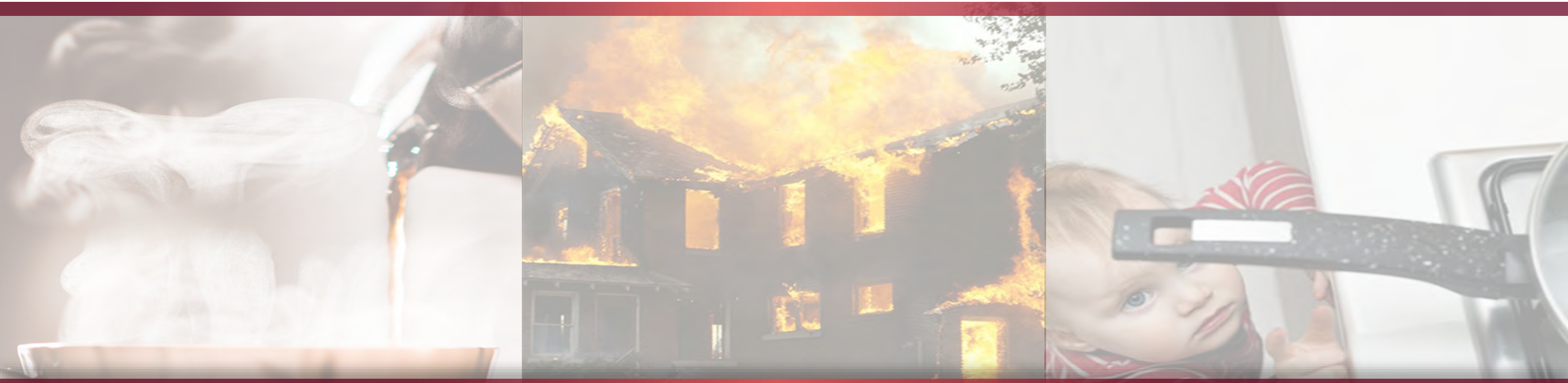


Management of Acute Burn Injuries: The First 24 Hours

Debbie Harrell MSN, RN

Shriners Children's™
Ohio

Speaker Disclosure

I, Debbie Harrell, MSN, RN, NE-BC, have no financial relationships to disclose.

Thermal Injuries

- 67% of burns are 10% or less.
- 60% of burns are children 5 and under.
- 90% of burns can be managed on an outpatient basis.

Initial triage

- Remove all clothing completely
- Stop the Burning Process for 3 to 5 minutes (never use ice)
- Prevent hypothermia
  - Cover with a dry dressing
  - Increase temperature ambient air
  - Warm IV fluids

Airway Management

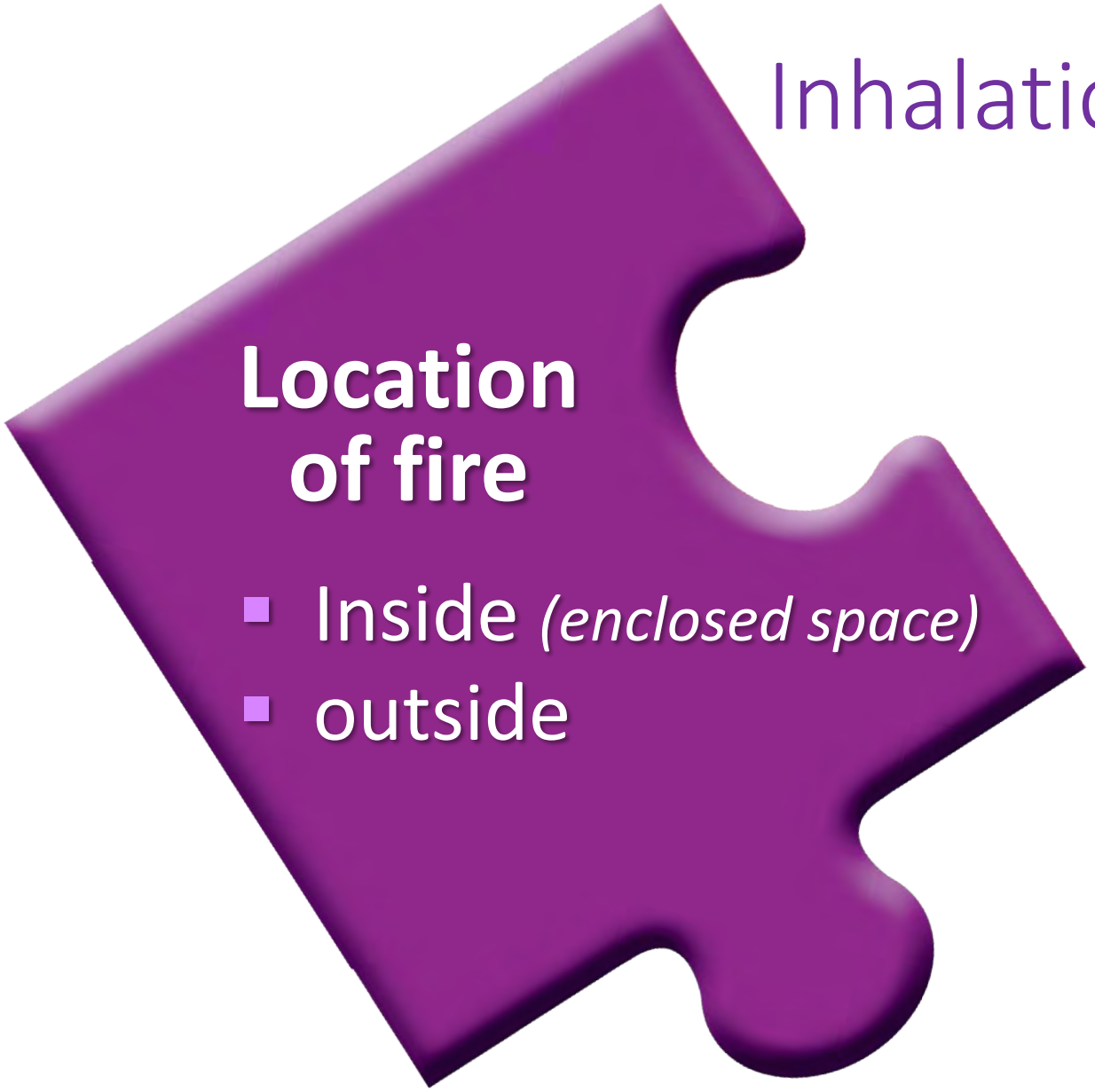
- Inhalation Injury
  - Emergent and immediate
- Edema
  - Evolves over 24 to 48 hours

Inhalation Injury

- Three distinguishable types:
  - Inhalation thermal injury
    - Above the glottis
      - Hoarse raspy voice
  - Carbon monoxide poisoning
    - Hypoxia/anoxia
  - Inhalation of chemicals and irritants
    - Presents later in the patient's course

