

Burn injuries

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:Burn: is a term used to describe skin damage caused by

Thermal

Electrical

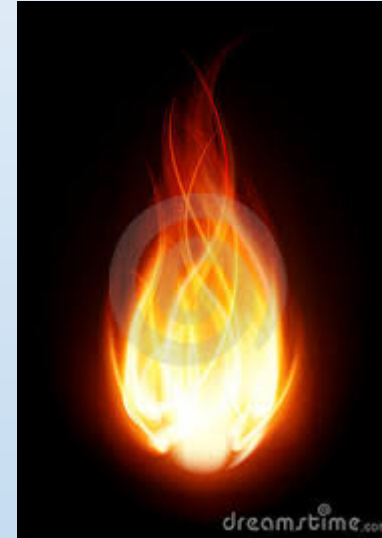
Chemical



- **Thermal burn:** refer to injury caused by heat or by cold.

E.g of heat injury:

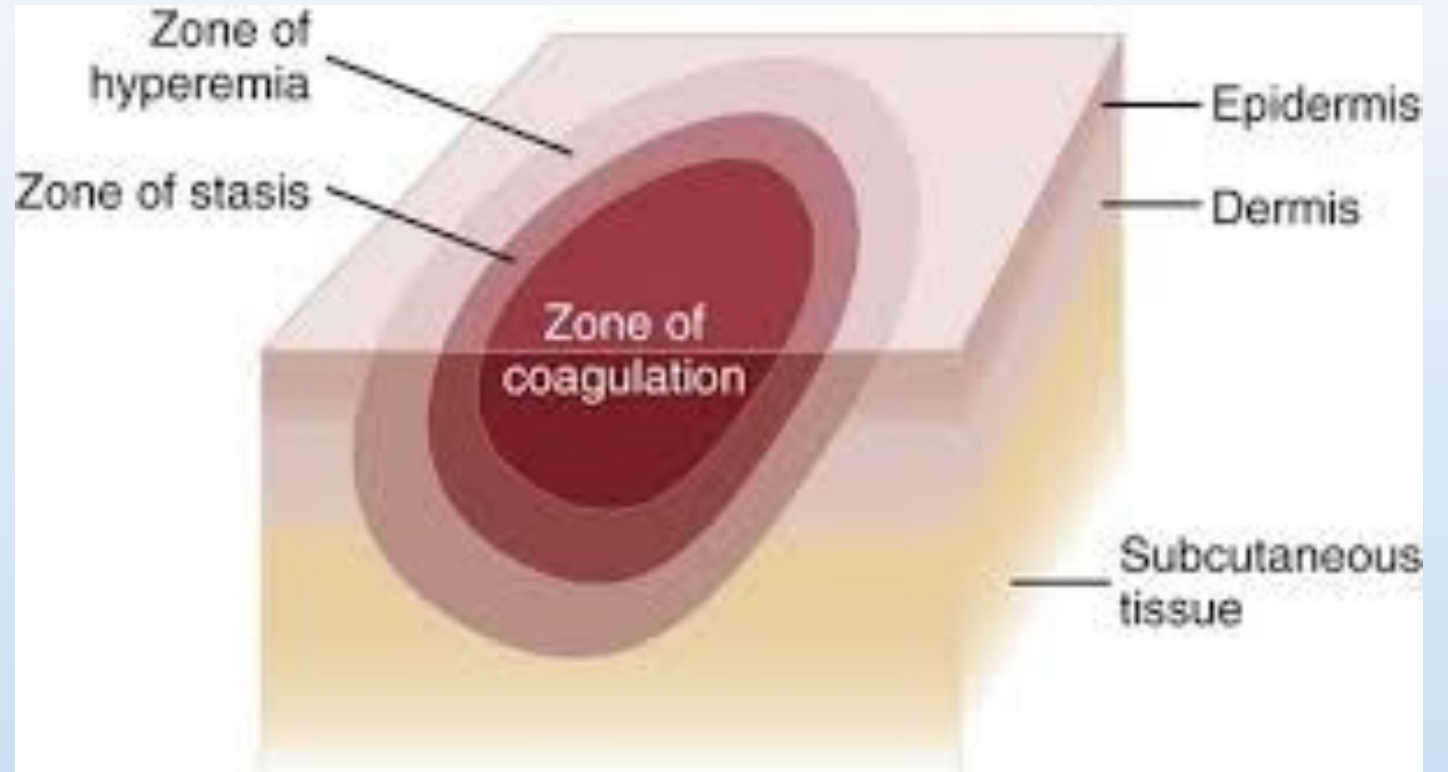
- Scald burn:
- Flame burn:
- Contact burn:
- Flash burn



