Managing burn emergencies
Pam Wiebelhaus; Sean L Hansen
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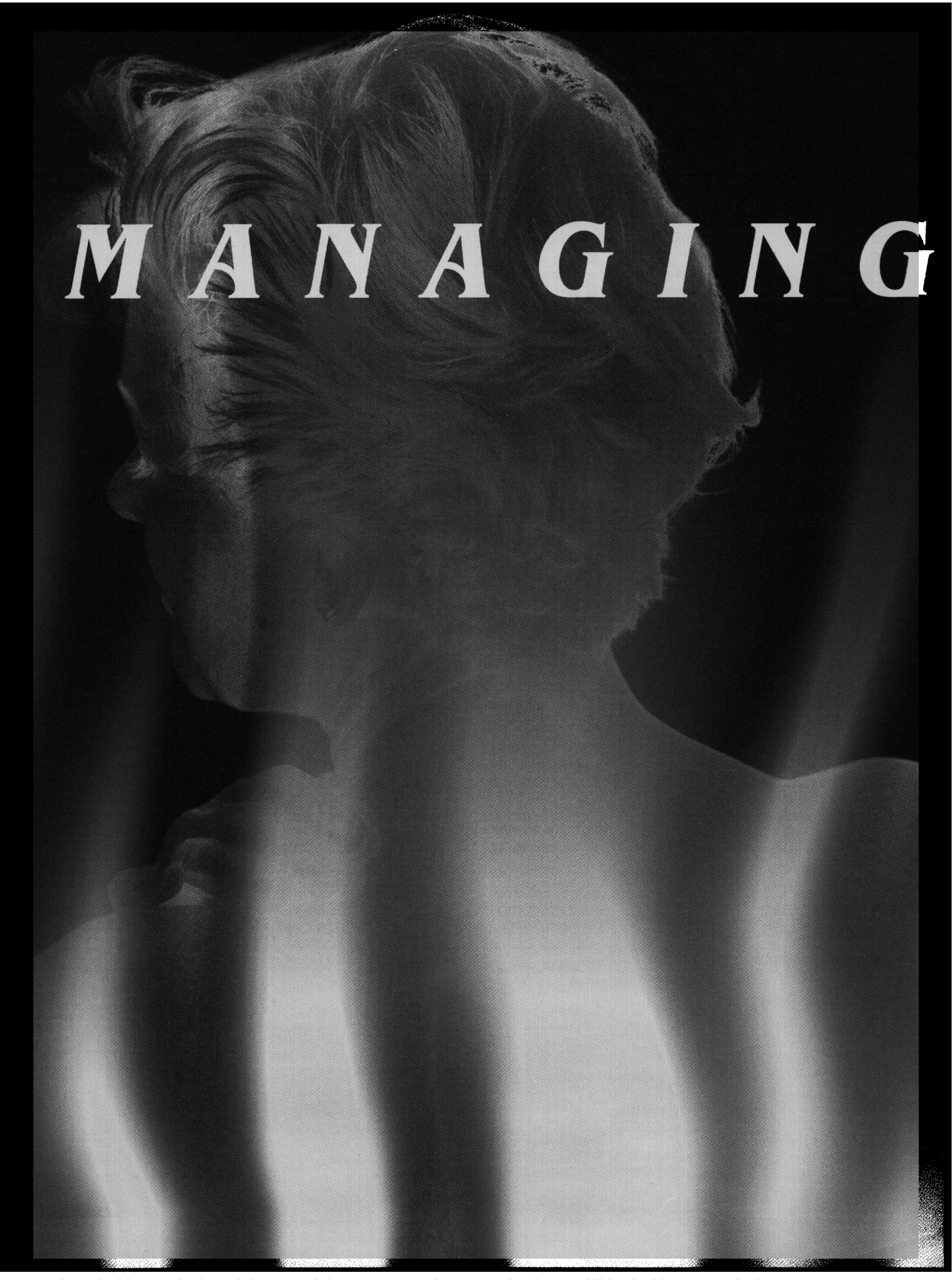

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BURN EMERGENCIES

Your staff's actions in the first crucial hours after a burn injury can improve the patient's chances of survival and a good recovery.

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Abstract: Learn how to provide emergency care for a burn patient, from safety at the scene to patient stabilization, and, if necessary, transport to a burn center.
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Each year, more than 2 million Americans suffer burn injuries. Only about 1% of these people require hospitalization for severe burns. But for these unfortunate people, the nursing care provided in the first few hours after injury is crucial. Your interventions can help determine a patient's ability to survive a serious burn and make a functional recovery.

