



EMS Burn Management

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Major Sources of Burns

Thermal

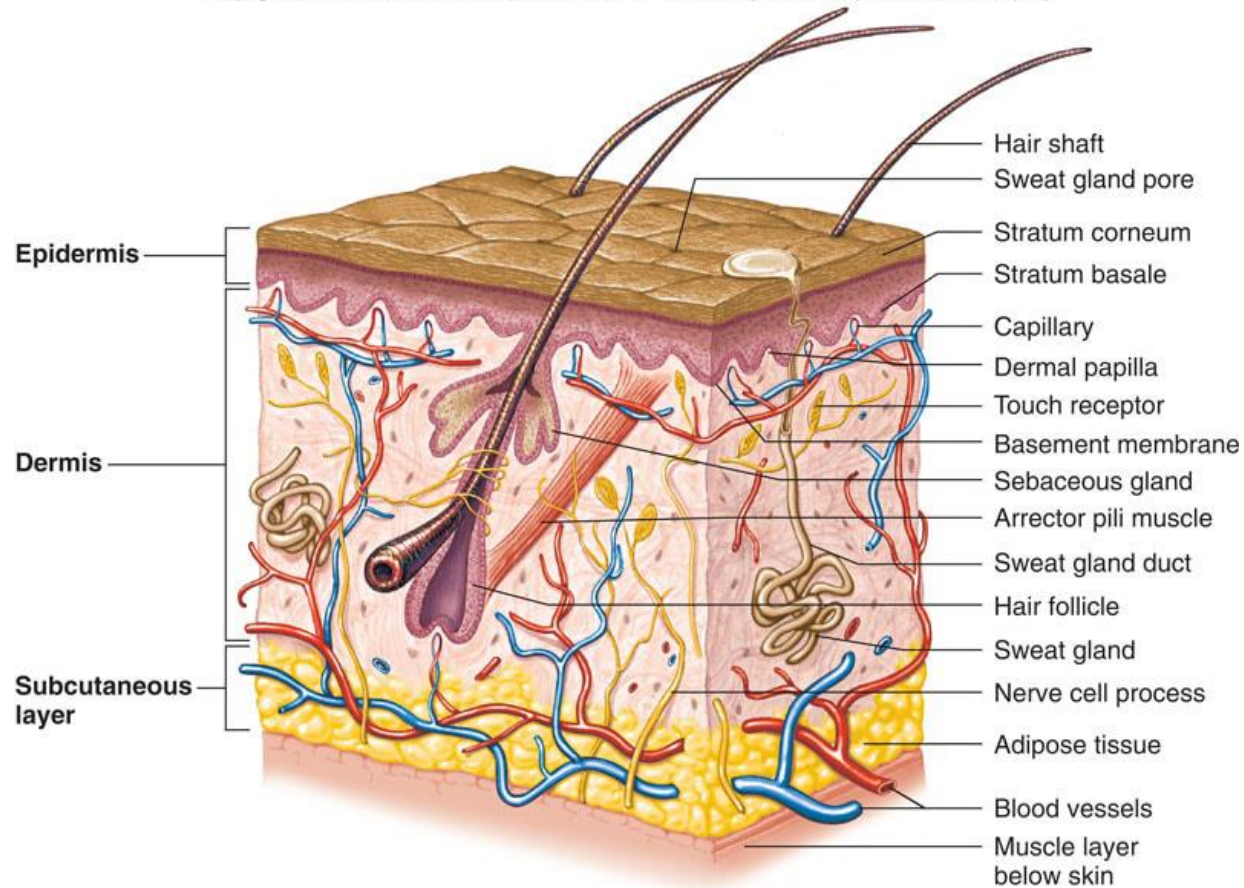
Chemical

Electrical

Radiation

The ability of the body to resist burn injury includes factors such as water content of the skin, thickness and pigmentation of the skin, presence or absence of insulating substances such as skin oils or hair, and overall peripheral circulation.

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A&P Review- The Skin

The Local Response to Burn Injury

Zones of Burn Injury

Each burned area has three zones of injury. The inner zone or “Zone of Coagulation” is where cellular death occurs and sustains the most damage. The middle area or “Zone of Stasis” has a compromised supply of blood, inflammation, and tissue injury. The outer zone or “Zone of Hyperemia” sustains the least damage.

