BURNS

1. Classify burn.

American Burn Association severity classification		
Minor	Moderate	Major
Adult <10% TBSA	Adult 10–20% TBSA	Adult >20% TBSA
Young or old < 5% TBSA	Young or old 5–10% TBSA	Young or old >10% TBSA
<2% full thickness burn	2–5% full thickness burn	>5% full thickness burn
	High voltage injury	High voltage burn
	Possible inhalation injury	Known inhalation injury
	Circumferential burn	Significant burn to face, joints, hands or feet
	Other health problems	Associated injuries

Classification according to depth of injury:

Burn depth	**Level of injury**	**Clinical features**	**Treatment**	**Usual result**
Superficial partial-thickness	Papillary dermis	Blisters Erythema Capillary refill Intact pain sensation	Tetanus prophylaxis Cleaning (e.g., with chlorhexidine gluconate) Topical agent (e.g., 1% silver sulfadiazine) Sterile gauze dressing[c] Physical therapy Splints as necessary	Epithelialization in 7–21 days Hypertrophic scar rare Return of full function
Deep	Reticular	Blisters	As for superficial	Epithelialization

partial-thickness	dermis	Pale white or yellow color Absent pain sensation	partial-thickness burns. Early surgical excision and skin grafting an option	in 21–60 days in the absence of surgery Hypertrophic scar common Earlier return of function with surgical therapy
Full thickness	Subcutaneous fat, fascia, muscle, or bone	Blisters may be absent Leathery, in classic, wrinkled appearance over bony prominences No capillary refill Thrombosed subcutaneous vessels may be visible Absent pain sensation	As for superficial partial-thickness burns Wound excision and grafting at earliest feasible time	Functional limitation more frequent Hypertrophic scar mainly at graft margins

Epidermal (first-degree) burns present clinically with cutaneous erythema, pain, and tenderness; they resolve rapidly and generally require only symptomatic treatment.[b]No clinically useful objective method of measuring burn depth exists; classification depends on clinical judgment.
Sterile gauze dressings are frequently omitted on the face and neck.

Rule-of-Nines Estimation of Percentage of Body Surface Area

	Head and neck	**Trunk**		**Extremity**		
		Anterior	**Posterior**	**Upper**	**Lower**	**Genital**
Adult	9	18	18	9	18	1
Infant	18	18	18	9	14	—

2. Discuss assessment of Burn wound. Write in short pathophysiology of Burn injury. How would you treat 30% burn in 50 kg. body weight female patient.

Answer:

Assessment:

- The mechanism of injury
- Associated injuries
- Patient age: Patient age has a major effect on outcome, with infants and elderly patients being at highest risk.
- State of health: Preexisting medical problems affecting management should be noted, including allergies, medications, hypertension, and diabetes mellitus.
- Prehospital treatment

- Prehospital treatment is ascertained and recorded, including care provided by the patient and by the emergency response team. Administered fluids are documented carefully and subtracted from estimated fluid requirements for the first 24 hours of injury. prehospital setting.

Primary survey:

- Primary survey should follow the guidelines established by the American College of Surgeons' Advanced Trauma Life Support Course.
- Airway assessment and security is the number one priority.
- Breathing is evaluated for effort, depth of respiration, and auscultation of breath sounds.
- Circulation. Circulatory support in the form of aggressive and prompt fluid resuscitation is a cornerstone of early burn management.
- Remove all clothing to halt continued burn from melted synthetic compounds or chemicals and to assess the full extent of body-surface involvement in the initial examination.