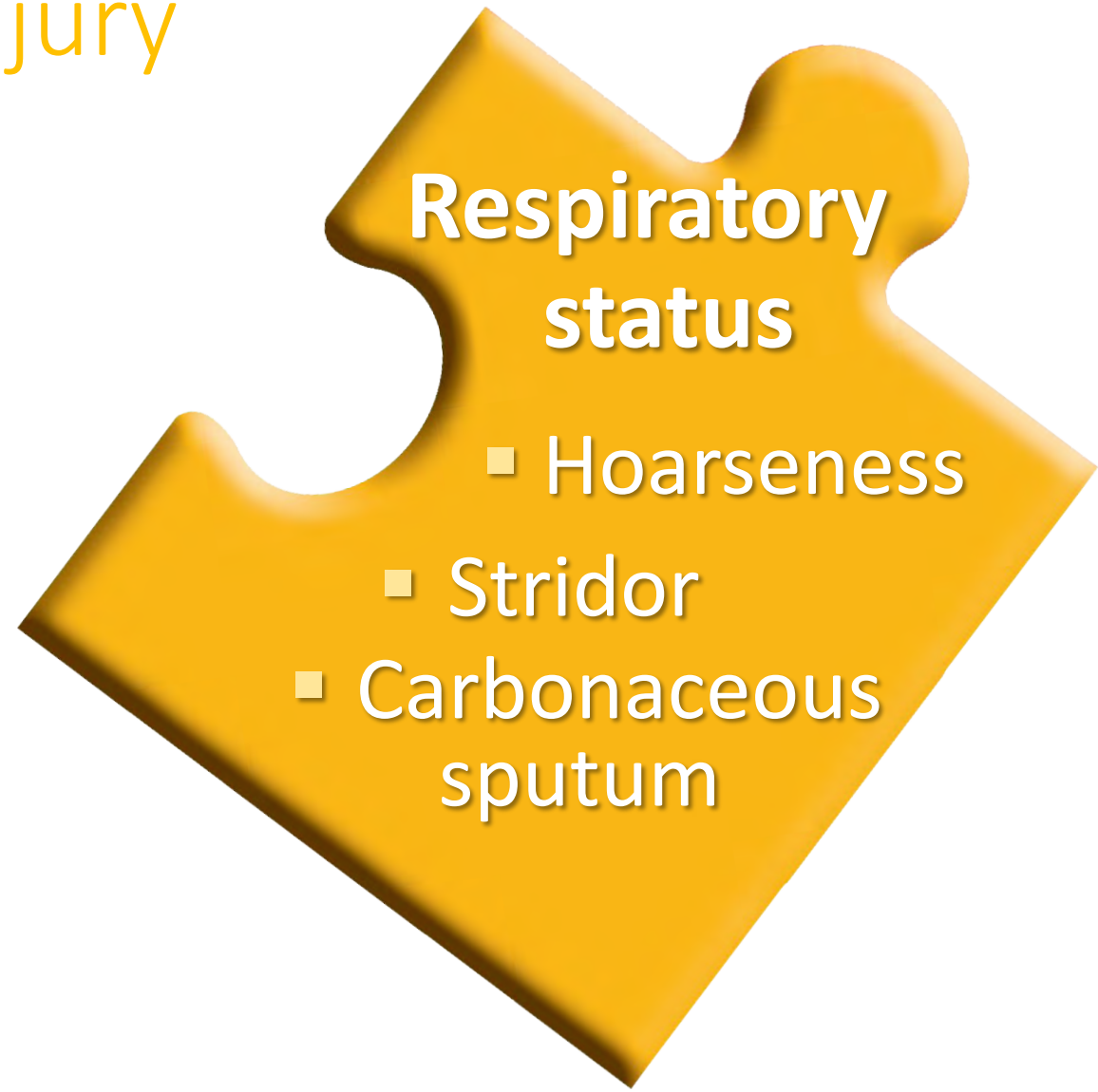
Index of suspicion…

Inhalation Injury

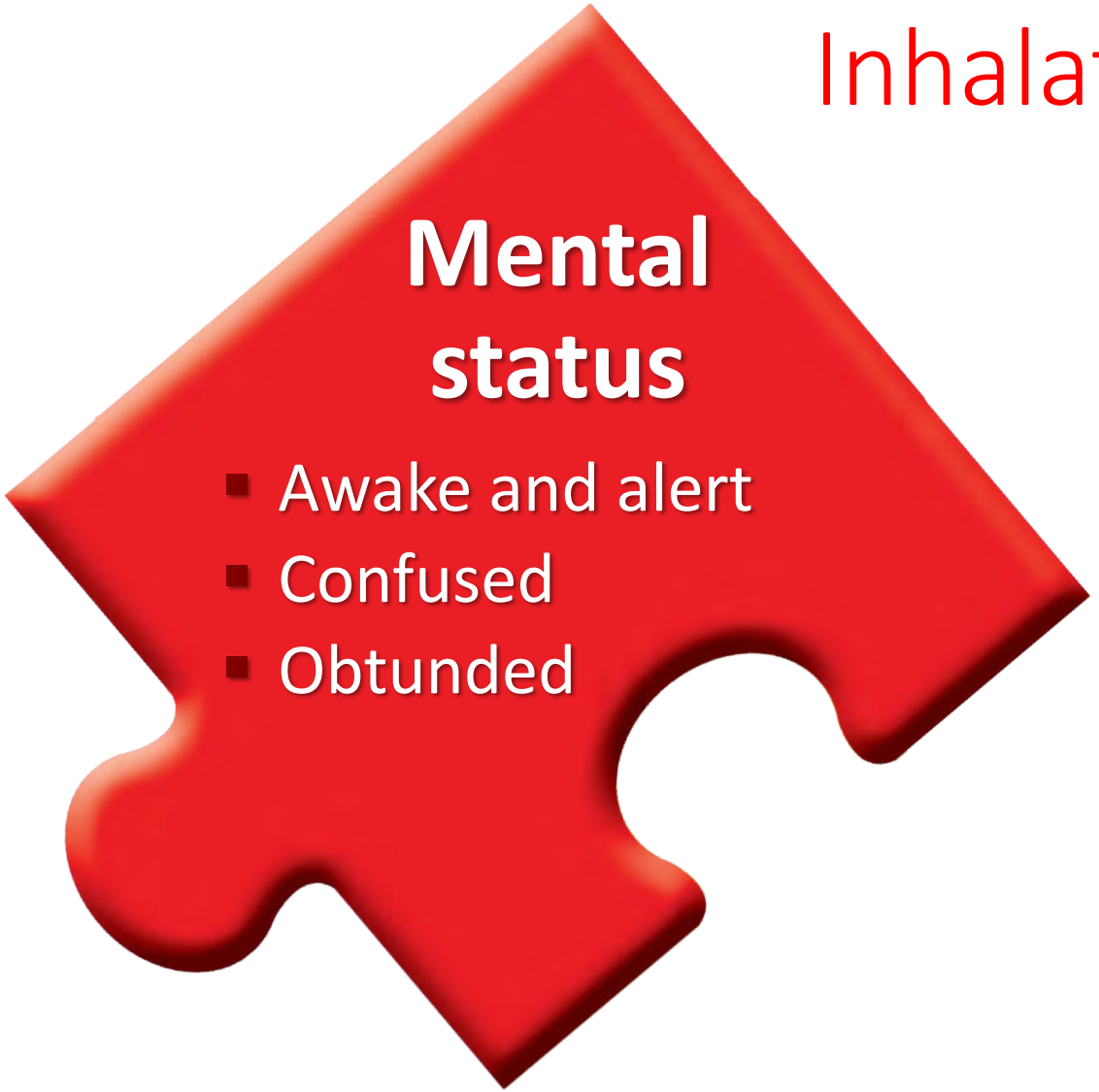


Inhalation Injury

Inhalation Injury



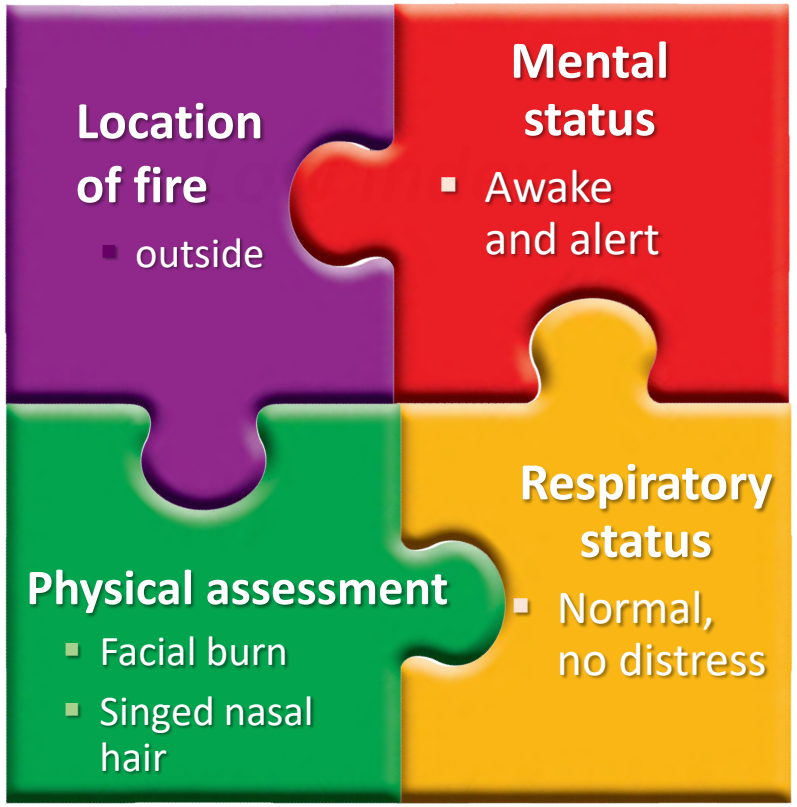
Inhalation Injury



- 9 year old female standing by trash barrel. Gas is thrown in the fire.