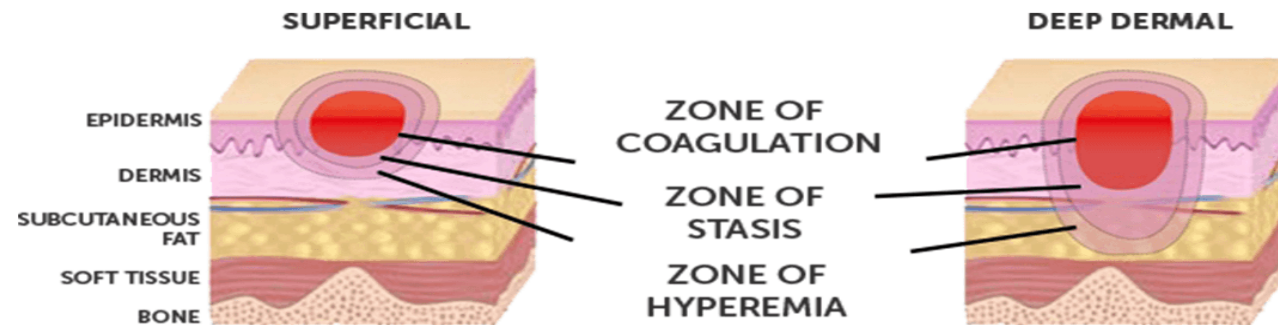


Image via: Idnps.com

Burn Severity Classifications

- Superficial Burns (first degree burns): these burns characteristically are painful, red, and dry.
 - Typically occur after prolonged exposure to low-intensity heat or a short duration flash exposure to a heat source
 - The superficial layer of the epidermis is destroyed
 - These injuries usually heal in 2-3 days
 - Example, sunburn

Burn Severity Classifications-

First degree burn



Burn Severity Classifications

- Partial Thickness Burns (second degree):
 - Superficial partial thickness burns are characterized by blisters and often caused by skin contact with hot, but not boiling, water or other hot liquids, explosions producing flash burns, hot grease, and flame. Damage to the epidermis to variable levels of the dermis. The injury area is usually red, wet, and painful. These wound usually heal within 14 days
 - Deep partial thickness burns involve the reticular layer of the dermis. Decreased sensation may be seen. The injury may appear red and wet or white and dry. Wound infection and sepsis can be complications. Healing usually takes place within 3-4 weeks. Formation of sever scare tissue can occur.

