

Pulse Check 2019

Initial care of the burn patient

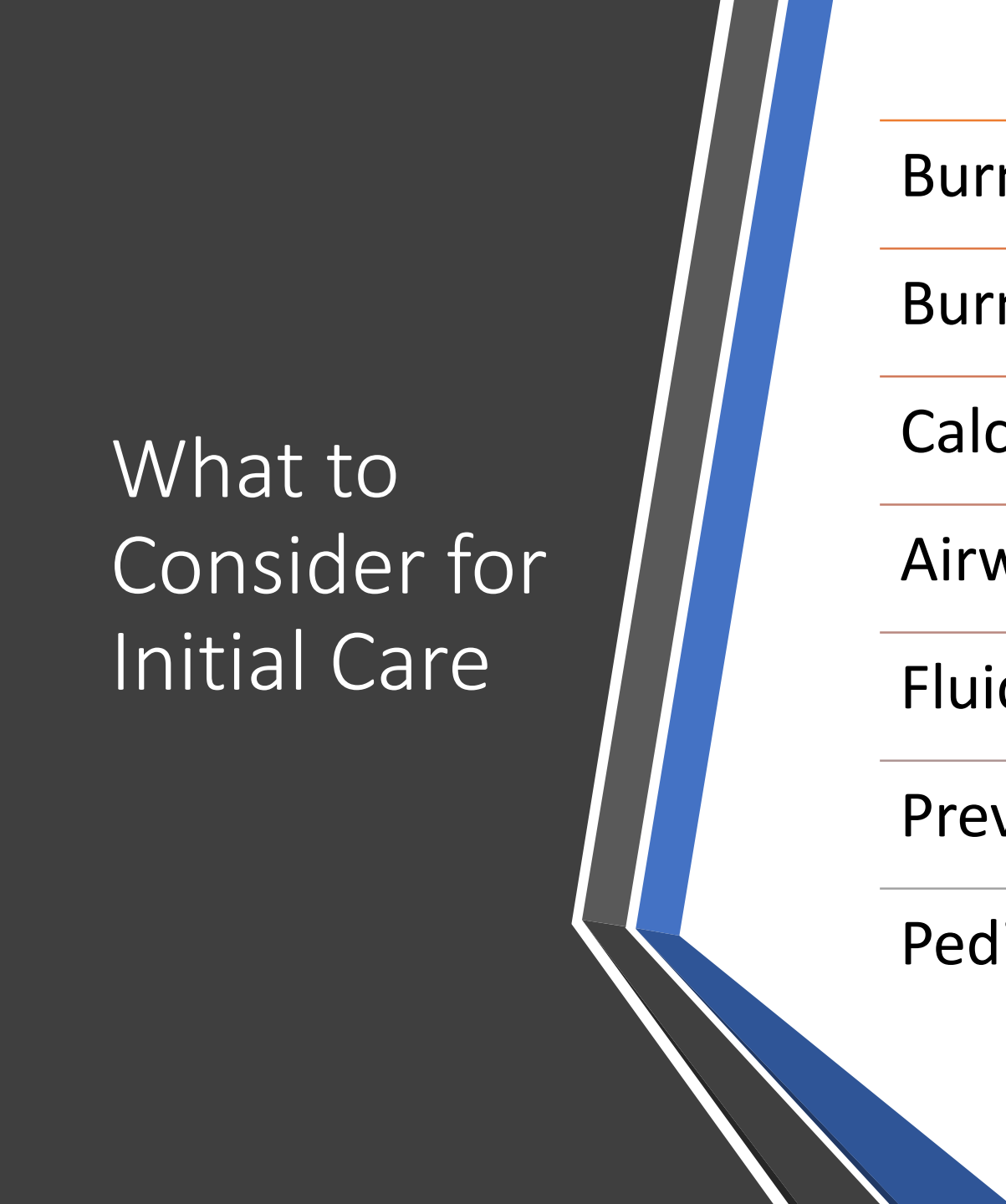
Suffern, NY

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What to Consider for Initial Care

Burn Center Referral?

Burn Classification

Calculating TBSA

Airway Management/ Inhalation Injuries

Fluid resuscitation

Prevention of Hypothermia

Pediatric Geriatric Considerations



What to do???

Resources ?

Type & manner of injury

Stop the burning process / decontamination needs?

ABC's?

Thermoregulation – prevent loss & active process

Burn classification? Depth & extent

Does the patient need fluids? Associated Trauma?

What are the circumstances surrounding the injury??