What is the index of suspicion?

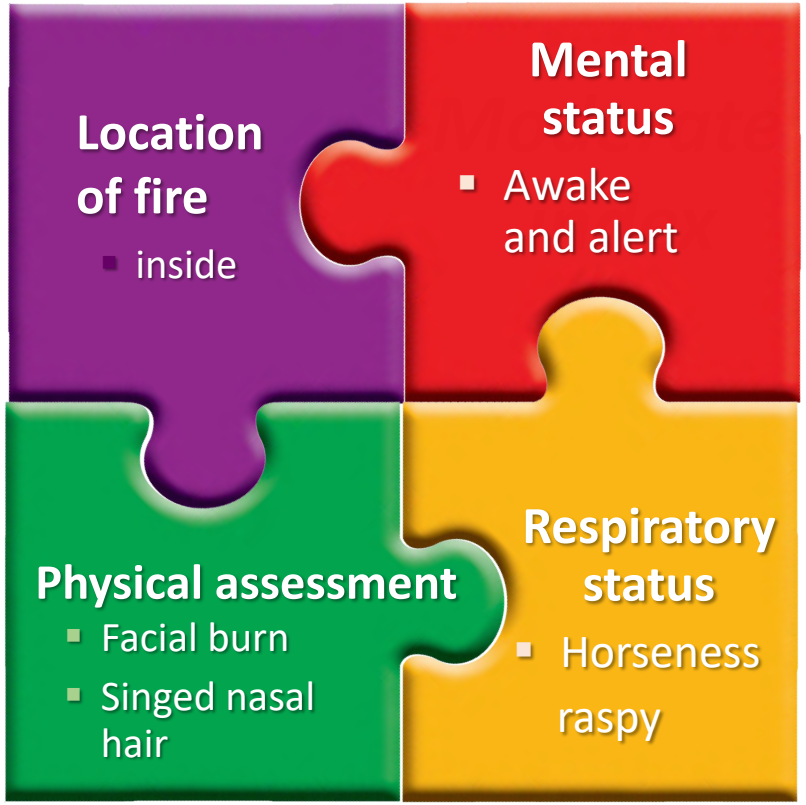
Index of suspicion…



- 14 year old male sprayed an accelerant on his clothing and lit it in his bedroom.
- He ran into the living room screaming, mom put him in the shower to extinguish the flames.

What is the index of suspicion?