Pathophysiology

- **Local effects**

1. zone of coagulation:
2. zone of stasis:
3. zone of hyperemia:



Systemic effects

Cardiovascular compromise (burn shock):

Respiratory impairment

Immunological impairment

Burn Shock

1. Local edema

vascular endothelial injury

Increased osmotic pressure in burned tissue

Systemic edema .2

vasoactive substances e.g. (leukotriene, Prostaglandins, histamine, and free radicals)

myocardial depression in 40% TBSA .3

.Fluid loss through skin wound .4

Respiratory impairment

- Systemic edema.
- Inhalational injury



Immunological impairment

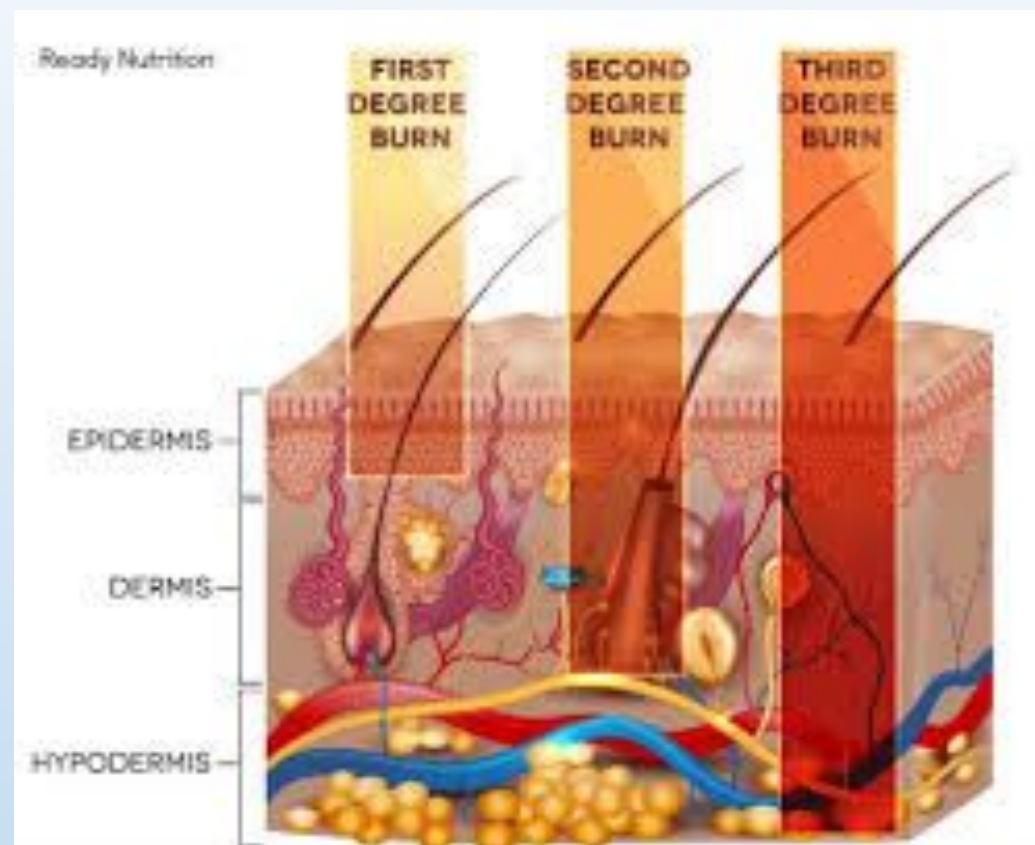
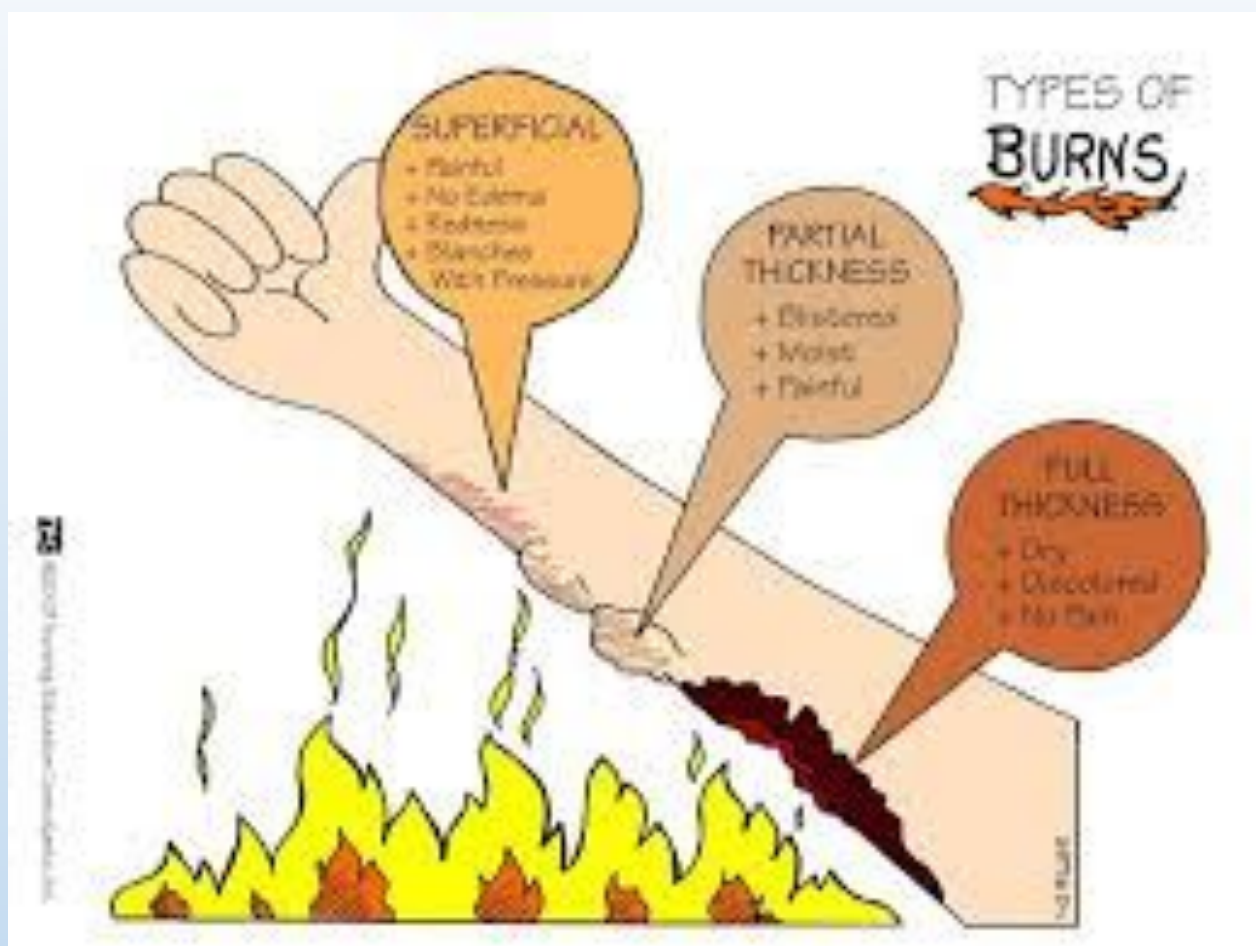
- loss of mechanical barrier
- endocrine response to trauma
- impaired cellular and humeral response
- invasive procedures e.g. CV line, folly's cath. etc.



Acute burn management

BURN DEPTH CATEGORIES

■ BURN DEGREE	■ CAUSE	■ SURFACE APPEARANCE	■ COLOR	■ PAIN LEVEL
First (superficial)	Flash flame, ultraviolet (sunburn)	Dry, no blisters, no or minimal edema	Erythematous	Painful
Second (partial thickness)	Contact with hot liquids or solids, flash flame to clothing, direct flame, chemical, ultraviolet	Moist blebs, blisters	Mottled white to pink, cherry red	Very painful
Third (full thickness)	Contact with hot liquids or solids, flame, chemical, electrical	Dry with leathery eschar until debridement; charred vessels visible under eschar	Mixed white, waxy, pearly; dark, khaki, mahogany; charred	Little or no pain; hair pulls out easily
Fourth (involves underlying structure)	Prolonged contact with flame, electrical	Same as third degree, possibly with exposed bone, muscle, or tendon	Same as third degree	Same as third degree