Burn injuries that should be referred to a burn center include:

1. Partial thickness burns greater than 10% total body surface area (TBSA).
2. Burns that involve the face, hands, feet, genitalia, perineum, or major joints.
3. Third degree burns in any age group.
4. Electrical burns, including lightning injury.
5. Chemical burns.
6. Inhalation injury.
7. Burn injury in patients with preexisting medical disorders that could complicate management, prolong recovery, or affect mortality.
8. Any patient with burns and concomitant trauma (such as fractures) in which the burn injury poses the greatest risk of morbidity or mortality.
9. Burned children in hospitals without qualified personnel or equipment for the care of children.
10. Burn injury in patients who will require special social, emotional, or rehabilitative intervention.



Initial Care and Management of Thermal Burns

What are the steps in the initial care and management of a burn patient?

- Stop the burn process
- Decontamination
- Minimizing the risk for hypothermia
- Pain management
- Fluid resuscitation
- Transporting to the nearest burn center

Burn Classification

- Depth of burn
 - Superficial
(first degree)
 - Partial-thickness
(second degree)
 - Full-thickness
(third degree)
- Extent of burn
 - **Rule of Nines**
 - Lund and Browder
 - **Palmar surface**

Why is the initial management so vital?

Every step of the process from the time of the injury impacts a patient's overall outcome.

- **Survivability**
- **Recovery**
- **Length of Stay**

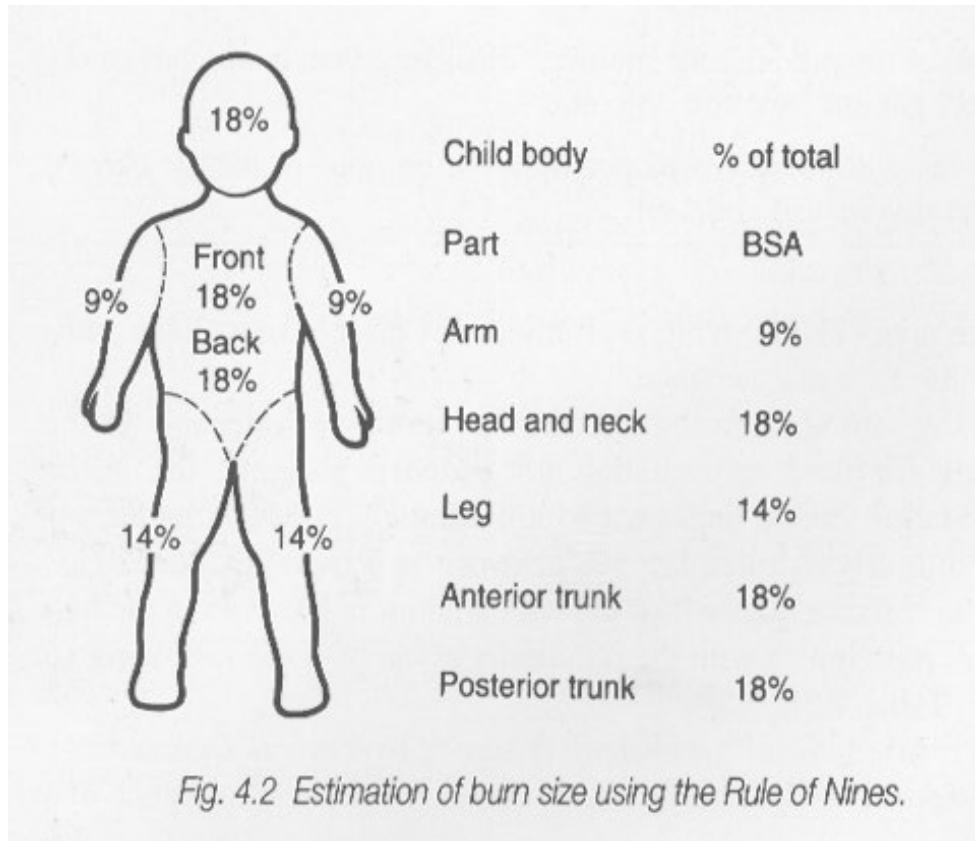
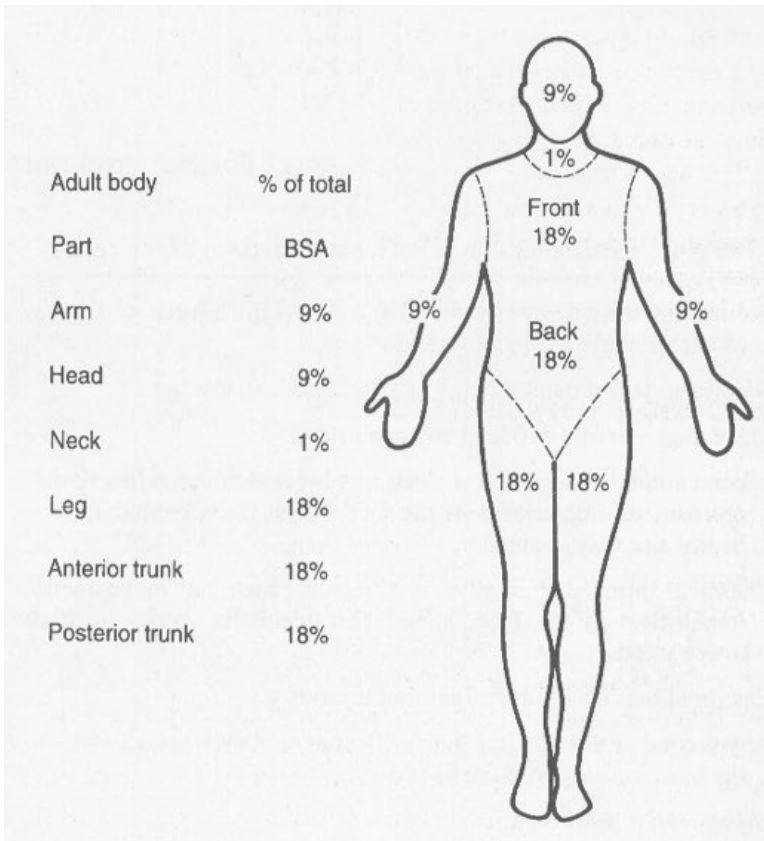