Index of suspicion…

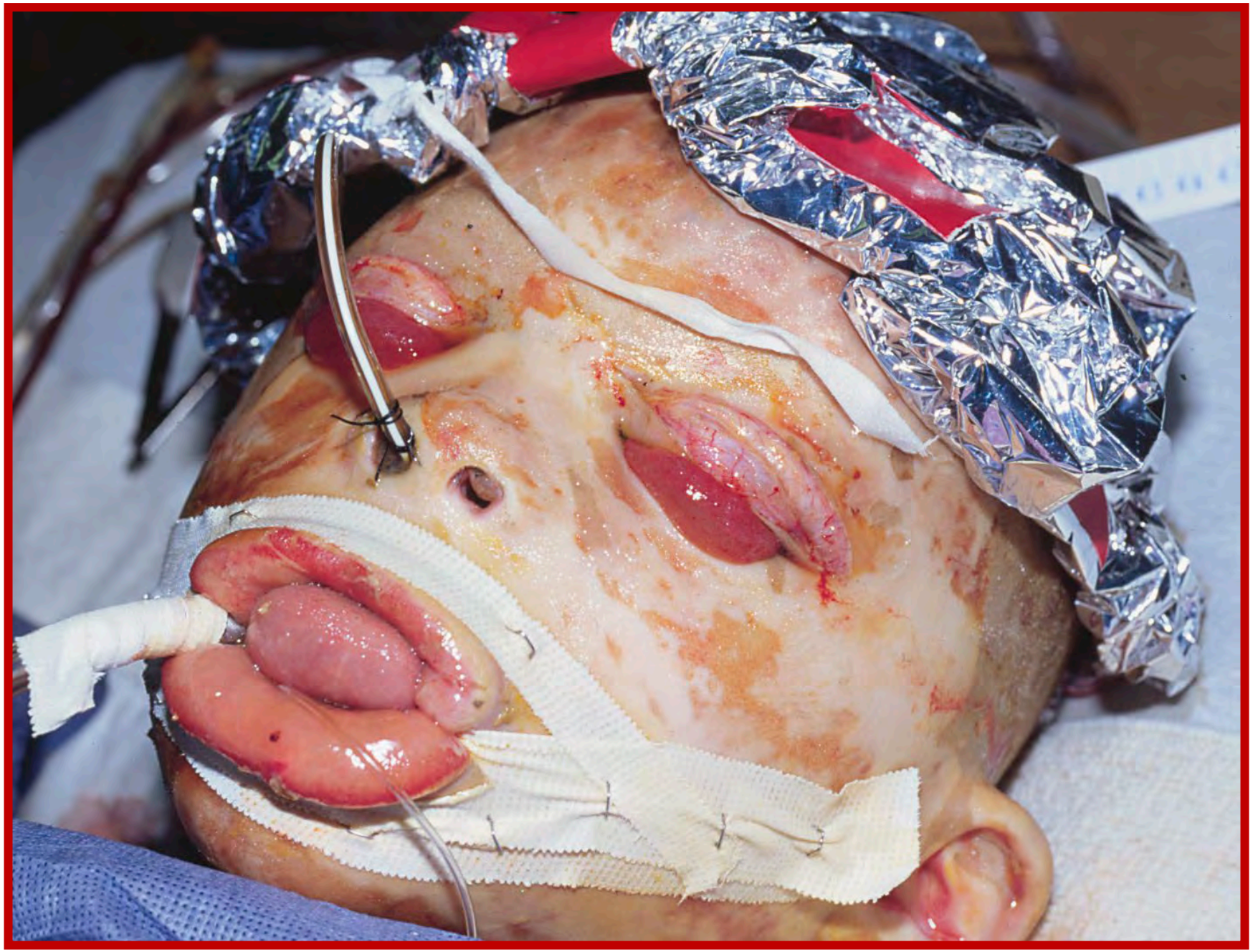


Burn Shock & Edema

- Burn damage causes **increased capillary permeability.**

- This increase in capillary permeability and the accompanying **inflammatory process** causes leakage into the interstitial space = **edema**

- Small burns have localized edema – like a blister - but burns >20% will result in systemic edema including areas not burned.



Escharotomy

- Incision made into the eschar to relieve pressure on compartment.
- Chest escharotomies allow for easier ventilation of pt. Can be life saving.
- Lateral incision mid-axillary line.
- Across chest and abdomen if involved.

Tools to calculate burn size

Total Body Surface Area

TBSA

Shriners Hospitals for Children®

CINCINNATI

Burn Estimate and Diagram Form

866-947-7840
24 Hours a day

Name

Age

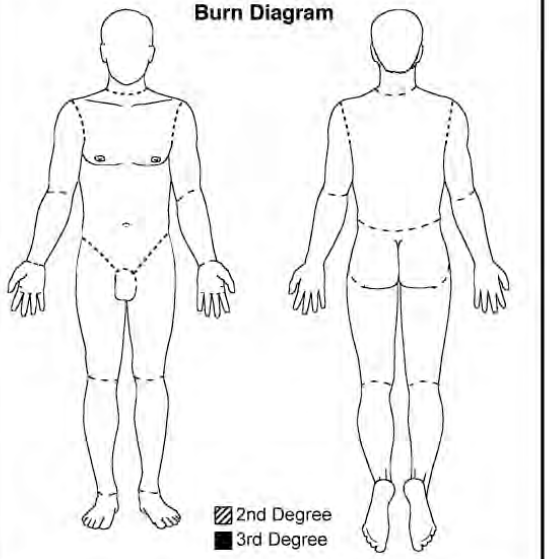
Date of Burn | Time of Burn

Height (cm) | Weight (kg)

CAUSE OF BURN:

- ☐ Chemical
- ☐ Contact
- ☐ Electrical
- ☐ Flame
- ☐ Questionable Circumstances
- ☐ Inhalation Injury
- ☐ Scald
- ☐ Other: _____

INITIAL Burn Diagram



Area	Birth 1 yr.	1-4 yrs.	5-9 yrs.	10-14 yrs.	15 yrs.	Adult	Initial TBSA 2°	Initial TBSA 3°
Head	19	17	13	11	9	7		
Neck	2	2	2	2	2	2		
Ant. Trunk	13	13	13	13	13	13		
Post. Trunk	13	13	13	13	13	13		
R. Buttock	2.5	2.5	2.5	2.5	2.5	2.5		
L. Buttock	2.5	2.5	2.5	2.5	2.5	2.5		
Genitalia	1	1	1	1	1	1		
R.U. Arm	4	4	4	4	4	4		
L.U. Arm	4	4	4	4	4	4		
R.L. Arm	3	3	3	3	3	3		
L.L. Arm	3	3	3	3	3	3		
R. Hand	2.5	2.5	2.5	2.5	2.5	2.5		
L. Hand	2.5	2.5	2.5	2.5	2.5	2.5		
R. Thigh	5.5	6.5	8	8.5	9	9.5		
L. Thigh	5.5	6.5	8	8.5	9	9.5		
R. Leg	5	5	5.5	6	6.5	7		
L. Leg	5	5	5.5	6	6.5	7		
R. Foot	3.5	3.5	3.5	3.5	3.5	3.5		
L. Foot	3.5	3.5	3.5	3.5	3.5	3.5		
						Total:		