Burn-specific secondary survey:

Depth of burn:

- First-degree burns are limited to the epidermis.
- Second-degree burns, which are subdivided into superficial or deep partial-thickness burns, are limited to the dermal layers of the skin.
- Full-thickness (third- or fourth-degree) burns

Rule-of-Nines Estimation of Percentage of Body Surface Area:

Victim	Head and neck	Trunk		Extremity		Genital
		Anterior	posterior	Upper (for each limb)	Lower(for each limb)	
Adult	9	18	18	9	18	1
Infant	18	18	18	9	14	-

Small areas: palm of patient's hand equals 1% of BSA

Pathophysiology of burn:

Local response

The three zones of a burn:

- **Zone of coagulation**: This occurs at the point of maximum damage. In this zone there is irreversible tissue loss due to coagulation of the constituent proteins.
- **Zone of stasis:** The surrounding zone of stasis is characterised by decreased tissue perfusion. The tissue in this zone is potentially salvageable. The main aim of burns resuscitation is to increase tissue perfusion here and prevent any damage becoming

irreversible. Additional insults—such as prolonged hypotension, infection, or oedema—can convert this zone into an area of complete tissue loss.
- **Zone of hyperaemia:** In this outermost zone tissue perfusion is increased. The tissue here will invariably recover unless there is severe sepsis or prolonged hypoperfusion. These three zones of a burn are three dimensional, and loss of tissue in the zone of stasis will lead to the wound deepening as well as widening.

Systemic response

The release of cytokines and other inflammatory mediators at the site of injury has a systemic effect once the burn reaches 30% of total body surface area.

- ***Cardiovascular changes*:** Capillary permeability is increased, leading to loss of intravascular proteins and fluids into the interstitial compartment. Peripheral and splanchnic vasoconstriction occurs. Myocardial contractility is decreased, possibly due to release of tumour necrosis factor α. These changes, coupled with fluid loss from the burn wound, result in systemic hypotension and end organ hypoperfusion.
- ***Respiratory changes*:** Inflammatory mediators cause bronchoconstriction, and in severe burns adult respiratory distress syndrome can occur.
- ***Metabolic changes***: The basal metabolic rate increases up to three times its original rate. This, coupled with splanchnic hypoperfusion, necessitates early and aggressive enteral feeding to decrease catabolism and maintain gut integrity.
- ***Immunological changes*:** Non-specific down regulation of the immune response occurs, affecting both cell mediated and humoral pathways.

Treatment**:**

Primary Survey:

- Use ABCDEF to check the patient's status:
  A. Airway/C spine immobilization
  B. Breathing and ventilation
  C. Circulation
  D. Disability, neurologic deficit
  E. Expose (remove all clothing and jewelry) Environmental control (keep warm)
  F. Fluid

Secondary Survey:

- Use head-to-toe approach
- Remove all clothing and jewelry
- Quickly assess percentage of skin involved and depth of burn
- Cover patient with clean, dry sheet
- Keep warm: Hypothermia occurs rapidly

- Avoid use of ice or ointments
- If material is stuck to the skin, do no attempt to remove
- For circumferential burns, elevate burn extremity above the level of the heart.

- **<u>Fluid therapy:</u>**

According to Modified Parkland formula:

Amount of fluid needed in 1st 24 hours = 4 x Percentage of burn x body weight in kg

- So, the amount of Ringer's lactate to be given = 4 x 30 x 50 = 6000 ml = 6L
- Patient should receive 3L of RL in 1st 8 hours and 3L of RL in next 16hours.
- Check for urine output, it should be 0.5ml – 1 ml/ kg body weight/hour.
- ➢ Colloid-containing solutions should be held for intravenous therapy until after the first 24 hours postburn.

- Ensure adequate analgesia: strong opiates should be used.
- Prevent hypothermia.
- Prevent stress ulcer.
- Foley's catheterisation.

Further management:

- Circulatory insufficiency caused by a circumferentially burned limb is best relieved by escharotomy. Escharotomies are usually not required within the first six hours of burn injury.

- Fasciotomy: seldom required, but may be necessary to restore circulation for patients with associated skeletal trauma, <u>crush injury</u> or burns involving tissue beneath the investing fascia.

- Gastric tube insertion: if there is nausea, vomiting, abdominal distention, or if more than 20% of the total body surface area is burnt.

- Analgesia and sedation:

  - Severely burned patients may be restless and anxious from hypoxaemia or hypovolaemia rather than pain.
  - Intravenous narcotic analgesics and sedatives may be administered in small, frequent doses.