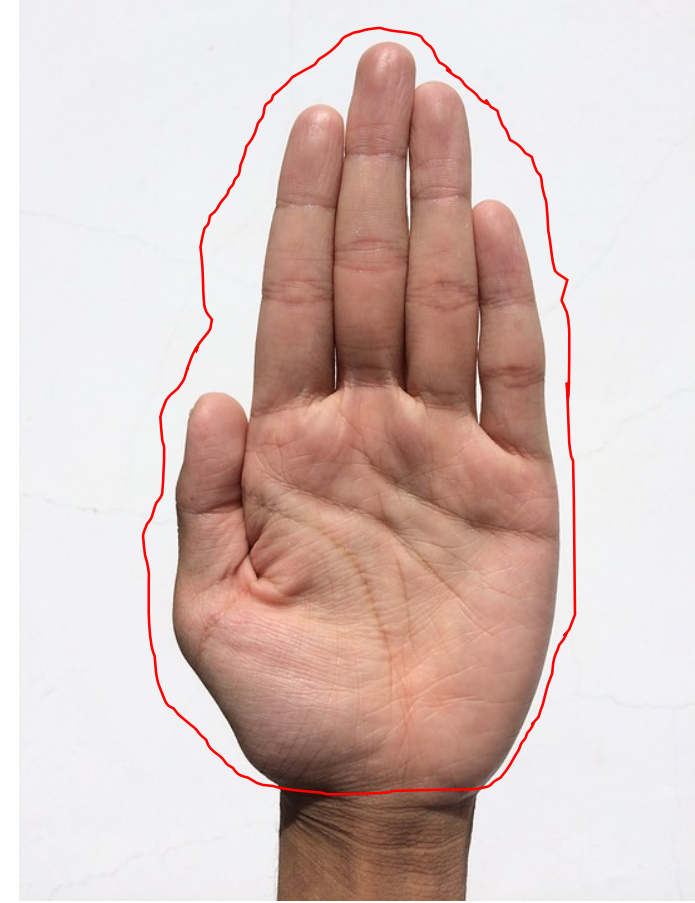
Fig. 4.2 Estimation of burn size using the Rule of Nines.

ABA Guidelines Rule of Nines

When calculating size of burn

- Total Body Surface Area (TBSA)
- Palmer method
- Rule of nines
- **Only count Second and Third degree burns**

- Second Degree (Partial Thickness): Skin may be red, blistered, swollen. Very painful.
- Third Degree (Full Thickness): Whitish, charred or translucent, no pin prick sensation in burned area.

