

Burn Care in the Emergency Department: Key Steps and Recent Guidance

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ABSTRACT

Burn injuries are common presentations in emergency departments (EDs) and require rapid evaluation and early intervention to prevent complications and reduce morbidity and mortality. Initial management focuses on airway stabilization, fluid resuscitation, pain control, burn assessment, wound care, and appropriate patient disposition. Standardized algorithms such as Advanced Burn Life Support (ABLS) emphasize systematic evaluation based on trauma principles, including airway, breathing, circulation, disability, and exposure. Accurate estimation of burn depth and total body surface area (TBSA) is essential to guide fluid resuscitation and determine the need for specialized burn center referral. Early analgesia, prevention of hypothermia, and evidence-based wound care are critical elements of ED management. Prehospital care and coordination with emergency medical services also play an important role in improving patient outcomes. In addition, special considerations are required for pediatric patients, rural healthcare settings, and mass casualty scenarios. Recent literature highlights the importance of standardized protocols, early multidisciplinary involvement, and improved prehospital training to optimize burn care delivery. This review summarizes key steps in emergency department burn management and discusses recent evidence guiding early stabilization, assessment, and referral decisions.

KEYWORDS: Burn injuries; Emergency department; Burn resuscitation; Burn assessment; Fluid resuscitation; Inhalation injury; Burn center referral; Emergency medicine; Acute burn management.

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INTRODUCTION

Burn injuries represent a frequent cause of emergency department visits and may range from minor cutaneous injuries to life-threatening trauma requiring rapid resuscitation and specialized care. Early management plays a critical role in determining patient outcomes because inadequate initial treatment may lead to complications such as burn shock, infection, or delayed transfer to specialized burn centers (1).

Emergency physicians must therefore adopt a systematic approach based on trauma principles, prioritizing airway stabilization, fluid resuscitation, analgesia, and early wound care. Standardized protocols such as Advanced Burn Life Support (ABLS) emphasize rapid assessment and structured

management to reduce morbidity and mortality associated with burn injuries (2).

Recent literature has also emphasized the importance of integrating prehospital and emergency department care. Effective coordination between emergency medical services and hospital teams improves early stabilization, pain control, and timely transfer to specialized burn centers when required (3).

LITERATURE REVIEW

Initial Assessment and Airway Management

The first priority in burn management follows the standard trauma approach based on airway, breathing, circulation, disability, and exposure. Early recognition of inhalation

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injury is essential because airway edema may progress rapidly and compromise ventilation (4).

Patients presenting with facial burns, singed nasal hairs, soot in the airway, hoarseness, or signs of respiratory distress should be evaluated carefully for inhalation injury. Early intubation is recommended in cases with suspected airway compromise because delayed airway control may become technically difficult due to progressive edema (5).

Inhalation injuries are associated with increased morbidity and mortality, highlighting the importance of early airway protection and adequate oxygenation during initial stabilization (6).

Circulation and Fluid Resuscitation

Assessment of burn severity requires estimation of total body surface area (TBSA) involved and evaluation of burn depth. These parameters guide fluid resuscitation and determine the need for specialized care (1).

For major burns, fluid resuscitation is typically initiated using formula-based strategies such as the Parkland formula. Early fluid administration helps prevent burn shock and maintain adequate tissue perfusion (5).

However, excessive fluid administration may lead to complications including pulmonary edema and compartment syndromes, a phenomenon sometimes referred to as “fluid creep.” Therefore, careful monitoring of urine output and clinical parameters is essential to guide resuscitation (7).

Exposure, Temperature Control, and Burn Assessment

Complete exposure of the patient is necessary to identify all injuries and accurately estimate burn size. However, maintaining thermoregulation is equally important because burn patients are highly susceptible to hypothermia due to loss of skin barrier function (4).

Burn wounds should be cooled using clean water for a limited period shortly after injury, as this may reduce tissue damage. Ice application should be avoided because it can worsen tissue injury (1).

Accurate burn assessment includes evaluation of mechanism of injury, burn depth, TBSA involvement, and associated trauma. These factors are essential for determining severity and guiding further management (3).