Burn Severity Classifications-

Second degree burn

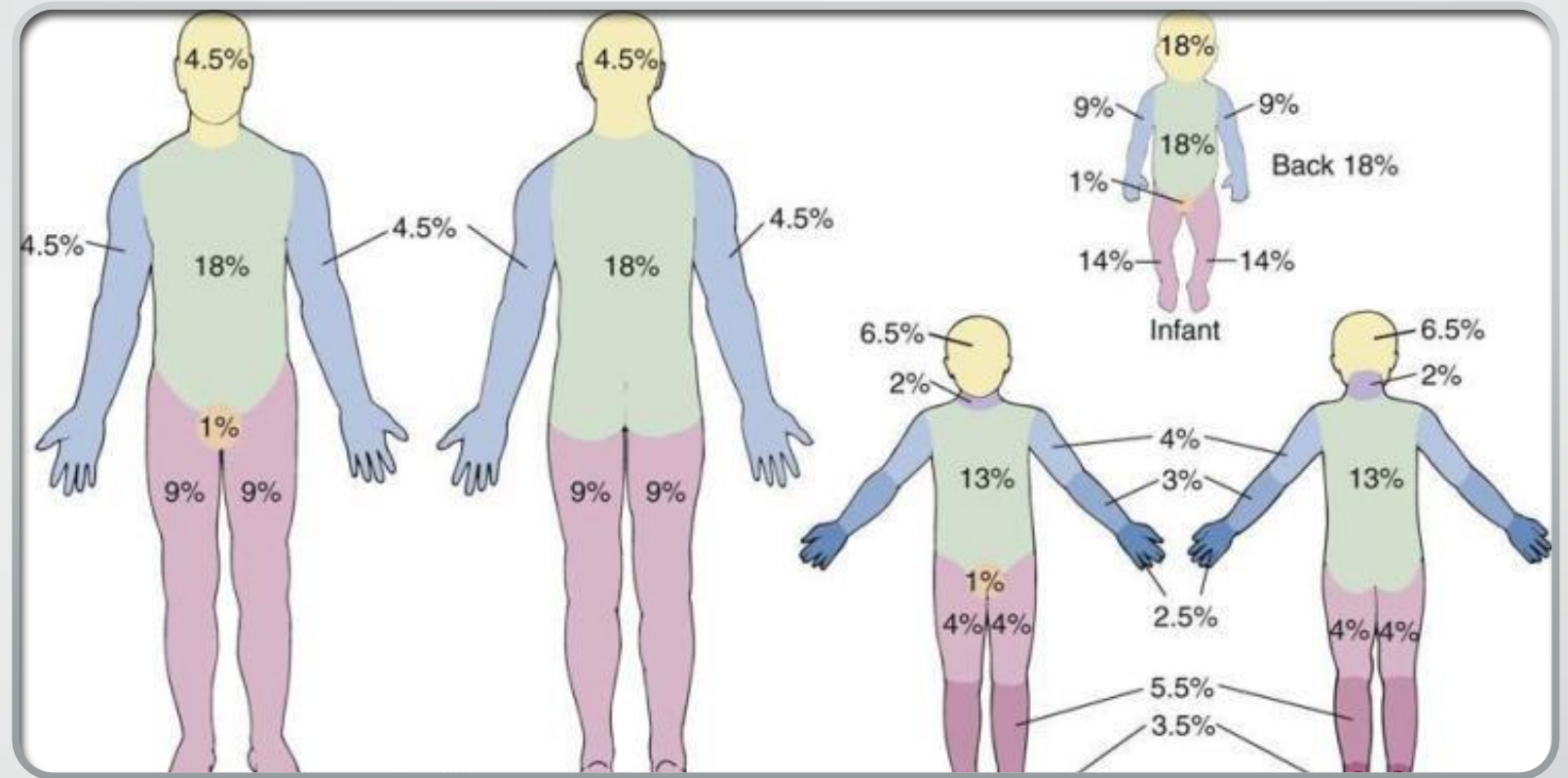


Burn Severity Classifications

- Full thickness burn (third degree): the entire layer of the epidermis and dermis is destroyed along with variable parts of the subcutaneous layer. The wound appears white, charred, or leathery. There is a lack of sensation and no capillary refill. Skin grafts are required for repair.
- Full thickness burn (fourth degree): involves all tissue layers.