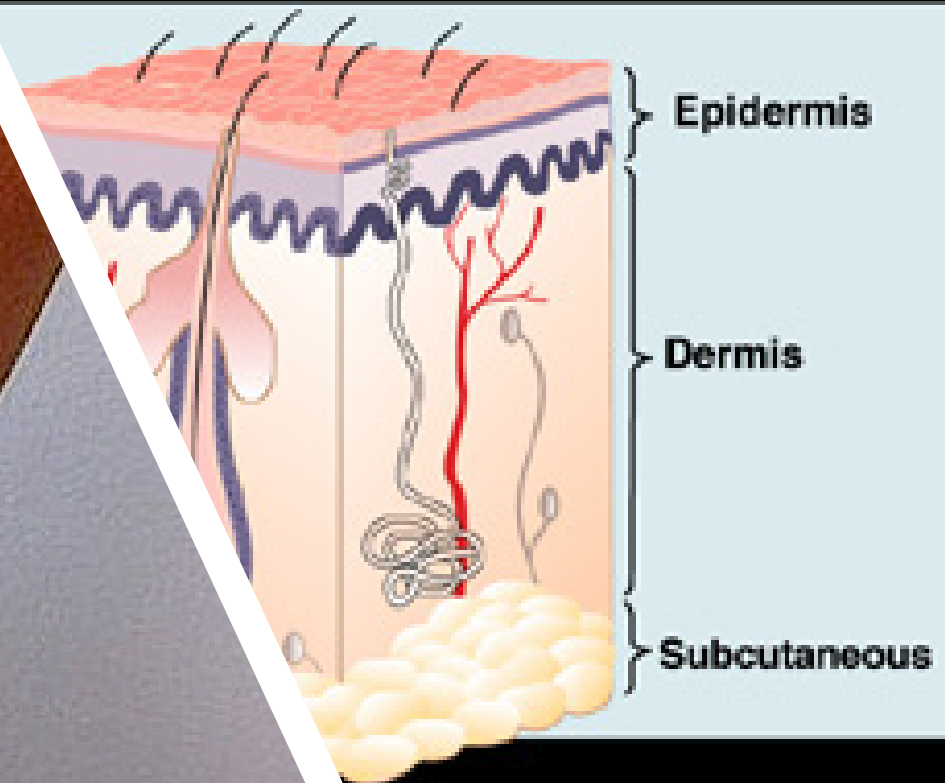


First Degree Burn

- Thinner outer epidermis layer
- Characterized by erythema and mild discomfort.
- Tissue damage is minimal and the skin functions are intact.
- Pain is the chief complaint
- Usually resolves in 2-3 days.
- (Is not included in TBSA)

First Degree Burn

- Sunburn
- Involves epidermis only
- Local pain and erythema
- No blisters
- Heals spontaneously without scarring
- Systemic response is minimal



Second Degree Burn (Partial Thickness)

- Involve the entire epidermis.
- Variable portions of the dermis have been destroyed by heat.
- Either superficial or deep.
- Should blanch and color should return when released.
- Superficial second degree burns involve the upper third of the dermis.
- characterized by edema, pain, generally pinkish to light red, and is moist.



Superficial Partial Thickness



Second degree (deep)

- ▶ Epidermis, papillary dermis and varying depths of deep dermis have been damaged
- ▶ Pale, pink-white, dry appearance common. Does not blanch
- ▶ Can convert to full thickness (third degree)
- ▶ Remains painful to pinprick and presents with less pain than superficial 2nd degree

Deep second degree

- Can heal but may take 3-4 weeks
- Excisional debridement with temporary skin coverage may be required



