

H10: Burns

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Introduction

Burns result from damage to cellular membranes, leading to extensive injury within the integumentary system. This damage can result in significant fluid loss, increase the risk for infections, and lead to hypothermia. Soft tissue burns may occur due to thermal injuries, chemical exposure, electrical contact, or ionizing radiation. Burns are optimally managed at appropriate trauma-receiving hospitals.

Essentials

- **Airway management and ongoing assessment of airway patency is important.** Burned patients should receive supplemental oxygen. Providers must be aware of the potential for rapid development of airway compromise. Signs of airway burns include cough, voice changes, and soot in the mouth, nose, or in sputum. Consider early advanced airway management in these cases.
- **Decontamination should be performed quickly at the scene where possible.** Remove clothes and flush burns with cool running water or saline for removal of carbonous soot and hydrocarbons (petroleum products). Hair, hands, and face should be cleaned with water and baby shampoo when appropriate. Refer to [PR05 Patient Decontamination](#)
- **15 minutes of cooling in the immediate aftermath of the burn is recommended.** This is inclusive of time bystanders have provided effective cooling measures. Cooling burns immediately following injury reduces the risk of skin graft requirements, long-term scarring, chronic pain, and sensory disturbances. Cooling is also a component of analgesia. Burns should be cooled with cool (not cold) running water wherever possible, which may involve remaining on scene for 15 minutes to access running water. In patients requiring immediate conveyance with immediate life threats, such as face/neck/airway burns or combined blunt/penetrating injuries, using cool saline is appropriate to help limit damage caused by burns.
- **Gel-soaked burn dressings may continue to alleviate pain and provide prolonged cooling,** after initial decontamination and active cooling. Emergency burn dressings are intended to be temporary and will be removed for assessment at the receiving facility.
- **Hypothermia is prevalent in large total-body-surface-area (TBSA) burns due to evaporative losses and cooling therapies.** Monitor for hypothermia and utilize the ambulance heater and blankets over non-burned areas as necessary.
- **Fluid replacement in the initial stage of burn care should be purposeful.** Fluid boluses may be used to correct hypotension but should be charted well, and not be excessive. A TBSA >20% burned is recommended to receive a calculated fluid replacement over the first 24 hours, but this is most accurately calculated in the ED following initial resuscitation and debridement.
- **Estimate the TBSA using the [Burn Chart or Rules of 9's chart](#).** Include only partial and deeper thickness burns. Superficial burns are not included in TBSA calculations. Estimates are intended to inform and communicate severity; they are not an absolute measurement and are reassessed more accurately outside of the acute phase of burn trauma.

Referral Information

- Triage according to the [Pre-hospital Triage and Transport Guidelines for Adult and Pediatric Major Trauma](#) decision tool.
- All patients with burn trauma should be conveyed to the closest appropriate trauma receiving hospital as per local trauma destination guidelines or [Clinical Pathways](#). Isolated burn injuries in the absence of other trauma may be conveyed to regional burn centers when appropriate.

General Information

- Burns are often associated with other forms of trauma, including fractures, complex soft tissue injuries, head trauma, and thoracic/abdominal injuries. It's important to be diligent in assessing for other injuries in patients who experience burns.

- In any fire environment, carbon monoxide is a by-product of combustion and is one of the many chemical products in smoke. Carbon monoxide poisoning should be suspected in any patient who was in an enclosed space. High-flow oxygen hastens the elimination of carboxyhemoglobin and is the hallmark of care. Monitor SpCO where available. [Refer to J02: Carbon Monoxide.](#)
- Hydrogen cyanide is a colorless gas with a faint, bitter, almond-like odor. Sodium cyanide and potassium cyanide are both white solids with similar odors in damp air. Cyanide salts and hydrogen cyanide are used in electroplating, metallurgy, the production of organic chemicals, photography, plastics manufacturing, the fumigation of ships, and some mining processes. Fires involving modern building materials, plastics, and furnishings can also produce large amounts of cyanide, and individuals exposed to the smoke from these fires can have significant cyanide exposures. Refer to [J03: Cyanide.](#)
- **Trauma Services BC defines major burn as any of the following:**
 - > 20% total body surface area (TBSA) partial and/or full thickness, any age.
 - > 10% TBSA partial and/or full thickness, age > 65.
 - > 5% TBSA full thickness, any age.
 - Burns to face, hands, feet, genitalia, or joints.
 - Electrical burns.
 - Chemical burns.
 - Inhalation injury.
 - Burns associated with major trauma.
- The American Burn Association classifies burns as minor, moderate, and major based upon burn depth and size. The traditional 'Fourth degree' classification is still commonly used to describe the most severe burns.
 - **Superficial:** burns involving only the epidermal layer of the skin; they are painful, dry, red, and blanch with pressure. *Previously first degree.*
 - **Superficial partial-thickness:** burns involving the epidermis and superficial portions of the dermis; they are painful, red and weeping, usually form blisters, and blanch with pressure. *Previously second degree.*
 - **Deep partial-thickness:** burns extending deeper into the dermis damaging hair follicles and glandular tissue; they are painful to pressure only, almost always blister, are wet or waxy dry, and display variable colour from patchy white to red. *Previously second degree.*
 - **Full thickness:** burns extending through, destroying the dermis; they are usually painless, and the skin can vary in appearance from waxy white to leathery grey, to charred and black. *Previously third degree.*
 - **Fourth degree:** burns extending through the skin to underlying tissues of the fascia or muscle.