Resuscitation Guidelines

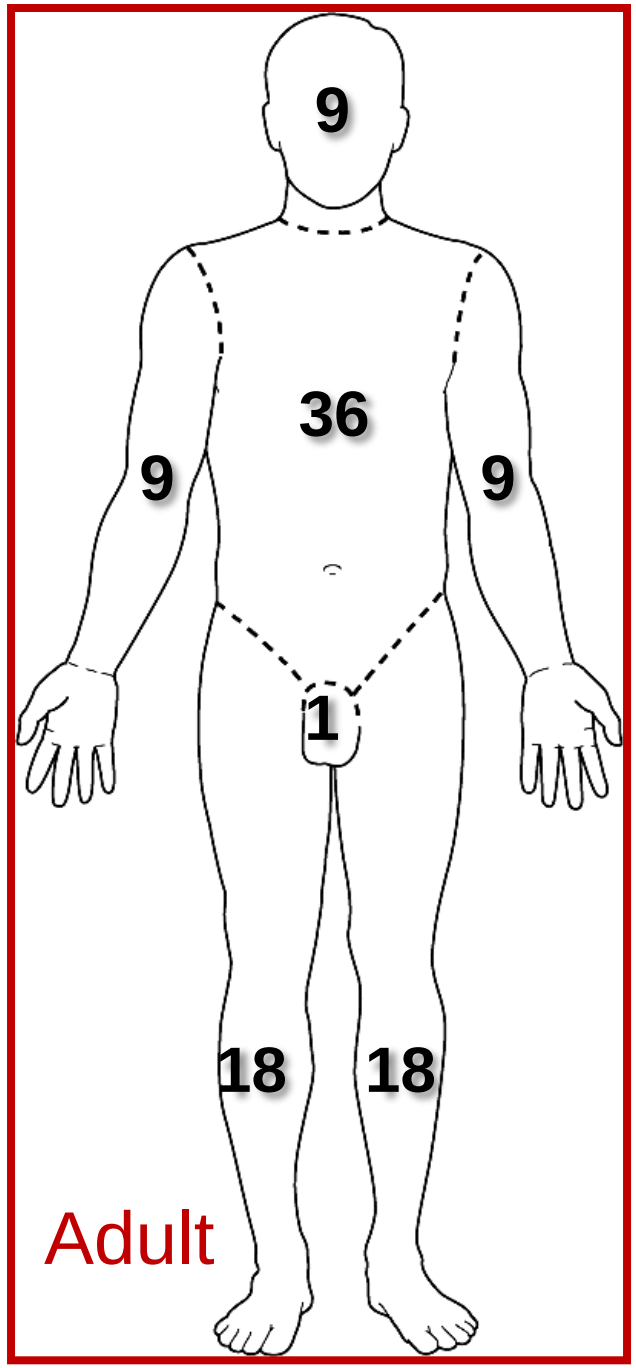
- 3 ml x % TBSA burn _____ x kg _____ = _____ ml / 24 hrs
- 1/2 of total over 1st 8 hours

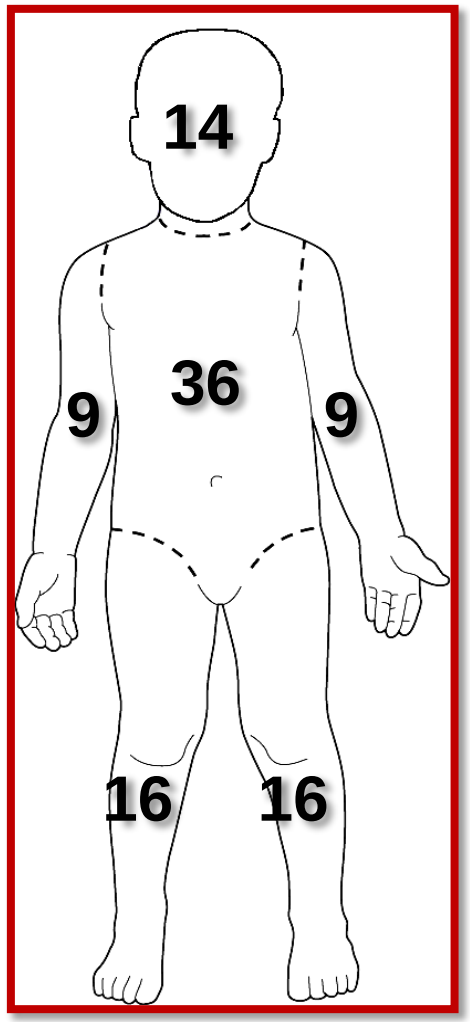
(Repeated Bolus Therapy **NOT** Recommended)

SHC-C_Mktg
Burn Est & Diag.10/16

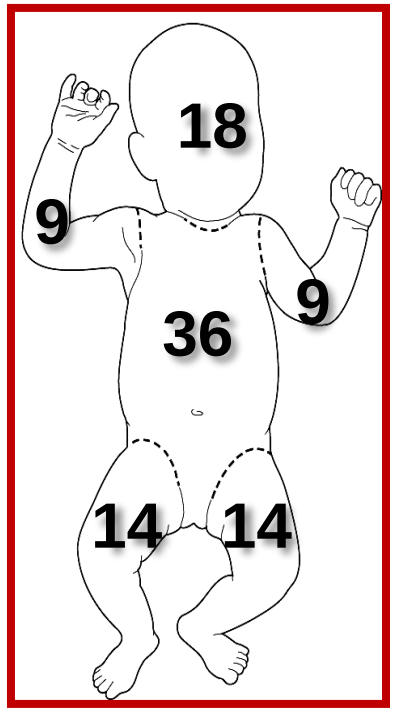
Rule of “Nines”

Modified for Age



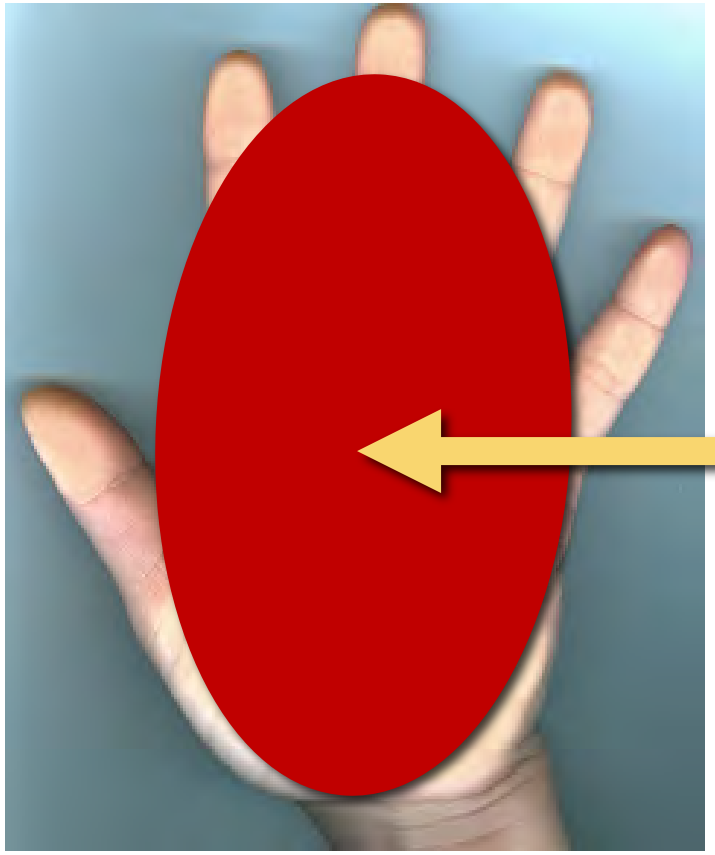


5 years



1 year

Estimation of Small Burns



Palmar Method

Patient's palm including fingers is equal to 1% of their Total Body Surface Area (TBSA)