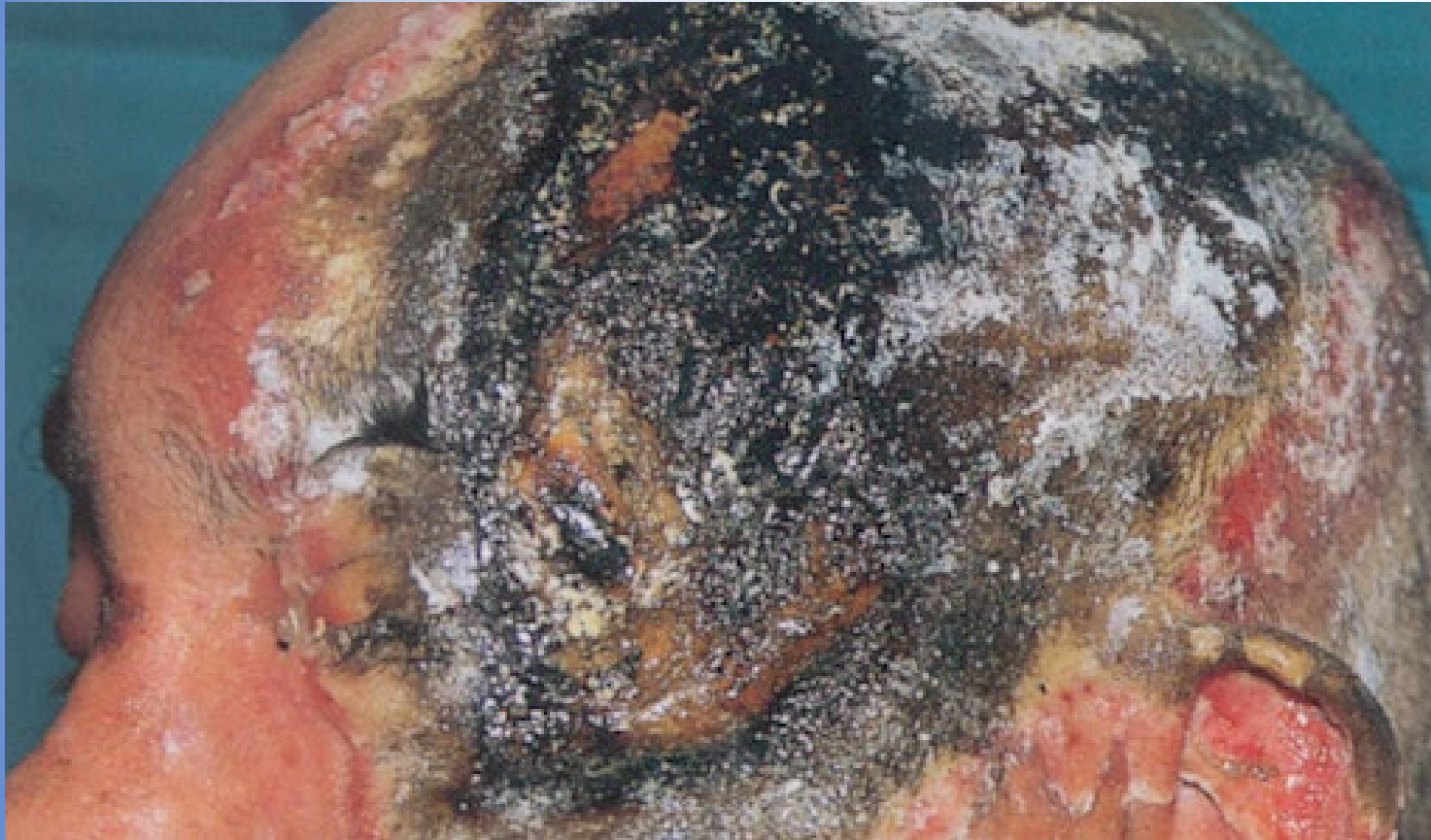
Third Degree Burn (Full Thickness)

- Destroy the entire epidermis and dermis layer.
- No residual epidermal cells left to re-epithelialize the affected areas.
- The hard dark yellow tissue is known as eschar.
- May also have a waxy white or yellow color due to its avascular nature.
- They may also be leathery or black if the tissue is charred.
- Dry, non edematous and painless



03/18/2009





Fourth Degree Burn or Deep Third Degree burn with Loss of Body Part

- Extend beyond the dermis and involve muscle and/or bone or underlying tissue.
- Injuries are usually the result of high-voltage electrical injury or prolonged exposure to intense heat.
- Appearance is dry and charred. No sensation, and limited or no movement.
- Myoglobinuria is usually seen when the muscle is involved.





Inhalation Injury

- Inhalational injuries complicate nearly one third of all major burns
- Doubles the mortality of cutaneous burns
- Three distinct components
 - Carbon Monoxide / Cyanide poisoning
 - Upper airway thermal burns
 - Lower airway chemical injuries



Inhalation Injury

- Physiologic changes associated with injury
 - Impaired ciliary activity
 - Inflammation
 - Hyper-secretion
 - Edema formation
 - Ulceration of the airway mucosa
 - Increased blood flow
- Accounts for 50 to 70% of burn mortality

Signs of a possible inhalation injury

- Facial Burns**
- Singed eyebrows, nasal hair, facial hair**
- Carbonaceous sputum**
- Unconsciousness**
- Closed Space**
- Signs of hypoxemia (cyanosis, agitation, etc)**
- Signs of respiratory distress**
- Hoarse voice**
- Inability to swallow**
- Erythema or edema of tissues**

CO and CN Treatment

100% FiO₂ until known CO level

Do not rely on pulse ox

Altered mental status, CO > 25, pregnancy gets hyperbarics x 3

If CO high, expect CN to be high and treat

Cyanokit: turns urine and patient purple

Will be unable to track myoglobinuria





Upper vs Lower Inhalation Injuries

Oropharynx

- Heat injury
- Inflammatory
- Severe localized edema can occur rapidly
- Indication for prophylactic intubation
- Maximal swelling 12-24 hours
- Resolves in about 3 days
- Resolves faster if not given inappropriate fluids

