EM CASE OF THE WEEK.

BROWARD HEALTH MEDICAL CENTER
DEPARTMENT OF EMERGENCY MEDICINE

BROWARD HEALTH
Care Warriors

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Burns

A 40 y/o male with no past medical history presents to the ED via EMS as a Level 1 Trauma. He has sustained burn injuries to his hands bilaterally, right arm, anterior trunk, and face after overfilling his cigarette lighter with lighter fluid and spilling it on himself, subsequently setting himself on fire. He is currently hemodynamically stable and vitals are within normal limits. On physical exam, he appears restless and uncomfortable, screaming in pain and shaking uncontrollably. He has erythema that blanches with pressure with blistering on the dorsal and palmar surfaces of both hands and on the right arm. He also has erythema that blanches with pressure on his anterior torso, face, and neck. The patient's eyebrows have also been burned off. Other than the burns, his physical exam is unremarkable. Does he meet criteria to be transferred to a burn center?

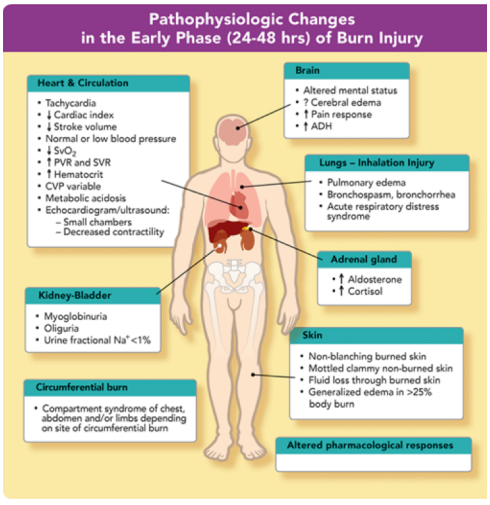
A. No; he is hemodynamically stable and only has superficial and partial thickness burns.

B. No; he is hemodynamically stable and does not have any comorbidities that will complicate his care.

C. No; he does not have any concomitant fractures, which increase his chances of mortality, and thus, does not need to be transferred.

D. Yes; he has burns on his face and hands, and may have partial thickness burns covering more than 10% of his TBSA

E. Yes; he is in an excruciating amount of pain and his burns would be better managed and pain would be better controlled at a burn center.



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EM Case of the Week is a weekly "pop quiz" for ED staff.

The goal is to educate all ED personnel by sharing common pearls and pitfalls involving the care of ED patients. We intend on providing better patient care through better education for our nurses and staff.

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Vol 4 | Issue 11

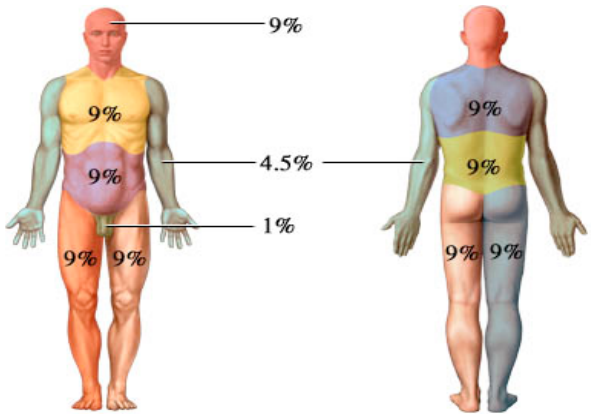
The correct answer is D.

According to American Burn Association guidelines, a person must meet at least one of the following criteria in order to be transferred to a burn center:

- Partial-thickness burns greater than 10% of TBSA
- Burns that involve face, hands, perineum, genitalia, or any major joints
- Third-degree burns in any age group
- Electrical burns, including lightning injury
- Chemical burns
- Inhalation injury
- Burn injuries in patients with preexisting medical problems
- Any patient with burns and concomitant trauma
- Burned children in facilities not equipped for pediatric care
- Burn patients who will require special social, emotional, rehabilitative intervention

Our patient met two of these criteria. He had partial-thickness burns greater than 10% of TBSA and had burns present on his face and hands.