Interventions

First Responder

- Airway management and frequent reassessment:
 - [→ B01: Airway Management](#)
- Provide supplemental oxygen for patients with potential airway burns, inhalation injuries, and exposure risk to carbon monoxide:
 - [→ A07: Oxygen Administration](#)
- Remove burned clothes and decontaminate patient as required
 - [→ J01: Approach to Toxic Exposures](#)
 - [→ PR05: Patient Decontamination](#)
- Cool burned areas for 15 minutes using cool running water wherever possible; this may require remaining on-scene for a prolonged period:
 - In patients with life-threatening injuries where it is not possible to remain on-scene, the use of cool saline may be sufficient to help limit the damage caused by the burn.
 - Avoid cooling the entire patient to prevent hypothermia.
- Apply burn dressings to affected areas.

Emergency Medical Responder – All FR interventions, plus:


- Initiate conveyance; consider intercept with additional resources

- Consider utilization of ambulance heater during conveyance if significant body surface area cooling required
- Pain management. Avoid the use of nitrous oxide when inhalation injury suspected:
 - → [E08: Pain Management](#)
- Estimate total surface area using [Burn Estimation Charts](#)

Primary Care Paramedic – All FR and EMR interventions, plus:

- Obtain vascular access
 - → [D03: Vascular Access](#)
- Evaluate and treat shock if hypotensive:
 - → [D01: Shock](#)

Advanced Care Paramedic – All FR, EMR, and PCP interventions, plus:

- Early advanced airway management in the presence of airway burns and prolonged conveyance.
-  **CliniCall consultation required prior to intubation of patients with perfusing rhythms.**
 - → [B01: Airway Management](#)
 - → [PR18: Anesthesia Induction](#)
 - → [PR22: Surgical Airways](#)

Critical Care Paramedic – All FR, EMR, PCP, and ACP interventions, plus:

- In cases of prolonged conveyance, calculate fluid maintenance rate:
 - **Initial 8 hours:** (patient weight in kg) x (total burned surface area in %) x 1.5 ml = (volume to be administered over 8 hours)
 - **Following 16 hours:** (patient weight in kg) x (total burned surface area in %) x 1.5 ml = (volume to be administered over the following 16 hours)
 - Fluid boluses should be accounted for in these totals.
 - Adjust based on urine output:
 - Target urine output = 30-50ml/hr
 - Urine output ≤ 30ml/hr increase rate by 20%
 - Urine output ≥ 50ml/hr decrease rate by 20%
 - Ringer's Lactate is the recommended fluid where available.
- Respiratory support for restrictive lung pathology. Consult EPOS in advocating for escharotomy of circumferential torso burns:
 - → [PR29: Mechanical Ventilation](#)
 - → [PR39: Escharotomy](#)
- Cyanide toxicity management.
 - → [J03: Cyanide](#)

Evidence Based Practice

Possible Airway Burns

Supportive

- [Mechanical Ventilation \(CCT\)](#)

Neutral

Against

Electrocution/Electrical Burns

Supportive

- [Narcotic](#)

Neutral

- [12-Lead ECG](#)
- [Cardiac Monitor](#)

Against

Chemical Splash/Burn

Supportive

- [Narcotic](#)
- [Irrigation Skin](#)

Neutral**Against**

Burns (fire/flame)

Supportive

- [Narcotic](#)
- [Nitrous Oxide](#)

Neutral

- [Crystalloid Fluid](#)
- [Wet/hydrogel dressing](#)

Against**References**

1. Alberta Health Services. AHS Medical Control Protocols: Algorithm #5 - Burns. 2020. [\[Link\]](#)
2. BC Emergency Medicine Network. Major Burns Trauma. [\[Link\]](#)
3. Specialist Trauma Advisory Network (STAN). Burn CPGs. [\[Link\]](#)
4. UpToDate. Overview of the Management of the Severely Burned Patient [\[Link\]](#)
5. EMSPEP Database. Burns (fire/flame). [\[Link\]](#)