Fighting fire

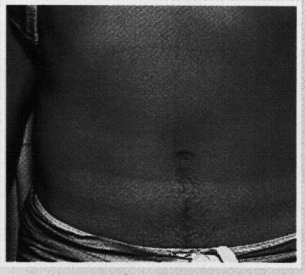
Suppose your first contact with a burn victim is at the scene of injury—a house fire, for example, or a car accident. If the victim's clothing is burning, your first priority is to stop the fire. Use a blanket or have the person stop, drop, and roll to extinguish the flames. Move him to a safe place and remove any smoldering clothing that isn't stuck to the skin. Also remove jewelry, such as rings or watches, from burned limbs; they may retain heat and impede circulation when the injured tissue swells.

Use cool compresses on the burn: Thermal damage continues as long as the tissues remain hot. But be cautious because of the risk of hypothermia. Never put ice on a burn; vasoconstriction can exacerbate tissue damage.

Once the burning has stopped and you

Classifying burns

♦ Superficial or first-degree burns involve damage only to the epidermis. A sunburn is a typical example. The skin is pink to red, without blisters, and dry and painful to the touch. Patients rarely need hospitalization unless the burn covers a large body surface area; in that case, he may need treatment for pain and fluid imbalance. Healing occurs within 3 to 5 days, as the injured epithelium peels away from the underlying healed tissue.

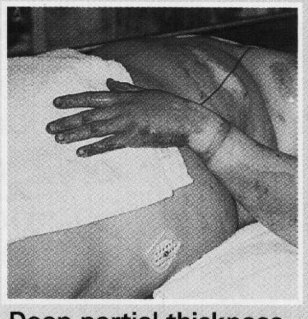


Superficial or first-degree

♦ Partial-thickness or second-degree burns may be further classified as superficial partial thickness or deep partial thickness. Superficial partial-thickness burns involve the epidermis and the upper layers of the dermis. Blistering is a classic sign of this injury. When blisters rupture, these burns appear moist, bright red, or mottled in color and are extremely painful to touch. The burns blanch when pressure is applied. Healing typically occurs within 10 to 21 days with minimal scarring.

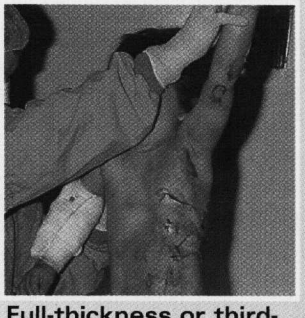
Partial-thickness or second-degree

♦ A deep partial-thickness burn involves destruction of the epidermis and most of the dermis. These burns may also blister, but most often appear slightly moist to dry and are dark red to pale in color. The burns are sensitive, but patients complain more of discomfort than pain. When pressure is applied to the burn, it may blanch slowly or not at all. Skin grafting may be necessary.



Deep partial-thickness or second-degree

♦ Full-thickness or third-degree burns destroy all layers of the skin. These burns are dry, leathery, and firm. They appear white or charred, are insensate to touch, and don't blanch when pressure is applied.



Full-thickness or third-degree

and the patient are safe, begin your assessment.

Tending to trauma

Burn patients are trauma patients, because severe and extensive burn injuries affect every organ system. Also, depending on circumstances, the patient may have other traumatic injuries.

During your primary survey, rapidly assess the ABCs and look for life-threatening injuries, such as blunt chest trauma, tension pneumothorax, or inhalation injuries. Once the patient has been stabilized and life-threatening injuries have been ruled out, you'll perform a more thorough secondary survey, which would include assessing the depth and extent of the burn.

Immediate assessment of the patient's airway is the first priority. Suspect inhalation injury—especially if the injury occurred in a closed or confined area—until you can prove otherwise. Signs and symptoms of inhalation injury include singed facial hair, carbonaceous sputum, soot in the oropharynx, hoarseness, and neck or face burns. Stridor is an ominous sign. Inhalation injury can occur above the glottis or in the lower airways and lung parenchyma and is usually a combination of thermal injury and inhalation of toxic fumes, such as carbon monoxide.

Carbon monoxide poisoning is likely if your patient was involved in an enclosed fire. A colorless, odorless gas, carbon monoxide has a much greater affinity for the heme molecule than oxygen, so it displaces oxygen from hemoglobin binding sites. Don't rely on pulse oximetry to rule out carbon monoxide poisoning; oximeters can't distinguish oxyhemoglobin from carboxyhemoglobin. You'll need to monitor arterial blood gases and carboxyhemoglobin levels to gauge the extent of carbon monoxide poisoning.