Discussion:
There are many different types of burns including thermal burns, frostbite, chemical burns, electrical burns, radiation burns, and inhalation burns. In adults, the most common type of burn is a thermal burn, usually from a flame. The depth of a thermal burn depends on the temperature of the item that the skin has come in contact with, as well as the duration of contact and thickness of the skin. Frostbite, another type of burn that occurs with cold exposure, usually occurs when blood vessels constrict and ice crystals form and penetrate cells. This causes damage to the skin and underlying tissues. Normal blood flow is interrupted which can cause hemoconcentration, thrombosis, and hypoxia. Chemical burns refer to injuries caused by caustic reactions, such as alterations in pH. These burns vary in severity based on the nature of the agent and the duration of contact. For example, alkali agents can dissolve proteins and collagen, causing extensive tissue damage, whereas acids denature the skin's protein, causing coagulation necrosis.



Electrical energy from lightning burns and burns from electrical weapons is transformed into thermal energy as the current passes through the tissue. Membrane potential is disrupted by damage to the cell membrane. Radiation burns most commonly present as sunburn. It can also result from ionizing radiation in patients undergoing treatment for cancer since ionizing radiation can interact with and damage DNA. Inhalation burns usually occur from exposure to fire and steam and occur when toxic products of combustion such as carbon monoxide injure airway tissue. Fire usually causes burns in the pharynx, whereas steam can cause burns below the glottis.

The extent of a burn is assessed by looking at total body surface area (TBSA) which can be approximated using the "Rule of Nines." According to the rule of nines, each leg represents 18% TBSA, each arm accounts for 9% TBSA, the anterior and posterior trunk each account for 18% of TBSA, and the head represents 9% of TBSA. Though this is a quick and efficient method to assess TBSA in adults, the Lund-Browder chart is more accurate for both adults and children because it accounts for differences in body shapes with age. The palmar method is another method that approximates TBSA and is good for small or patchy burns. According to this method, the palm of a patient's hand, excluding the fingers, is about 0.5% of TBSA

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Vol 4 | Issue 11

pth	Level of Injury	Clinical Features	Result/Treatment
perficial (first degree)	Epidermis	Dry, red; blanches; painful	Healing time 3–6 days, no scarring
perficial partial thickness superficial second degree)	Papillary dermis	Blisters; moist, red, weeping; blanches; severe pain to touch	Cleaning; topical agent; sterile dressing; healing time 7–21 days; hypertrophic scar rare; return of full function
ep partial thickness (deep econd degree)	Reticular dermis; most skin appendages destroyed	Blisters; wet or waxy dry; reduced blanching: decreased pain sensation to touch, pain present to deep pressure	Cleaning; topical agent; sterile dressing; possible surgical excision and grafting; scarring common if not surgically excised and grafted; earlier return of function with surgery
l thickness (third degree)	Epidermis and dermis; all skin appendages destroyed	Waxy white to leathery dry and inelastic; does not blanch; absent pain sensation; pain present to deep pressure: pain present in surrounding areas of second-degree burn	Treatment as for deep partial-thickness burns plus surgical excision and grafting at earliest possible time; scarring and functional limitation more common if not grafted
urth degree	Involves fascia and muscle and/or bone	Pain to deep pressure, in the area of burn; increased pain in surrounding areas of second-degree burn	Healing requires surgical intervention

Anesthesiology 2 2015, Vol 122 448-464

Management of Burns in the Emergency Department

- ABCDE's, establish burn depth and extent, tetanus status, r/o other injuries
- Early intubation > observation in patients with signs of upper airway injury
- Mechanical ventilation if needed
- if carboxyhemoglobin levels are elevated, give 100% O2 until COHb level falls below 10%; if increased COHb and pH < 7.4, treat with hyperbaric oxygen
- Place 1 or 2 large bore peripheral lines and administer crystalloids based on patient's TBSA
- Usually adequate resuscitation in adults is achieved with >/= to 30-40 mL/hr
- Parkland formula calculates fluid needs for burn victims in the first 24 hrs:
  - Required fluids (mL)= 4 mL crystalloid x % TBSA burned X weight (kg)
  - ½ is given in the first 8 hrs after injury, other ½ is given over the next 16 hrs
- Assess need for referral to burn center

Take Home Points

- There are several mechanisms for burns
- Burns are classified by depth
- Burn extent is assessed by percent TBSA which can be approximated using the rule of nines, Lund-Browder chart, and the palmar method
- In the ER, make sure to assess ABC's- intubate early if upper airway compromise is suspected, fluid resuscitate to avoid hypovolemic shock!
- Assess need for burn center referral

This month's case was written by Anaam Shaikh. Anaam is a 4th year medical student from NSU-COM. She did her Emergency Medicine rotation at Broward Health North in August 2017. Anaam plans on pursuing a career in General Surgery.

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