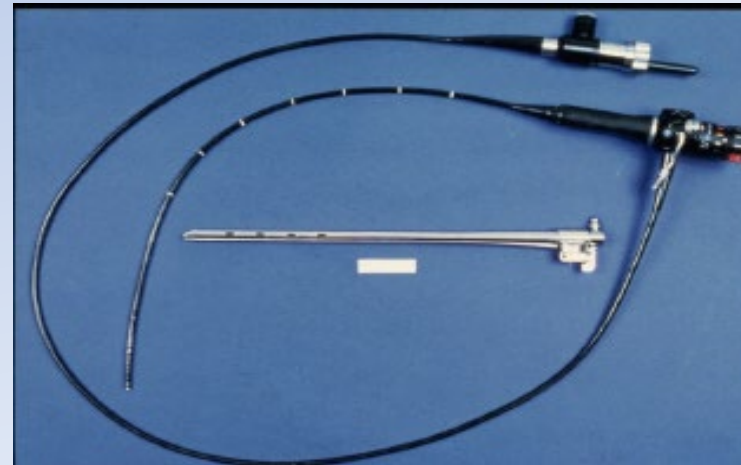
Upper vs Lower Inhalation Injuries

Tracheobronchial Tree

- Smoke/Chemical or Steam
- Heat in unconscious (may be cobble stoning 2-d appearance)
- Transudate-a transudate is characterized by high fluidity and a low content of protein, cells, or solid matter derived from cells.
- Secretions from goblet cells
- Increased shunting- bypassing of alveoli by blood circulating through the lungs.
- *Beware Volume ventilation*

Lower Airway Thermal Injuries

- Injury to tracheobronchial tree and lung parenchyma
- Due to combustion products in smoke and inhaled steam. More chemical than thermal.
 - Atelectasis
 - Shedding of columnar epithelium
 - Decreased ciliary action
 - Pooling of secretions
 - Bronchorrhhea
 - Bronchospasm
 - Pulmonary Edema



To Intubate or Not to intubate?



- If giving a lot of fluid: you will have more edema if there is a heat injury to the oropharynx
- Is there a voice change?
- Stridor?
- Okay to give 100% oxygen via mask or NC with facial burns
- Nares may swell, may have to bring NC to mouth
- Keep on 100% FiO₂ if CO suspected.
- If you need to do a surgical airway: good news: the skin won't bleed if full thickness burn.

Management of Inhalation Injury

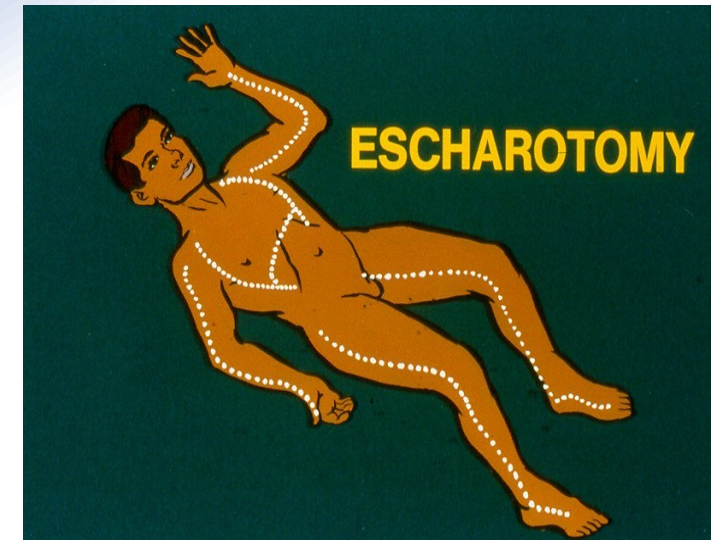
- Airway assessment
- Endotracheal intubation
- Mechanical ventilation
- High flow - 100% oxygen
- ABGs
- Carboxyhemoglobin

Burn Types

- Circumferential full-thickness burns
 - As edema progresses, may have tourniquet effect
 - Escharotomy
- Management
 - Monitor respiration and chest expansion
 - Monitor distal circulation

Escharotomies & Fasciotomies

- Circumferential Trunk Burns
- Circumferential Extremity Burns
 - Cyanosis of distal unburned skin on limb
 - Unrelenting deep tissue pain
 - Progressive paresthesias
 - Decrease or absence of pulse
- Fasciotomy in OR