Determination of Burn Extent

- Rule Of Nines
- Patient's Hand
- Lund And Browder charts

Determination of Burn Extent

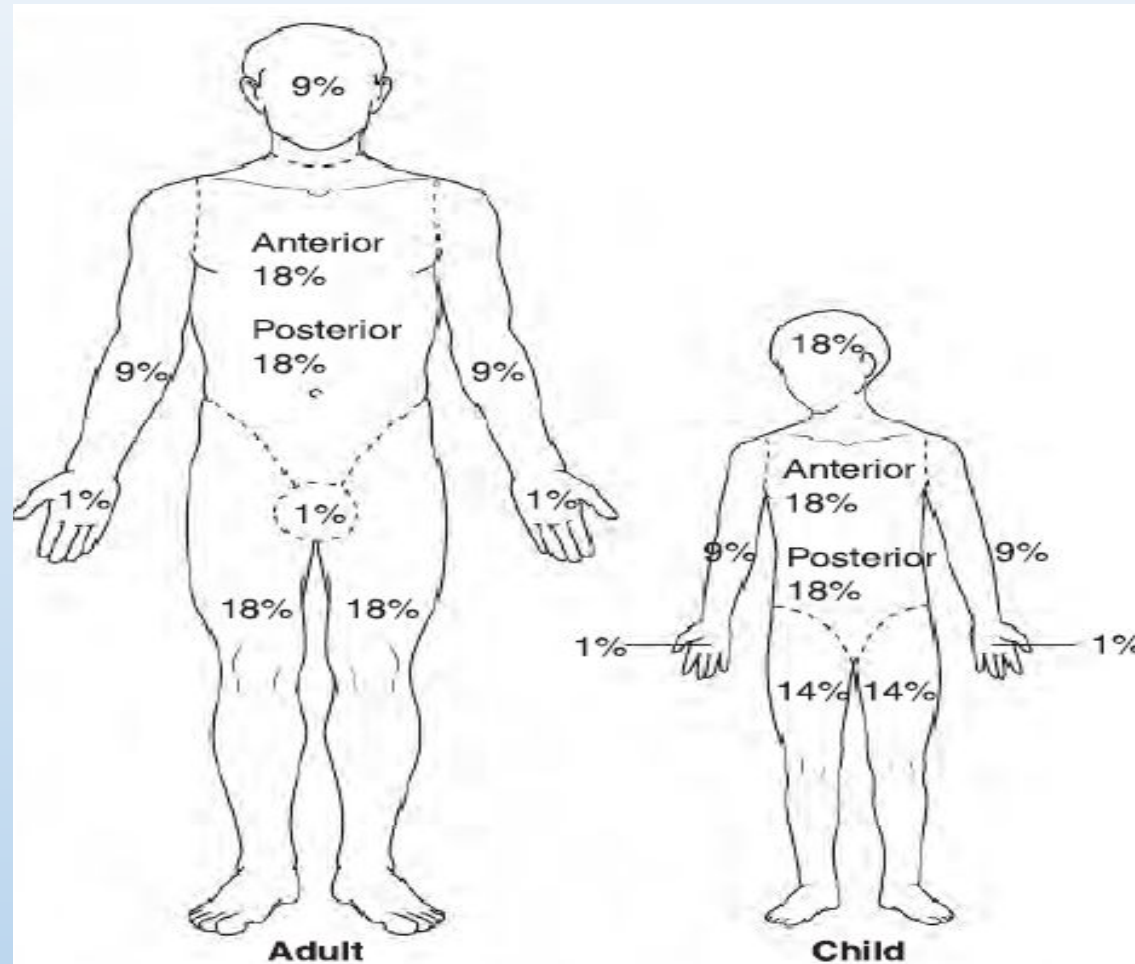
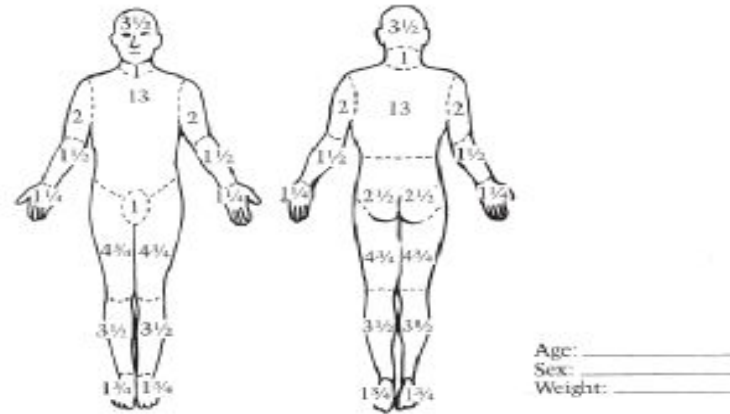