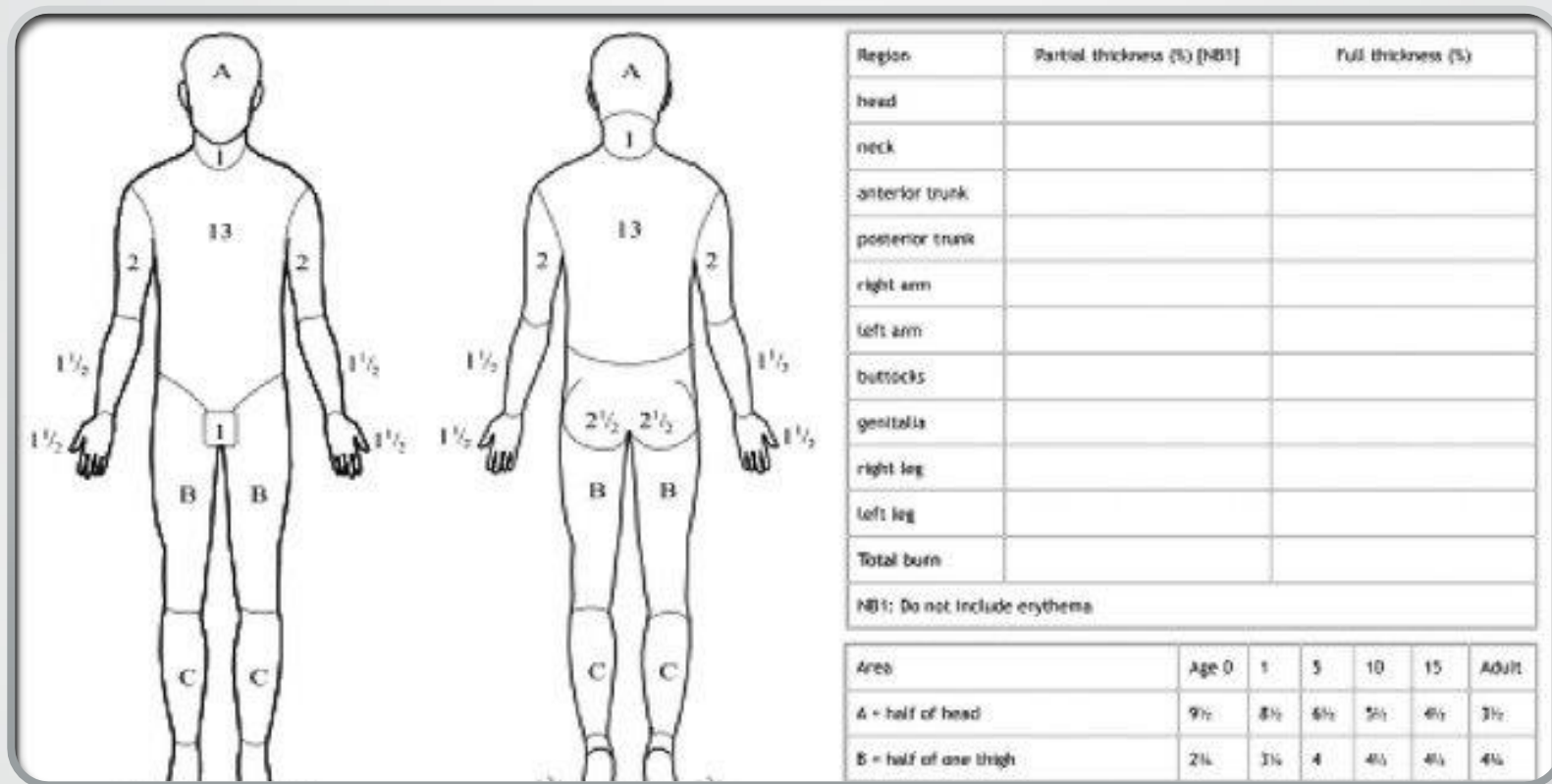


Burn Severity Classifications-
third degree burn



Assessing Burn Extent

The Rule of Nines



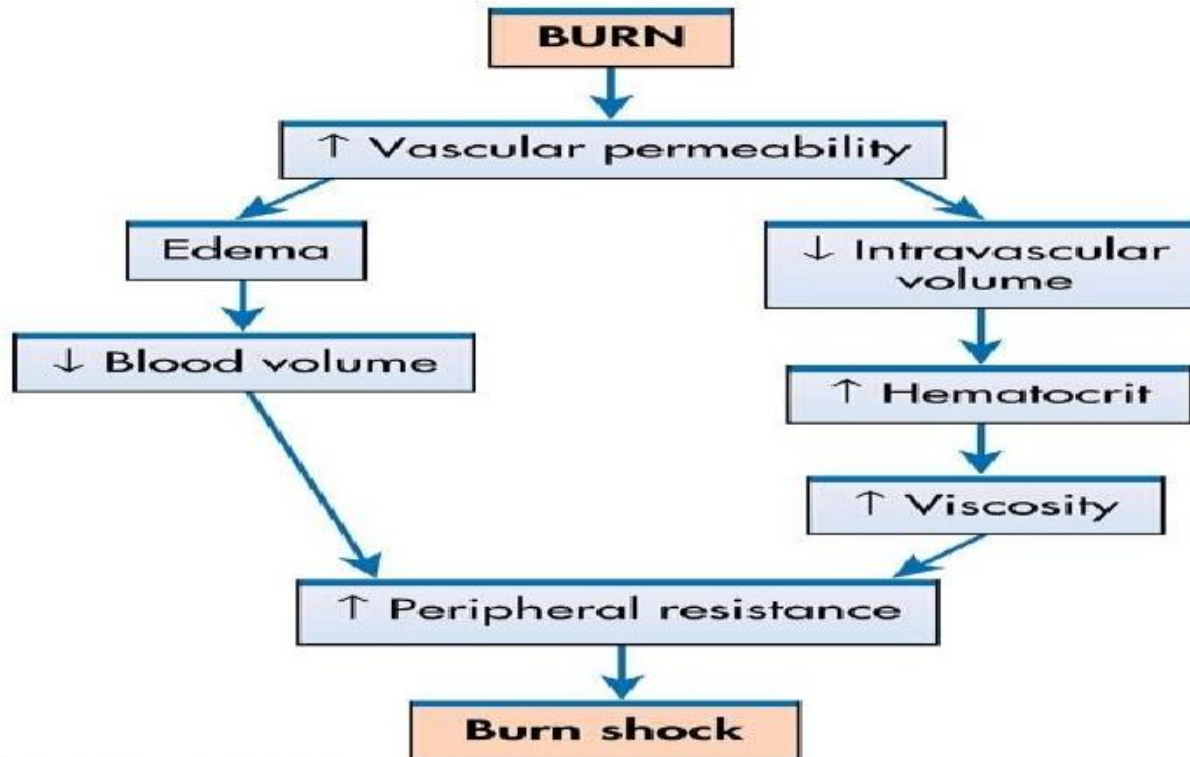
Assessing Burn Extent

Lund and Browder Chart

Classification of Burn Severity

- Major Burns, PTB greater than 25% of TBSA in adults, 20% in children. FTB between 2-10% of TBSA. All burns involving the eyes, ears, hands, feet, face, or perineum. Burns caused by caustic substances. High voltage electricity injuries. Any burn complicated by inhalation.
- Moderate Burns, PTB 15-25% of TBSA in adults, 10-20% in children. FTB less than 10% of TBSA.
- Minor Burns, PTB less than 15% of TBSA in adults, or 10% in children. FTB burns less than 2% of TBSA

Conditions Leading to Burn Shock



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Phases of Burn Shock

Assessment of the Burn Patient

- Scene safety
- Primary survey
 - ABC's. Airway management should be aggressive if inhalation burns are suspected
 - Pulse oximetry readings could be inaccurate due to the presence of CO
 - Neurological assessment
- Obtain a patient hx while completing a secondary assessment
