

- Be fair, evidence-based, and responsive to the needs of the patients
- Include processes and procedures for ensuring that decisions and implementation of the standards are made equitably
- Engage both the community and providers in the development of the standards, and provide adequate public education
- Become the rule of law when enacted

While numerous burn mass casualty planning articles have been published, none has directly addressed the issue of palliative care. The purpose of this article is to provide a framework for palliative care in a BMCI.

Rationale

A BMCI will challenge current palliative care algorithms, which are focused primarily on the management of patients suffering from chronic terminal conditions such as cancer. BMCI incidents will likely generate palliative care needs for previously healthy, relatively young individuals who do not have chronic disease as well as the “traditional” palliative care patient with multiple comorbidities. Hence, there is a need for a more comprehensive triage process.

Burn injury uses both burn size and age to assist in making palliative care decisions. The ABA recommends responders follow a Triage-to-Benefit Ratio table first developed by Saffle et al and refined by Palmieri et al that classifies severity as outpatient, high, medium, low, and expectant.^{6,59} For more specific recommendations see Guideline for Burn Care Under Austere Conditions: An Introduction to Burn Disaster Management Principles. It should be noted that all triage decisions have complex legal and ethical implications and should be addressed by emergency planners who need to work in a transparent manner, using a sound ethical framework. Patients triaged as expectant are those most likely to benefit from palliative care.^{55,60,61} Expectant category designation, however, should not mean “no care.” Medical providers have the moral imperative to provide assistance to all patients within situational, supply, and resource constraints. Development of

non-resource-intensive palliative care plans prior to a BMCI is the best way to assure that these patients receive the optimum care that can be provided in that particular situation.

Due to the paucity of research on provision of palliative care in austere conditions, it is impossible to provide strict evidence-based guidelines to be used in this scenario. Fortunately, excellent evidenced-based guidelines have been published by the National Quality Consensus Project for Palliative Care and the IAHP.^{48,58}

Care Location Requirements

When designated burn beds are limited, expectant patients may be cared for at alternate care sites. Community disaster plans should identify the most appropriate sites of care. Locations such as hospices and long-term care facilities are excellent options if available. Hospice and palliative care specialists and geriatric specialists should be integrated early on into the planning process.^{49,53} Regardless of location, palliative care should be provided at a site that is as comfortable and as private as possible allowing the patient’s family/significant others to be present. It is critical that parents or guardians be allowed to be with their children. Promoting patient comfort should be the highest priority.

Pain and Anxiety

Pain and anxiety management should be evidence based as much as possible.^{48,58} “Practice Guidelines for the Management of Pain,” published in the *Journal of Burn Care and Research*, provides guidance regarding pharmacologic management of acute burn pain. Finally, the palliative care guidelines published by the IAHP may be helpful.^{58,62} During a disaster, there may be significant shortages of medications. The best available and strongest analgesics should always be used. Parenteral opioids offer the quickest onset of action. Oral opioids may be useful if parenteral opioids are unavailable and the patient is able to ingest them. Transdermal opioids may also be a viable alternative if there is an area of intact skin and no other routes are available. The sublingual route should also be considered. All opioids need to be titrated to an effective dosage, implementing a pain scale to assess effectiveness. Nonopioids such as acetaminophen and nonsteroidal anti-inflammatory drugs are an option if there are no available opioids. Acetaminophen may be administered rectally and some nonsteroidal anti-inflammatory drugs parenterally if necessary. Adjuncts such as anxiolytics (lorazepam) and anesthetic agents (nitrous oxide

or ketamine) may also be considered. In situations where resources are severely limited, local herbal remedies or alternative care methods may be the only interventions readily available for patient comfort and should be considered (www.herbalremediesinfo.com). A more extensive discussion on medications is presented in the Guideline for Burn Care Under Austere Conditions: Pain Management section of this manuscript.

Airway and Wound Care

Burn professionals recognize that while severity of injury is contingent on several risk factors, complications resulting from the burn pose the greatest early threats.⁶³ Airway obstruction caused by inhalation injury, neck edema, and secretions adds to the patient's anxiety. Intubation may be clinically appropriate but should be instituted only if adequate equipment and medical staff are available to support what could potentially be prolonged ventilatory support. Supplemental oxygen and bronchodilators may also be administered if available. Ensuring adequate pain control and managing the patient's anxiety will help decrease the patient's sensation of air hunger, particularly if the patient is not a candidate for intubation and ventilatory support.⁵⁸ The patient's wounds should be covered with clean blankets and the patient should be kept warm and dry. Oral nutrition and hydration can be provided if the patient is able to swallow and is so desirous. Attention should be paid to the emotional, spiritual, and cultural needs of the patient and family. Psychosocial support should be provided if possible. Psychiatrists, psychologists, social workers, and clergy should be used if available.

Palliative care in austere conditions is sure to be less than ideal; however, every effort should be made to ensure that the patient is kept comfortable and is allowed to die with dignity in the presence of family and significant others. Although these recommendations are grounded in the best possible evidence from the palliative care literature, little has been published to guide practitioners during disasters. Further retrospective study of past mass casualty events needs to be completed, with a focus on the management of end of life issues. Emergency planners need to begin to develop plans that address the issues outlined above. Plans should be developed using an ethical framework which balances the precept of the greatest good for the greatest number with the imperative to ensure that respect and dignity are maintained for the dying.

Recommendations

- All burn centers should work with the community to develop fair evidence-based palliative care guidelines to be used during a mass burn casualty.
- Patients triaged into the expectant category are those that will most benefit from palliative care.
- Community disaster plans should identify alternative sites of care (eg, hospices, long-term care facilities) for patients requiring palliative care.
- Pain and anxiety management with the best available pharmaceuticals is a priority.
- Artificial airways, supplemental oxygen, and bronchodilators if available may be beneficial for the prevention/management of air hunger.
- Privacy and access to family and spiritual supports should be provided.

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