FIGURE 15.1. The Rule of 9's provides a facile method of estimat-



Area	Birth-1 y	1-4 y	5-9 y	10-14 y	15 y	Adult	Partial thickness 2°	Full thickness 3°	Total
Head	19	17	13	11	9	7			
Neck	2	2	2	2	2	2			
Anterior trunk	13	13	13	13	13	13			
Posterior trunk	13	13	13	13	13	13			
Right buttock	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2			
Left buttock	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2			
Genitalia	1	1	1	1	1	1			
Right upper arm	4	4	4	4	4	4			
Left upper arm	4	4	4	4	4	4			
Right lower arm	3	3	3	3	3	3			
Left lower arm	3	3	3	3	3	3			
Right hand	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2			
Left hand	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2			
Right thigh	5 1/2	6 1/2	8	8 1/2	9	9 1/2			
Left thigh	5 1/2	6 1/2	8	8 1/2	9	9 1/2			
Right leg	5	5	5 1/2	6	6 1/2	7			
Left leg	5	5	5 1/2	6	6 1/2	8			
Right foot	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2			
Left foot	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2			
Total									

FIGURE 15.2. The Lund and Browder chart provides a more precise estimate of burn TBSA for each body part based on the individual's age.

Indication of referral to burn center

BURN CENTER REFERRAL CRITERIA

The American Burn Association has identified the following injuries as those usually requiring a referral to a burn center. Patients with these burns should be treated in a specialized burn facility after initial assessment and treatment at an emergency department.

Questions about specific patients can be resolved by confirmation with the burn center.

Second- and third-degree burns >10% body surface area (BSA) in patients <10 or >50 years old.

Second- and third-degree burns >20% BSA in other groups.

Second- and third-degree burns with serious threat of functional or cosmetic impairment that involve the face, hands, feet, genitalia, perineum, and major joints.

Third-degree burns >5% BSA in any age group.

Electrical burns, including lightning injury.

Chemical burns with serious threat of functional or cosmetic impairment.

Inhalation injury with burn injury.

Circumferential burns with burn injury.

Burn injury in patients with preexisting medical disorders that could complicate management, prolong recovery, or affect mortality.

Any burn patient with concomitant trauma (for example, fractures) in which the burn injury poses the greatest risk of morbidity or mortality. However, if the trauma poses the greater immediate risk, the patient may be treated in a trauma center initially until stable, before being transferred to a burn center. Physician judgment will be necessary in such situations and should be in concert with the regional medical control plan and triage protocols.

Hospitals without qualified personnel or equipment for the care of children should transfer burned children to a burn center with these capabilities.

Initial management

- **Intravenous access:**
- Two peripheral IV if <30% burns.
- Patients with larger burns or significant inhalation injury may require central line placement.
- Lines should be sutured in place, particularly over burned areas where the use of tape dressings is Difficult.



Escharotomy:

The leathery eschar of a full thickness burn can form a constricting band that compromises limb perfusion

:Indicated for full thickness circumferential burns of the extremity or chest wall

.The incision should go through only eschar, not fascia



Fluid Resuscitation

Day 1:(hours 0-24)

THE PARKLAND FORMULA FOR FLUID RESUSCITATION

Formula: $4 \text{ cc/kg/\%TBSA} = \text{total fluid to be administered in the first 24 h}$

$\frac{1}{2}$ of fluid should be given in the first 8 h

$\frac{1}{2}$ of fluid should be given in the next 16 h

Fluid should be Ringer's lactate

Sample calculation: 70 kg person with a 50% TBSA burn

$4 \times 70 \times 50 = 14 \text{ L of fluid}$

7 L in the first 8 hours (875 cc/h)

7 L in the next 16 hours (437 cc/h)

- The formula is only a guideline. Fluid administration should be titrated to urine output of 30 cc/h for adults and 1 cc/kg/h for children.