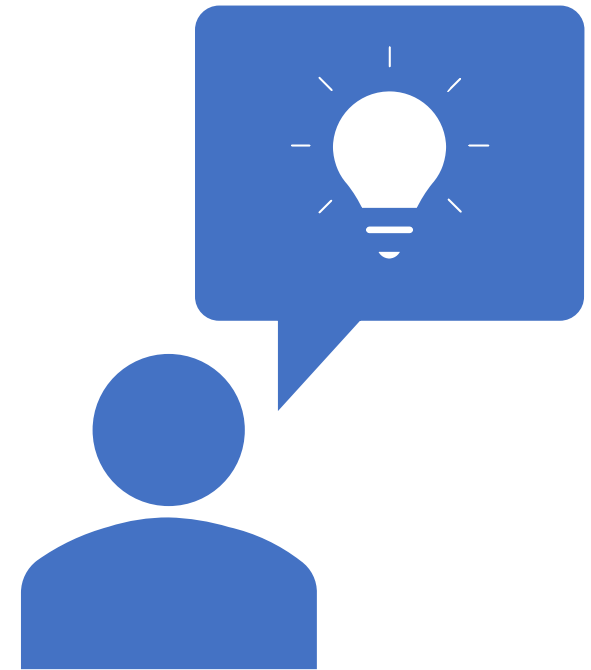




Problems with Parkland??

- State of the Science meeting in 2006:
 - “Fluid Creep” Dr. Basil Pruitt
- Burns were getting 4.6-6.3 ml/kg/TBSA
- Prevalence of Intra-abdominal Hypertension 67-74% major burns
- Prevalence of Abdominal Compartment Syndrome 4-16%

- 4 cc / kg / TBSA



Over resuscitation issues

- Limb ischemia
- Ocular compartment syndrome
- Increased wound conversion
- Increase ventilator requirements
- Pulmonary edema
- Risk for Intra-abdominal hypertension/ compartment syndrome