Indications for Fluid Resuscitation

- TBSA > 20% adults
- TBSA > 20% Children
- Age >65 y/o or < 2 y/o any size burn

Fluid Replacement

- Large Bore IV
- Crystalloid Solution
  - Lactated Ringers
- Begin as soon as possible

Fluid Resuscitation Formulas

- Pre hospital formulas
  - Disaster fluid management
  - Initial fluid management
- TBSA based formulas
  - Parkland formula
  - Modified Brooke formula
  - Pediatric formula

Disaster fluid management

(intended for adults 40kg to 80kg)

- Estimate TBSA to closest 10%
- % TBSA X 10 = ml per hour
- For every 10kg over 80kg add 100ml/hr
  - Example
    - 50% TBSA X 10 = 500 ml/hr
      - Estimated weight 90kg
    - 500ml + 100 ml = 600ml/hr

Initial fluid management

- Initial fluid formula
  - < 5 y/o 125ml/hr of LR
  - 6-14 y/o 250ml/hr of LR
  - > 15 y/o 500ml/hr of LR

TBSA based formulas

- Parkland formula
  - 4ml X kg X % TBSA
- Modified Brooke formula
  - 2ml X kg X % TBSA
- Pediatric formula
  - 3 ml X kg X % TBSA

Pediatric Formula

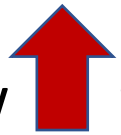
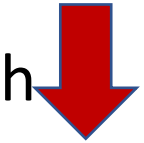
- 3ml x 20kg x 90% = 5400ml/24 hours
  - Half the amount in first 8 hours

- 1st 8 hours 2700 = 338ml/hr

- 2nd 8 hours 1350 = 169ml/hr

- 3rd 8 hours 1350ml = 169ml/hr

Adjust fluids based on UOP

- Adults
  - 30ml to 50ml per hour
- Pediatric
  - .5ml to 1ml/kg/hr
    - UOP too low  fluids by 10%
    - UOP too high  fluids by 10%
  - Stay away from Boluses

Types of Burns

- Contact
- Scalds
- Flame
- Chemical
- Electrical

Scald Injuries

- Time of contact and water temperature to cause a burn

  - 120°F - 5 minutes
  - 130°F - 30 seconds
  - 140°F - degrees - 5 seconds
  - 160°F - degrees - instantaneous

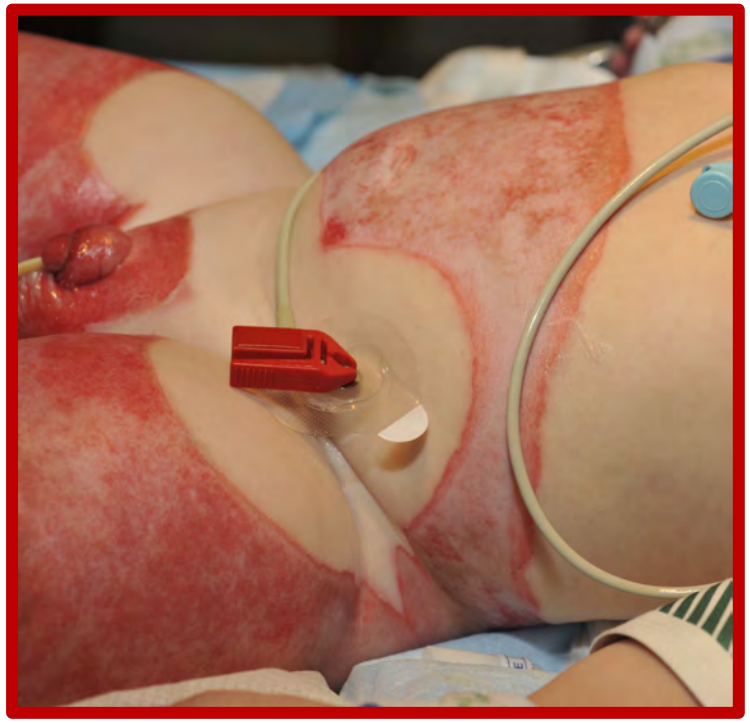
- Young children and older adult may burn deeper and faster because their skin is often very thin.

Non-accidental Scald Burns

“Classic Dip”

- No splash marks
- Clear demarcation
- No or inconsistent story

Clear demarcation



Sparing of flexion creases

Flash and Flame Injuries

- Flash burns
  - Intense heat for a short period
  - Clothing protective unless ignited
  - Generally not full thickness

- Flame burns
  - Deep dermal or full thickness
  - Proportional to time of contact

Post burn day 1

Post burn day 7

Chemical Burns

- Alkalis pH>7
  - Examples: found in oven, drain, toilet bowl cleaners and industrial wax striping agents.
    - Combine with cutaneous lipids to create “soup” dissolving tissue.
- Acids pH <7
  - Examples: muriatic acid, rust removers, masonry and brick cleaners.
    - Damage by coagulation necrosis. Usually self limiting by creating impermeable barrier.

Acid burn

Alkalis

Electrical Injuries

- Length of ECG monitoring
  - Documented dysrhythmia
  - Loss of consciousness
- Myoglobinuria
  - Indication of muscle damage
  - Titrate fluid to maintain UOP double the required
- Compartment syndrome
  - Caused by cellular anoxia
  - Loss of pulses is the last sign
- Fluid resuscitation

Electrical Injuries


stryker

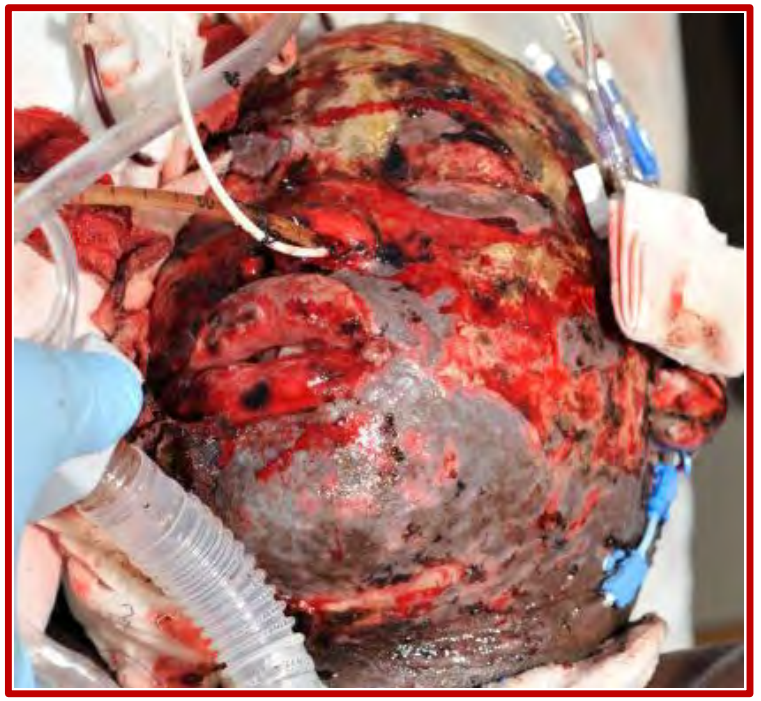
Other Conditions

- Frostbite
- Dog bite
- Friction burns
- Road rash
- EB/SJS/TENS

Frostbite

Friction

Dog bite



Superficial

1st degree

- Involves epidermis
- Reddened, painful,
- No blisters
- Heals within 3-10 Days
- No scarring
- Care
  - Lotion for comfort

