



Burns

Airway, then area, then fluids · And titrate to urine output, not to the formula

UO 0.5–1 mL/kg/h
the real endpoint

AIRWAY FIRST *the burn that kills early is the one you cannot see*

INHALATION INJURY RED FLAGS

Enclosed-space fire · facial burns, singed nasal hair, soot in the mouth or sputum · hoarseness or stridor · drooling · reduced consciousness. **Airway edema progresses over hours** — a patent airway now does not mean a patent airway in two hours.

INTUBATE EARLY

If you are seriously considering it, **do it now**. Once edema develops, intubation becomes extremely difficult and surgical airway rates rise. **Use an uncut tube** and secure it with ties rather than adhesive tape, which will not hold on burned skin.

CARBON MONOXIDE & CYANIDE

Pulse oximetry is falsely normal in CO poisoning — measure a **carboxyhemoglobin** level and give **100% oxygen**. Suspect **cyanide** with persistent lactic acidosis and cardiovascular collapse from an enclosed fire; **hydroxocobalamin** is the antidote.

ESTIMATE THE AREA *only second-degree and deeper count*

Method	Detail
Rule of nines (adult)	Head 9% · each arm 9% · each leg 18% · anterior trunk 18% · posterior trunk 18% · perineum 1% . Children have proportionally larger heads and smaller legs — use a Lund and Browder chart.
Palm rule	The patient's whole palm including fingers is about 1% — useful for scattered or irregular burns.
Do not count erythema	Superficial (first-degree) burns are excluded from the TBSA calculation. Including simple erythema is the commonest cause of over-estimation and consequent over-resuscitation.
Depth	Superficial partial — blisters, moist, blanching, very painful. Deep partial — drier, less blanching, reduced sensation. Full thickness — leathery, white or charred, painless and non-blanching. Depth often declares itself over 48–72 hours.

FLUID RESUSCITATION *the formula is a starting point, not a prescription*

- Consensus formula: 2–4 mL/kg per %TBSA of lactated Ringer's over 24 hours.** The classic **Parkland** figure is **4 mL/kg/%TBSA**; the **modified Brooke** uses **2 mL/kg/%TBSA**, and current practice has moved toward **starting lower** to avoid over-resuscitation.
- Give half in the first 8 hours from the time of the burn** — not from arrival — and the remaining half over the following 16 hours. If the patient presents late, the first half must be delivered over the time remaining.
- Titrate to urine output: 0.5–1.0 mL/kg/h in adults and 1.0–1.5 mL/kg/h in children. Avoid boluses unless there is hypotension.** The formula predicts the starting rate; the urine output governs everything after that.
- Over-resuscitation is a real harm** — "fluid creep" causes pulmonary edema, **abdominal compartment syndrome**, and conversion of partial-thickness burns to deeper injury. More fluid is not safer.
- Insert a urinary catheter** in any significant burn, and watch for **myoglobinuria** in electrical or deep burns, which needs higher targets.

THE REST OF THE FIRST HOUR *and who needs a burns center*

DO ALSO

Stop the burning process and cool with running water for 20 minutes — effective up to about 3 hours after injury — but **avoid ice and avoid hypothermia**. **Remove rings, watches and constricting clothing early**. Analgesia, tetanus status, and **keep the patient warm**. **Escharotomy** for circumferential full-thickness burns causing limb ischemia or restricting chest wall movement. **No prophylactic systemic antibiotics**.

REFER TO A BURNS CENTER

Partial thickness > 10% TBSA · any **full-thickness** burn · burns of the **face, hands, feet, genitalia, perineum or over major joints** · **electrical** (including lightning) or **chemical** burns · **inhalation injury** · burns in children, the elderly, or with significant comorbidity · burns with concomitant trauma. **Discuss early rather than after initial management fails**.

BURNS THAT BEHAVE DIFFERENTLY *the surface area badly underestimates these*

Type	What changes
Electrical	The visible skin injury massively understates the damage — current travels through deep tissue, causing muscle necrosis between small entry and exit wounds. Expect rhabdomyolysis : check creatine kinase and potassium, give generous fluids and target a higher urine output . Cardiac monitoring for arrhythmia. Look actively for compartment syndrome and associated fractures from tetanic contraction or falls.
Chemical	Brush off dry powder first , then irrigate copiously and for far longer than a thermal burn — often an hour or more, guided by surface pH. Do not attempt neutralization , which generates heat. Alkalis penetrate deeper than acids . Hydrofluoric acid is a specific emergency causing hypocalcemia and arrhythmia — treat with calcium gluconate topically, and locally infiltrated or intra-arterially, and monitor calcium and the ECG.
Circumferential	Full-thickness burns encircling a limb or the chest cause a tourniquet effect . Watch for rising airway pressures or a cool, pulseless limb with reduced capillary refill, and arrange escharotomy urgently.
Non-accidental injury	Consider it in children and vulnerable adults . Red flags: a history inconsistent with the pattern, delayed presentation, glove-and-stocking or symmetrical immersion burns , sharply demarcated edges, and cigarette-shaped burns. Document carefully and escalate through safeguarding .

PEARLS & PITFALLS

- Do not count erythema in the TBSA.** It is the single commonest cause of over-estimation and over-resuscitation.
- Time the fluids from the burn, not from arrival.** A patient presenting at 4 hours is already behind.
- Intubate early if you are considering it.** Airway edema makes a delayed attempt far more dangerous.
- A normal SpO₂ does not exclude carbon monoxide poisoning** — the oximeter cannot distinguish carboxyhemoglobin. Measure it.
- Titrate to urine output, not to the formula.** Over-resuscitation causes compartment syndrome and burn conversion.
- Remove rings and constricting items immediately**, before swelling makes it impossible and costs a digit.