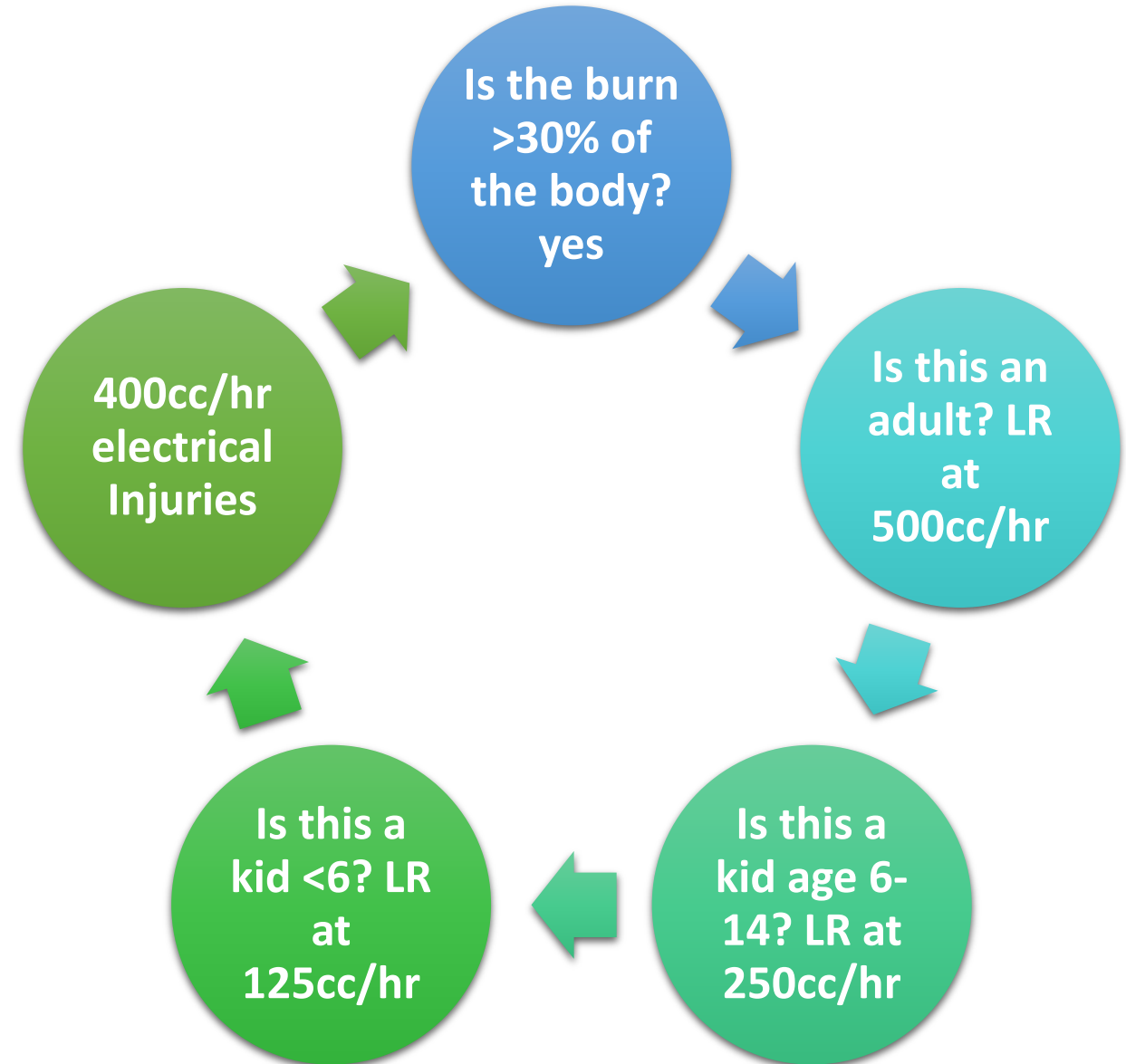


Photo Credit: Bacamo, Ferdinand K and Chung, Kevin K. **A primer on burn resuscitation**
[J Emerg Trauma Shock](#). 2011 Jan-Mar; 4(1): 109–113.

Fluid Resuscitation

- Prehospital > 20% TBSA:
 - 5 years old and younger – LR @ 125ml/hr
 - 6-14 years old – LR @ 250ml/hr
 - 15 years and older – LR @ 500ml/hr
- **NEVER BOLUS A BURN PATIENT WITH FLUIDS UNLESS THERE IS AN ASSOCIATED TRAUMA**

2010 ABA Consensus Guideline



Prehospital or
during
Primary eval

Avoiding overresuscitation

Fluid is not consequence free:

Treat the patient

If acidotic, correct acidosis

If bleeding, treat as a trauma and give blood and control hemorrhage

If MAP<55, add pressors

If fluids at a high rate already, change 1/3 of the rate to albumin

Aim for only 30-50cc/hr of UOP. “permissive oligouria”

If UOP is 1cc/kg/hr: cut back fluids by 10-20%

Kidneys can be replaced.



Hypothermia

- Patients with a burn injury greater than 20% are at higher risk for hypothermia
 - Others at risk:
 - Children- due to a large body surface area relative to body size
 - Elderly- the body's ability to regulate temperature Body's Surfaces SENSE COLD CHANGES WITH AGE
- Hypothermia can lead to elevated blood pressures due to vasoconstriction
- Increase risk for mortality
 - 60% mortality if present on first evaluation
- Inappropriate normotension
- Inappropriate normouria

Pediatric Burns

- Monitor GLUCOSE LEVEL in children < 2 years of age as they have smaller glycogen stores .
- Children < 10 Kg resuscitate with D5LR.
- Thinner skin
- Less subcutaneous tissue

Burns and the elderly

- Elderly individuals are more vulnerable to burn injury due to their limited mobility coupled with their physical inability to react rapidly and reach safety when faced with danger.
- Skin's integrity and function is eventually jeopardized by the process of aging through structural and biochemical processes, and manifests as impaired neurosensory perception, permeability, and compromised response to injury and repair capacity.
- > 65 have more comorbid medical conditions and double the mortality following a major burn injury than those under 65 years of age. They are at a higher risk for complications such as pulmonary edema, congestive heart failure and pneumonia.

Patients
with a 20%
TBSA or
greater:

Maintain body temperature, prevent heat loss

Elevate temperature to 90 degrees or greater and keep the doors closed to maintain cabin temperature.

Keep the patient covered with clean/dry/warm blankets

< 10% TBSA moist dressings (NYS Collaborative)

Manage pain.

Administer fluids accordingly, use a warmer if available- be cautious to avoid fluid creep

Monitor the patient's temperature regularly

Summary

- Early deaths are due to airway respiratory compromise
- Limit progression of depth and extent
- Keep patients warm
- Careful, systematic approach:
 - Identify and manage critical life-threatening problems and improve patient outcome
- Start resuscitation:
 - 125cc/hr, 250cc/hr, or 500cc/hr.



Questions??

References

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- Farage MA, Miller KW, Elsner P, Maibach HI. Characteristics of the Aging Skin. *Adv Wound Care (New Rochelle)* 2013;2(1):5–10.