 - Chief complaint
 - Circumstances of burn injury (space, forces, etc.)
 - Source of the burn injury (chemical, liquid, metal)
 - Patient medical hx, medications, allergies
- Physical exam: VS measurement ECG. What to do when burns are severe?
- Destination Determination

General Pre-hospital Burn Management Goals

- Preventing further tissue injury (stop the burning process)
- Managing the airway (intubate early)
- Managing pain
- Providing fluid resuscitation
- Determining and transporting to the most appropriate destination
- Infection prevention (sterile techniques)
- Maintaining body temperature
- Providing emotional and psychological support
- Evaluate for other injuries

Fluid Replacement for Burn Patients

- Consider crystalloid solutions (isotonic)
- The Parkland Formula:
- Total infusion over 24 hrs = $4 \text{ mL/kg} \times \text{patient body weight (kg)} \times \text{TBSA\% burned}$

Parkland Formula

Volume of Ringer's lactate =
 $4 \text{ mL} \times \% \text{BSA} \times \text{weight (kg)}$

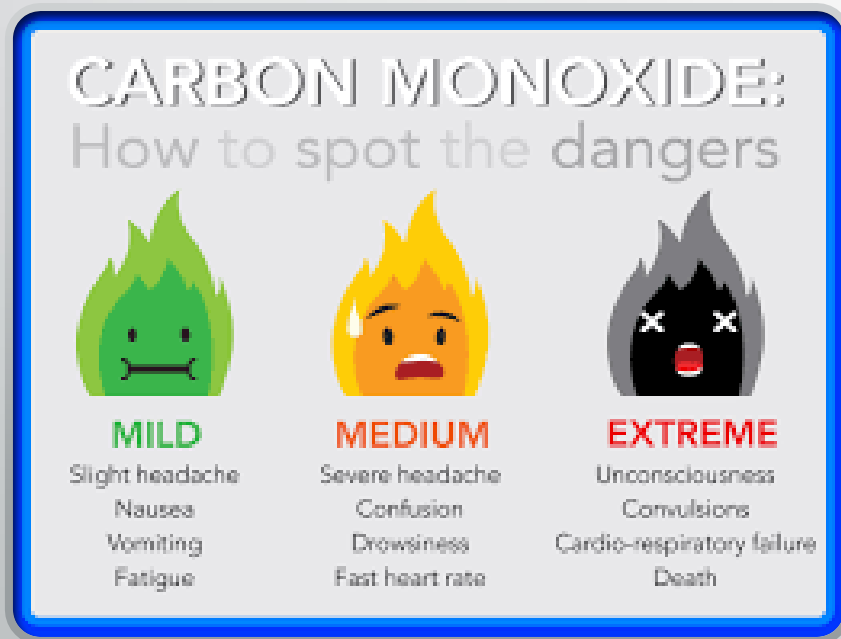
$\frac{1}{2}$

First 8 hours

$\frac{1}{2}$

Next 16 hours

What About Carbon Monoxide (CO)?