Partial Thickness

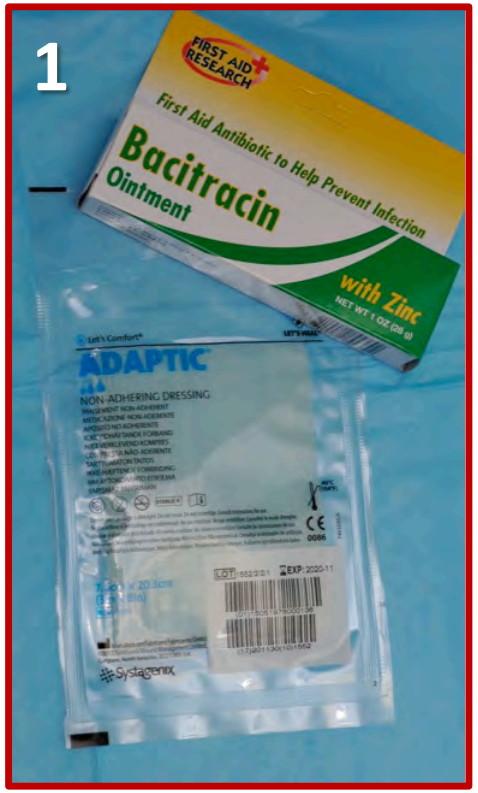
2nd degree

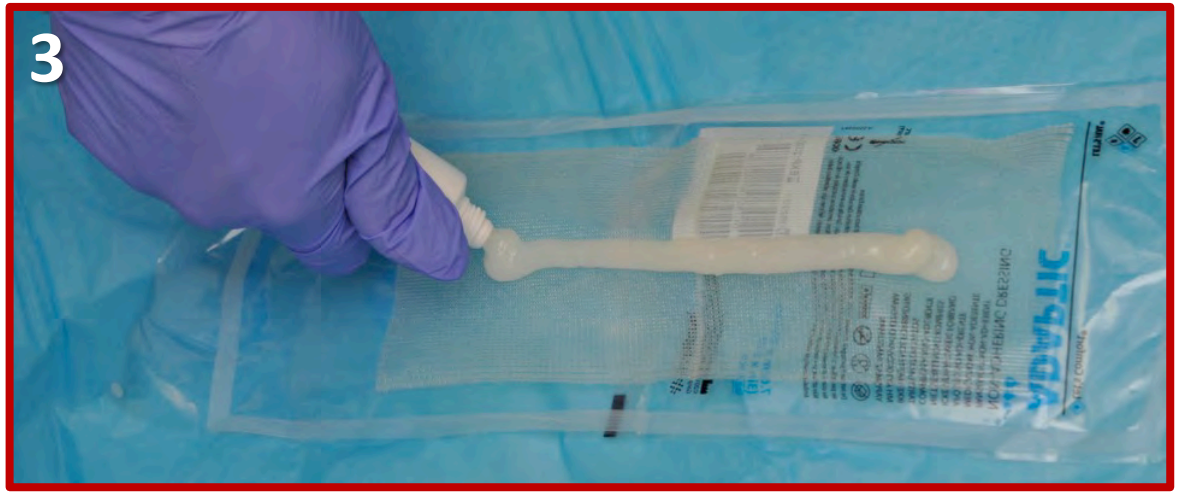
- Involves epidermis/part of dermis
- Painful, red, blisters
- Most often heals within 14 days

Post burn day 2

Post burn day 10

Dressing Preparation





Dressing Application

Post burn day 2

Post burn day 14

Full Thickness

- 3rd degree
  - Epidermis/Dermis
  - No pain/blanching
  - Whitish/leathery/red
  - Will not heal

Escharotomy

- Vascular impairment from circumferential burns
- Laterally & Medially
- Across involved Joints

Burn day 1

Burn day 10

Burn day 20

Treatment

Sheet Autograft

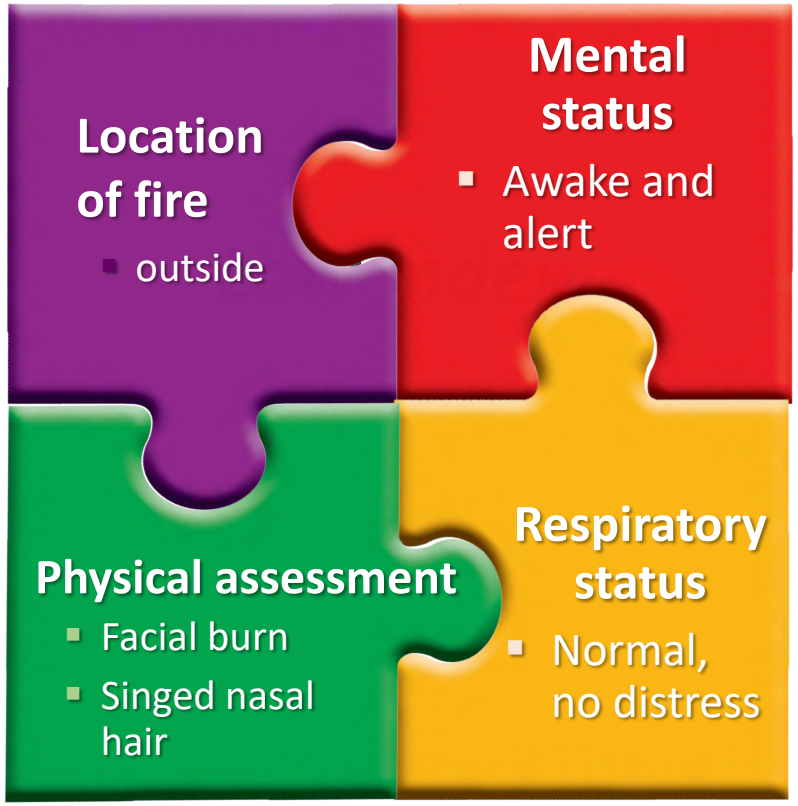
- Advantages:
  - more durable than mesh grafts
  - more cosmetic
  - contracts less than mesh grafts
- Disadvantages:
  - Bacteria/fluid may collect under the graft causing graft loss.