In circumferential full-thickness burns of the hand, the formation of a rigid eschar combined with progressive tissue edema can lead to increased compartment pressure and compromised distal perfusion. Because the hand is considered a special anatomical region with limited soft-tissue compliance and multiple tightly organized compartments, early recognition of vascular compromise is critical. In these situations, dermofasciotomy (escharotomy with possible extension to fasciotomy) may be required to relieve constrictive eschar and restore adequate perfusion. Indications include progressive pain, paresthesia, delayed capillary refill, cyanosis of the digits, diminished Doppler signals, and increasing tissue tension. Prompt decompression helps prevent ischemic injury to muscles, nerves, and

tendons, thereby preserving hand function and reducing the risk of permanent disability (1-3).



Figure 1. Schematic representation of dermofasciotomy in circumferential third-degree burns of the hand, illustrating eschar-related vascular compromise and the decompressive surgical incisions used to restore distal perfusion.

Pain Management

Adequate analgesia is a central component of emergency burn care. Severe pain is common even in relatively small burns, and inadequate pain control may worsen patient distress and complicate evaluation (1).

Intravenous opioids remain the primary treatment for acute burn pain in the emergency department. Ketamine is also increasingly used as an adjunct or alternative analgesic, particularly in patients requiring procedural sedation or in pediatric populations (8).

Early and aggressive pain management improves patient comfort and facilitates wound evaluation and treatment.

Wound Care in the Emergency Department

Initial wound management focuses on gentle cleaning, removal of debris, and application of protective dressings. Evidence-based recommendations generally discourage routine prophylactic antibiotic use in uncomplicated burns (3).

Closed dressings are typically applied to maintain a moist wound environment and reduce contamination risk.

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Additional treatment strategies depend on burn depth and the presence of associated injuries (1).
Special Populations and System-Level Considerations
Certain patient groups require additional considerations in emergency burn management. Pediatric patients are particularly vulnerable due to their higher risk of fluid imbalance and different physiological responses to burn injury (9).

Burn injuries are also frequently encountered in rural emergency departments where access to specialized burn centers may be limited. Structured protocols and telemedicine consultation with burn specialists can help guide management and facilitate timely transfer when necessary (2).
Prehospital care plays a crucial role in early burn management. Studies suggest that appropriate first aid, early analgesia, and rapid transfer significantly improve outcomes in burn patients (10).

Table 1. Key Steps in Emergency Department Management of Burn Patients

Management Step	Key Actions	Clinical Importance
Primary survey	ABCDE trauma assessment and cervical spine protection	Identifies life-threatening injuries early
Airway evaluation	Assess for inhalation injury; early intubation if needed	Prevents airway compromise
Circulation and fluids	Estimate TBSA and initiate fluid resuscitation	Prevents burn shock
Exposure and temperature control	Fully expose patient but prevent hypothermia	Ensures accurate assessment
Analgesia	Administer IV opioids or ketamine	Improves patient comfort and evaluation
Wound care	Cooling, cleaning, and protective dressings	Reduces infection risk
Disposition	Determine need for burn center referral	Ensures specialized care when necessary

DISCUSSION

Emergency department management of burn injuries requires rapid assessment, standardized protocols, and coordinated multidisciplinary care. The primary goals are stabilization of vital functions, prevention of secondary injury, and early identification of patients who require specialized burn center treatment.
Recent studies highlight the importance of improved training for emergency physicians and prehospital providers. Variability in burn assessment and early management remains a challenge in many healthcare systems, particularly in rural or resource-limited settings (10).
Additionally, registry data suggest that many burn injuries presenting to emergency departments are minor and can be managed without specialized referral. Nevertheless, appropriate triage remains critical because delayed transfer of severe burns to specialized centers may worsen outcomes (9).

CONCLUSION

Burn injuries require rapid and structured management in the emergency department to minimize morbidity and mortality. Early airway assessment, appropriate fluid resuscitation, effective analgesia, and evidence-based wound care are essential components of initial treatment.
Standardized protocols and improved coordination between prehospital services, emergency departments, and burn centers are key to optimizing patient outcomes. Continued research and education are needed to improve early burn assessment, reduce treatment variability, and enhance care delivery in diverse clinical settings.

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