- Carbon monoxide is a colorless, odorless, tasteless gas produced by incomplete burning of carbon containing fuels.
- Carbon monoxide has 250 times the affinity that oxygen has for hemoglobin
- CO poisoning can cause hypoxia and cell death
- Adequate ventilation and high concentration oxygen is essential when treating suspected CO poisoning

A Few Notes About Chemical Burns

- Chemical burns result from exposure to substances that have an extreme pH <3 or >11
- Alkalis, acids, and organic compounds
- Examples: household products such as oven cleaners, drain cleaners, fertilizers



Chemical Burn Assessment and Treatment

- Scene safety
- ABC's
- Primary/secondary assessment
- Determine the type of chemical substance along with the concentration and volume
- Determine the time of contamination
- Mechanism of injury

Chemical Burn Assessment and Treatment

- Protect yourself, PPE
- Remove the patients clothing
- Brush the powder off the skin
- Remove blisters that contain the powder
- Irrigate the area with copious amounts of water. If the eyes are affected irrigate the eyes medial to lateral.



A Few Notes About Electrical Burns

- There are 3 types:
 1. Direct contact burn injuries
 - Entrance and exit sites
 2. Arc burn injuries
 - Source->air->bystander
 - Entrance/exit?
 3. Flame and flash burn injuries
 - Boom



Tissue Damage Factors to Consider with Electrical Sources

- 1. Amperage (intensity)
- 2. Voltage (force, tension)
- 3. Resistance (tissue)
- 4. Type of current (DC vs. AC)
- 5. Current pathway
- 6. Duration of flow

Electrical Burn Assessment and Management

- Scene safety
- ABC's
- Spinal immobilization?
- Hx of event
 - Chief complaint
 - Source, voltage, amperage, duration
 - LOC
 - Significant medical hx

Electrical Burn Assessment and Management (cont.)

- Physical Exam
 - Exit/entrance wounds
 - Remove all clothing
 - Evaluate PMS in all extremities
 - Cover wound with sterile dry dressings
 - Utilize ECG monitoring
- Administer fluids early
- Utilize analgesia per protocol
- Determine transport and destination

Lightening Injuries

- Lightning strikes the earth ~ 8 million times each year accounting for ~ 35 deaths per year
- 10% die
- Lightning burns occur over the skin rather than through the skin
- A linear or feathery burn pattern is seen