CASE STUDIES AND REVIEW

Case study

- 12 year old male threw an aerosol can in a trash fire. When first responders arrive the child is sitting in the back yard awake and alert.

Index of suspicion…



- What is the best way to calculate TBSA?

  Palmar method

- What is his TBSA?

  5% TBSA

- Initial dressing applied?

  Dry dressing

- Does he require fluid resuscitation?

  No

- What type of pain control?

  IV/oral/nasal opioid

Case study

- 15 year old male involved in a house fire in January. When crews arrive he has been rescued from the house and he is lying in the neighbors' yard.
- He is being sprayed with a hose.
- All clothes have burned off except his underwear.
- Appears to be covered in eschar.

Priorities

- Patient is obtunded; what type of airway management?
  - Immediate intubation
  - Bagged with 100% O2
- The child is on the grass being cooled with water from a hose. What should be done?
  - Remove all clothing
  - Cover with dry sheets/blankets
    - Keep covered as much as possible
    - Warm fluids
    - Increase temperature of squad

Priorities

- Due to extensive eschar what type of IV access?
  - Intraosseous
- What is the initial fluid formula for a 15 year old?
  - 500 ml/hr
- What fluid is preferred?
  - Lactated ringers
- Transport!

ED Admission

- Estimated 90 to100% TBSA, all full thickness
- Orally intubated 100% FiO2
- 2 intraosseous lines infusing at 500 ml/hr
- Vital signs
  - HR 88
  - BP 80/34
  - Temp 33.6°C (92.6°F)

Priorities

- Measures to increase patients temperature
  - Keep covered at all times
  - Increase ambient air temperature
  - Provide warm IV fluids
- Continue to provide 100% oxygen
- Resuscitate using TBSA formula
  - 2ml X 60kg X 90% TBSA = 10,800 ml in 24 hours
  - 5,400 ml first 8 hours = 675ml/hr
- Insert urinary catheter
  - Urine output 30ml to 60ml an hour

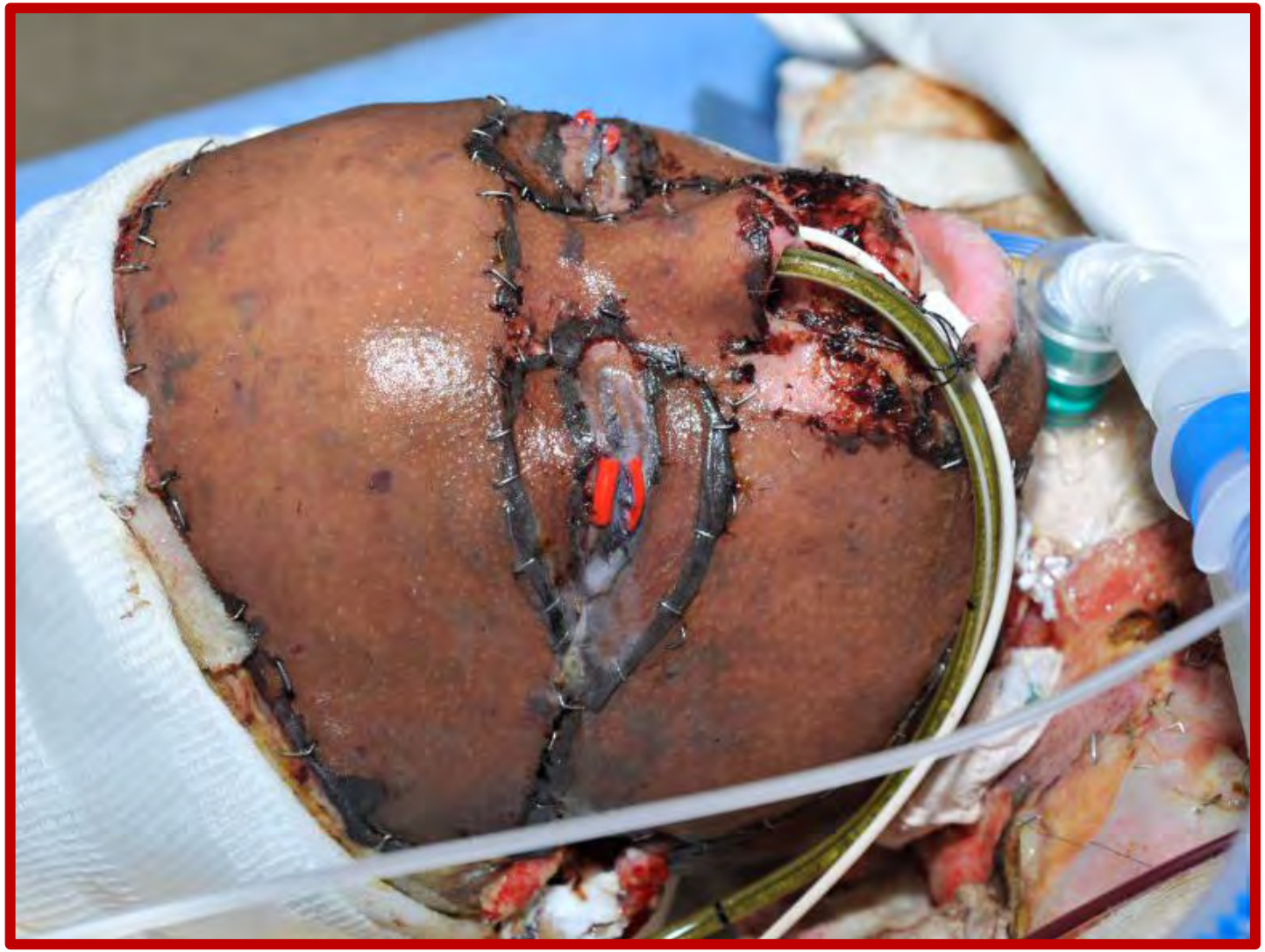
6 hours post burn

- Vital signs
  - HR 110
  - BP 100/60
  - Temp 35.8 C (96.5 F)
    - Keep covered at all times
    - Continue warm IV fluids
- UOP 10ml
  - Increase fluids by 10%
    - IV fluid rate now at 800 ml/hr

Post burn day 3

- IV fluid rate 300ml/hr
- Levophed 0.5mcg/kg/min
- Trophic tube feedings at 5ml/hr
- Due to the severity of the burn, a tracheostomy was performed.
- Excision and autograft to hands and face.
- Excision and allograft to bilateral arms.

Post burn day 8



Post burn 4 months

Post burn 6 months

Post burn 3 years

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We have an APP!

Download and get direct access to our evidence-based pediatric burn care through the "Our Services" app.

Our Services

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2 DOWNLOAD "OUR SERVICES" APP

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Burn and Emergency Services **866-947-7840**

Plastic Surgery Services **855-206-2096**

or visit: **shrinersohio.org**

Within the App…