Pediatric patients less than 15 kg should also receive maintenance fluid based on their weight.

:Day 2(hours 25-48)

- Change ringer's lactate to **5% dextrose** water and adjust according to O.U.P as above.
- Begin colloid infusion: 5% albumin at 0.3-1.0 cc/kg/% burn /16 = cc 5% albumin/hr. (do not vary according to U.O.P)

Day 3 (hours 49)

- maintenance intravenous fluid

Or

- begin oral and/or enteral feeding.

Topical Wound Agents

Superficial burn wounds (such as sunburns) soothing lotions that will expedite epithelial repair such as aloe Vera.

Partial thickness burn :keep the wound moist and provide antimicrobial protection that optimizes epithelialization.

Deeper partial thickness and full thickness
antimicrobial protection



Name of agent	Antimicrobial spectrum	Depth of penetration	Side effects
Silver sulfadiazine 1% cream	Broad spectrum but weak against enterobacteriaceae and pseudomonas aeruginosa	Incapable of eschar penetration, so it is less useful in management of infected wound.	<ul style="list-style-type: none"> Leukopenia sulfa allergy
Mafenide (Sulfamylon) 5% solution	broad spectrum	Readily penetrates burn eschar, making it an excellent agent for infected wound	<ul style="list-style-type: none"> Metabolic acidosis.(potent carbonic anhydrase Inhibitor) Painful
Silver nitrate 0.5% solution	Broad spectrum	No penetration	<ul style="list-style-type: none"> Stains everything it touches black. osmolar dilution (hyponatremia and hypochloremia) methemoglobinemia

Other agents: Bacitracin, neomycin, and polymyxin B ointments

Nutrition

nutritional requirements is increased due to:

- Hypermetabolism and hypercatabolism that persists until complete wound coverage is achieved.
- The nutritional requirements to heal burn wounds, skin grafts, and donor sites



- under 20% TBSA can obtain enough calories by oral feeding.
- Patients with larger burns and patients who will be intubated for several days should have an enteral feeding tube placed on **admission.**
- Because of the high levels of narcotics patients receive, routine use of stool Softeners should also begin on admission to prevent constipation

Gastrointestinal Prophylaxis

Stress ulcers (Curling ulcers) are a common complication following severe burn injury.

Best protection against stress ulcers is by feeding the patient.

- **Drug prophylaxis indication:**

- 1. Patients who are not taking oral diet or enteral feeds.
- 2. Patients with previous history of peptic ulcer disease.

- **Prophylactic agents:**

- H2 blockers, sucralfate, and PPI.

:Pain control

- Burn patients typically have two types of pain: background and procedural.
- Narcotics are the most commonly used analgesics,
- Nonsteroidal medications are not used in patients who are going to undergo surgery because of the increased risk of bleeding.
- Background pain presents on a daily basis with little variation. Best treated with longer-acting agents (Methadone).
- Procedural pain occurs during daily wound care and therapy, shorter-acting agents are probably best (fentanyl).

:Deep Venous Thrombosis Prophylaxis

- **Indication:**

- Injuries to the extremity.
- The intubated patient.
- Indwelling catheters (femoral vein).

:INHALATION INJURY



- **Diagnosis:**
- History (the circumstances surrounding the burn injury) and findings on physical examination.
- Bronchoscopy.
- Arterial blood gas and carboxyhemoglobin level

INHALATION INJURY

Treatment:

- 100% oxygen to correct carboxyhemoglobin level (CO poisoning)
- Secure a patient's airway early in the post burn period, particularly if the patient is going to require large volumes of fluid.

:Decision Not to Resuscitate DNR

In cases of extensive burn injury, a decision is made regarding the potential futility of resuscitation and subsequent surgical management based on several factors:

- location of burns,
- depth of burns
- presence of inhalation injury

increase mortality by 30-40% alone.

- patient's age
- comorbidities



- Mortality rate = age+ burn % of TBSA (Baux formula)

Thank you