Early signs of carbon monoxide poisoning are headache, nausea, vomiting, and unsteady gait. Without treatment,

these can progress to unconsciousness, seizures, and death. Administer 100% oxygen via non-rebreather mask until the patient's carboxyhemoglobin level returns to normal.

Thermal inhalation injuries, which are frequently isolated above the glottis, result from an initial gasp of superheated air. However, if the patient has had prolonged exposure to smoke, the injury may be more severe in the lower airways and lung tissue.

Early intubation is recommended when you suspect an inhalation injury, especially if facial burns are involved. When in doubt, intubate; intubation is much more difficult once the patient's airway is swollen.

During your airway assessment, also check for cervical spine injury and take appropriate precautions. If you need to open the airway and you suspect a cervical spine injury, use a combined jaw thrust and spine immobilization maneuver. Apply a hard cervical collar if indicated, even if it has to go over the burn.

After you've secured the airway, turn your attention to the patient's breathing. Observe and auscultate the chest for adequacy of air exchange and depth of respirations. Watch for labored or limited ventilatory excursions if major burns encompass the chest. Lung sounds may include crackles or wheezes, but these are late signs and are often absent early in the course of inhalation injury.

Quickly examine the chest and listen for equal breath sounds in all fields. A patient injured in an explosion may have rib fractures and a pneumothorax, which can be confirmed with a chest X-ray.

Without treatment, a burned patient can develop hypovolemia and shock. Assess the patient's circulation regularly and closely monitor burns on the extremities and thorax. Burned skin encircling these areas can quickly become tight, constricting blood flow into the extremities or impeding breathing.

Document the presence or absence of pulses in the extremities initially and monitor the adequacy of capillary filling in the digits. Monitor closely and frequently and note when a pulse in an extremity changes. Elevate all burned extremities after pulse checks to reduce swelling and increase blood flow back to the heart.

Tight eschar or swelling with eschar can impede circulation, causing the patient to lose a pulse and posing the danger of neurovascular injury. Losing the pulse in an injured extremity is an emergency requiring an escharotomy to prevent extensive damage.

The last step of the primary survey is to look for any obvious disabilities and assess changes in the patient's level of consciousness using the AVPU mnemonic: Alert and oriented, responds to Verbal stimulus, responds only to Painful stimulus, Unresponsive. Most burn patients are

Special considerations for other burn types

When dealing with any type of burn, be sure to protect yourself with the appropriate safety wear and get yourself and your patient out of the danger zone before beginning interventions.

Electrical burns
Attach a cardiac monitor and treat life-threatening arrhythmias as necessary. Assess for associated trauma and for central and peripheral nerve function. Closely monitor distal pulses. Hyperkalemia is a potential complication, so monitor electrolytes closely.

Chemical burns
Brush powdered chemicals off the wound, then flush with water for a minimum of 20 minutes. Don't attempt to neutralize a chemical burn; this could cause an exothermic reaction and further injury. Identify the chemical and its concentration.

If the patient has a chemical burn to the eyes, remove contact lenses (if any) and obtain an ophthalmologist consult. Always irrigate burned eyes from the inside canthus outward, to avoid washing chemicals down the tear ducts. Use a gentle stream of saline or lactated Ringer's solution, starting with 1 liter of solution for each eye. Properly dispose of all contaminated clothing.

Tar burns
Cool the tar using cool compresses, but don't remove it if you're transferring the patient to a burn center. Removal could traumatize the tissue below. Obtain a surgical or plastic surgery consult.

alert and oriented regardless of the extent of burn injury. If they aren't alert, suspect other injuries.

Secondary survey

Perform the secondary survey while a colleague calculates fluid replacement and administers pain medication. Expose and examine your patient from head to toe, looking for any minor associated injuries. Obtain an AMPLE history: Allergies, Medications (including herbals), Past medical history, Last meal, and the Events surrounding the injury.

Draw blood samples for a complete blood cell count, glucose and electrolyte levels, blood urea nitrogen, creatinine, and an arterial blood gas analysis (including a carboxyhemoglobin level). If the patient has suffered a flash facial burn, check his corneas for injury.

Tight eschar or swelling with eschar can impede circulation, causing the patient to lose a pulse and posing the danger of neurovascular injury.

Assessing burn size

Next, calculate the patient's burn size, degree of injury, and fluid requirements. The rule of nines is a quick method for estimating total body surface area (BSA).

Under this rule, an adult's head and neck account for 9% of total BSA, each arm is 9%, each leg is 18%, the front and back of the torso are 18% each, and the perineum is 1%. The rule of nines can't be used for children because a child's body has different proportions.