- Wound care:

- Partial-thickness burns are painful when air currents pass over the burned surface. Gently covering the burn with clean linen relieves the pain and deflects air currents.
- Do not break blisters or apply an antiseptic agent.
- Any applied medication must be removed before appropriate antibacterial topical agents can be applied.
- Application of cold compresses may cause hypothermia. Do not apply cold water to a patient with extensive burns.

- Antibiotics: should be reserved for the treatment of infection.
- Tetanus: determination of immunisation status is very important.
- Full-thickness burns: require excision and grafting unless they are less than 1 cm in diameter. Grafting is required within three weeks in order to minimise scarring.

After healing:

- The area of healed burns should be moisturised and massaged to reduce dryness.
- A high-factor sun cream should be used to prevent further damage and pigmentation changes.

3. Discuss the management of 40% burns in a 22 years female patient of 50 kg body weight, carrying 12 weeks pregnancy.

Answer. Obstetric management of the pregnant burned woman:

Total % burn	Age of gestation		Management
< 30	First trimester		No obstetric interference
	Second trimester		No obstetric interference
	Third trimester	More than 36 wks	Induce labour / caesarian section
		Less than 36 wks	Conservative approach and monitoring of heart rate
30-50	First trimester		Foetal monitoring by ultrasound 3-4 wks
	Second trimester		Foetal monitoring every 3-4 wks. Tocolytic therapy
	Third trimester	More than 32 wks	Deliver foetus within 48 h
		More than 36 wks	Careful foetal monitoring
50-70	First trimester		Terminate pregnancy

	Second trimester		Terminate pregnancy
	Third trimester	If baby is viable	Induce labour / caesarian section within 24h
		Intrauterine death	No active intervention up to 4 wks / monitoring of foetus of haemocoagulation factors
> 70	First trimester		No treatment
	Second trimester		No treatment
	Third trimester		Caesarian section as an emergency procedure at the earliest

4. **Electric burns.**

Introduction: Factors influencing severity include the voltage (high is >1,000 V), resistance, type of current, current pathway through the body, and duration of contact with an electrical source. Severity of injury frequently is underestimated when only the entrance and exit wounds are considered.

Electrical injuries:

- Low voltage (< 1000V). Domestic electrical supply. Causes local contact wounds but no deep injury. May cause cardiac arrest.
- High voltage (> 1000V). High tension cables, power stations, lightning. Causes cutaneous and deep tissue damage with entry and exit wounds.
- ECG on admission for all injuries; continuous cardiac monitoring for 24h for significant injuries.
- In high voltage injury, muscle damage may require fasciotomy.
- Myoglobinuria can cause renal failure: urine output > 75-100mL/h.

Complications:

• Cardiopulmonary arrest (more common with alternating current).	• Associated fractures related to fall or severe muscle contraction.	• Cataracts.
• Thrombosis.	• Spinal cord injury,	• Rhabdomyolysis may occur and result in myoglobin release from injured cells of deep tissues. Precipitation of protein in the renal tubules can cause acute renal failure.

5. Chemical injury

Answer.

- Chemical injury may result from contact with alkali, acid, or petroleum. compounds. Removal of the offending agent is the cornerstone of treatment.
- Dry chemicals should be brushed off or aspirated into a closed suction container before irrigating with copious amounts of water for at least 20 to 30 minutes.
- Alkali burns, which penetrate more deeply than acid burns, require longer periods of irrigation.
- Irrigation has a threefold effect: It dilutes the chemicals already in contact with the skin, washes unreacted agent from the skin, and helps to correct the hygroscopic effects that some agents have on tissues.
- Neutralizing the chemicals is no longer recommended because the resulting reaction has the potential to generate more heat, which can exacerbate the injury.
- All chemical injuries to the eye are potentially blinding and require copious irrigation with several liters of water and prompt referral to an ophthalmologist.
- Tar can cause ongoing burn if not removed.
- Cool the tar with cold water, and then use an adhesive remover to remove any remaining tar.