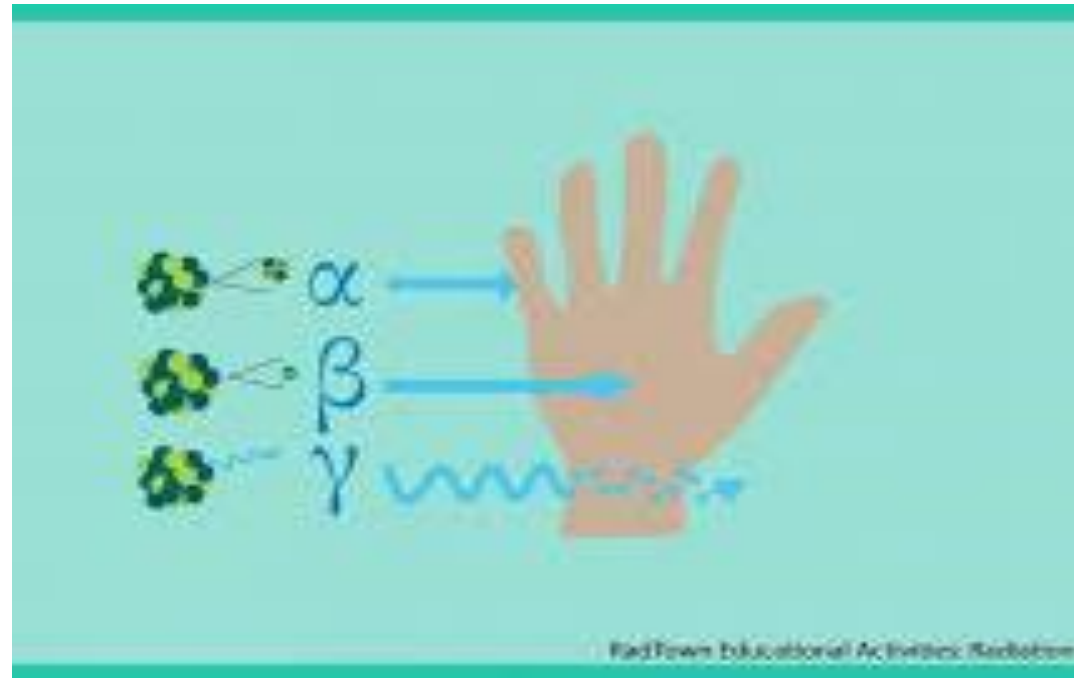


Lightening Injury Assessment and Treatment

- Scene safety, seek shelter from the storm
- ABC's
- Spinal immobilization?
- Fluid resuscitation
- Analgesia per protocol
- Seizure activity? Treat
- ECG monitoring, dysrhythmia? Treat
- Dry sterile wound care
- Destination determination, burn center?

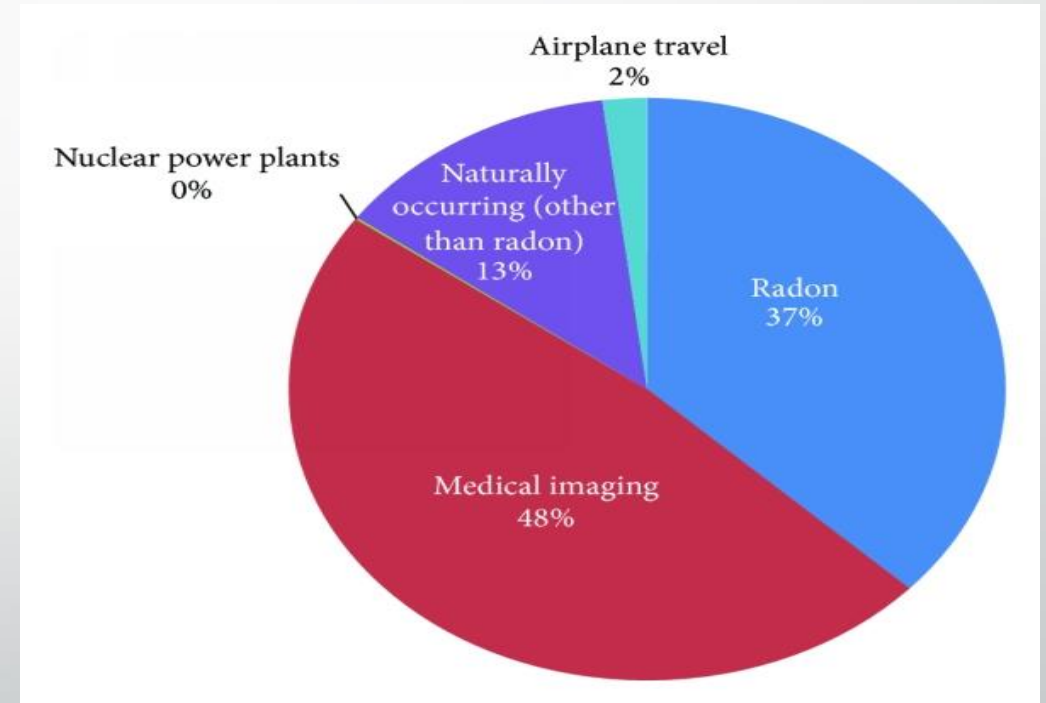
Radiation Exposure Injuries

- Radiation exposure events are rare
- Ionizing vs. Non-ionizing radiation
 - Ionizing- energy released from atoms traveling in electromagnetic waves, can cause tissue damage
 - Alpha, beta, and gamma
 - Non-ionizing- radio waves and microwaves, safe



Radiation Exposure Injuries

- Personal protection for first responders starts before arriving to the scene, HAZMAT
- High doses of ionizing radiation can cause:
 - N/V
 - Diarrhea
 - Cognitive impairment
- Symptoms may not present immediately



Thank you!

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