The Lund-Browder classification helps you make a more accurate assessment of the extent of burns because it takes age-related body proportions into consideration. This method typically is used after the patient is stabilized.

Another method for estimating burn size, especially in the case of splatter burns, is the rule of palm. This rule, which can be used for adults and children, states the patient's palm (not including the fingers) represents 1% total BSA.

Restoring fluids

Without adequate treatment, a patient is at risk for hypovolemia in the 24 to 48 hours following the burn injury. Prepare to administer aggressive fluid resuscitation if his injury covers more than 20% of total BSA or if he has burns on the face or hands (which could keep him from drinking enough fluids).

Intravenous (I.V.) fluid resuscitation helps maintain vital organ perfusion until burn shock subsides. If possible, place two large-bore I.V. devices through unburned skin. If you must place an I.V. device in a burned area, thread the cannula a long way into the vein because swelling will push the hub out and may cause infiltration.

Resuscitation formulas vary in quantity and composition. The two resuscitation formulas most commonly used during the first 24 hours after a burn injury are the Parkland formula and the modified Brooke formula. The dosage for these formulas is 2 to 4 ml/kg/percent of total BSA burned of lactated Ringer's solution. For example, a patient weighing 70 kg (154 pounds) who has burns over 50% of his body would need 14,000 ml of fluid (4 x 70 x 50) in the first 24 hours under the modified Brooke formula. Give half of this amount, or 7,000 ml, during the first 8 hours by setting an infusion rate of 875 ml/hour. Give the remaining volume over the next 16 hours. Don't give dextrose solutions, which may cause osmotic diuresis, complicating fluid resuscitation.

Prepare to initiate invasive hemodynamic monitoring if oliguria persists despite adequate fluid replacement, if the patient has cardiac or renal disease, or if the patient is very old or very young.

Keep the fluid flow rate at a level to maintain a urine output of 30 to 50 ml/hour in an adult. Increasing fluids in an attempt to maintain urine output above this range can lead to an increase in intracranial pressure, pulmonary edema, or heart failure.

Managing pain

After starting fluid resuscitation, administer and titrate pain medication. Morphine is the gold standard; however, if the patient is allergic to morphine, fentanyl is an option.

The typical adult dosage for morphine is 3 to 5 mg I.V., repeated in 5- to 10-minute intervals until pain is controlled. After each dose of morphine, assess the patient's BP, pulse, respiratory rate, and level of consciousness. Remember that any degree of hypovolemia may grossly exaggerate the effects of medications.

If the patient hasn't had a tetanus booster in the last 5 years, he'll need tetanus immunization.

Wound care

Burn injuries are classified by depth. The longer the patient's skin is in contact with the burning agent and the higher the temperature, the deeper the cellular damage. The thickness of the patient's skin is another factor: Infants and the elderly have thinner skin than do young adults. (See "Classifying burns.")

If the patient will be transported to a burn center within the next few hours, cover the burn with a clean, dry sheet; airflow over the affected areas can be painful. Don't use creams, which can impede visualization of the wound.

Make sure the patient has been given adequate analgesia, and if the transport won't take place for more than 12 hours, the physician will debride all loose tissue and gently clean the wounds with mild soap and water. Apply a thin layer of silver sulfadiazine to all open areas.

Transporting to a burn center

The American Burn Association recommends that patients with any of the following conditions be transferred to a burn center:

- second-degree burns covering more than 10% of total BSA
- burns that involve the face, hands, feet, genitalia, perineum, or major joints
- third-degree burns
- electrical burns, including lightning injury
- chemical burns
- inhalation injury
- any patient with a preexisting medical disorder that could complicate care, prolong recovery, or endanger life
- any patient with other traumatic injuries (such as fractures) in which the burn injury poses the greater risk of complications or death. If the other traumatic injuries pose a greater immediate risk, the patient may be stabilized at a trauma center, then transferred to a burn unit. The decision depends on the physician's judgment, regional medical control plans, and triage protocols.
- any child if the hospital lacks the expertise or equipment to care for children
- any patient who will require special social, emotional, or long-term rehabilitative support; for example, a child injured by an abusive parent.

If the patient will be transferred to a burn center, the referring and receiving physicians should discuss which type of transportation to use. Meanwhile, keep the patient N.P.O. and consider whether he needs gastric decompression to prevent nausea, vomiting, and aspiration. Call the receiving burn center to give a concise report on the patient's condition, then give a thorough report to the transport team. A detailed written transfer form will also accompany the patient to the burn facility.

By knowing how to respond promptly, you'll be able to help a burned patient take the first step on the long road to recovery. NM

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