

Burnett Burn Center (BH52)

The University of Kansas Health System



JUST IN TIME: BURN BOOK

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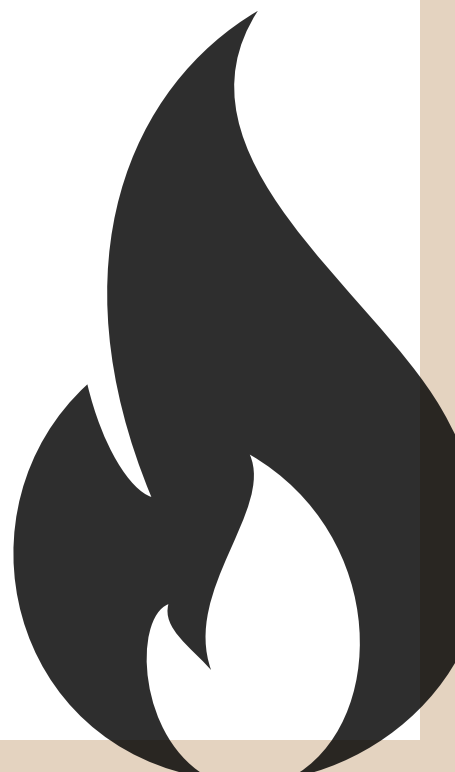
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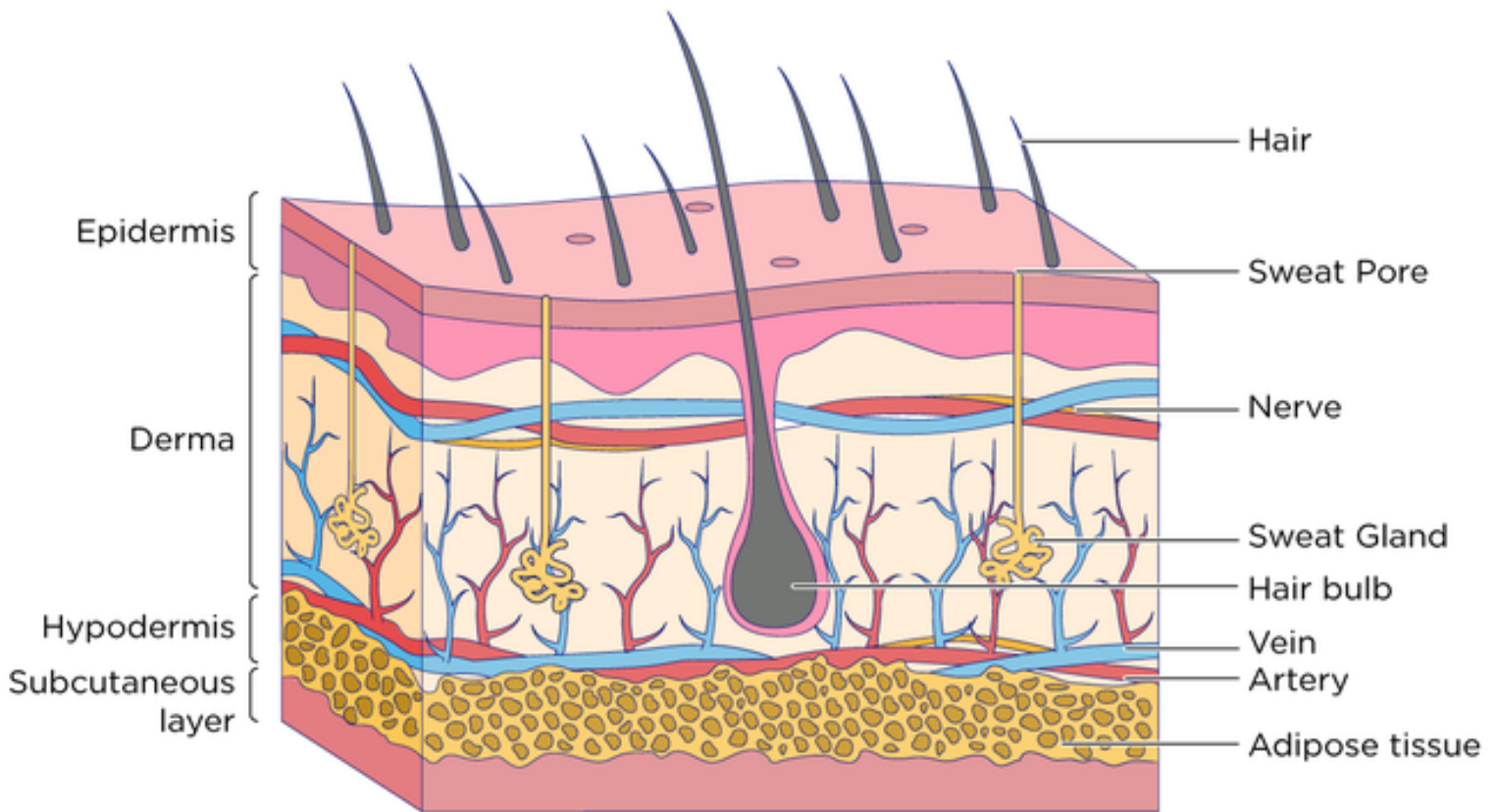
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SKIN ANATOMY



O1. EPIDERMIS

- Outermost layer; thin in comparison to other layers
- Thickness depends on age and body location (eyelids=thinnest; palms and soles of feet=thickest)

O2. DERMIS

- Middle layer; relatively thick
- Contains skin appendages (hair follicles, sweat glands, nerves, blood vessels)

O3. SUBCUTANEOUS

- Deepest layer
- Consists of fat, connective tissue, and large blood vessels

Knowing the layers will help you better understand burn depths !

Fun Fact: A quarter size piece of skin contains 1 yard blood vessels, 4 yards nerves, 25 nerve endings, 100 sweat glands, 3 million cells

SKIN PHYSIOLOGY

- Protective barrier against:
 - infection
 - physical, thermal, and chemical injury
- Sensory organ for:
 - touch (light vs. deep)
 - temperature (hot vs. cold)
 - pain
- Temperature regulation via:
 - sweat glands
 - blood vessels
- Aesthetic containment
- Vitamin D production
- Prevents moisture loss



BURN CLASSIFICATION & SEVERITY

CLASSIFICATION

- **Flame**
- **Scald**
 - Hot liquid (grease, water, etc.)
- **Flash**
 - Usually due to explosion
- **Chemical**
 - Alkali vs. acidic
- **Contact**
 - Touching a hot object
- **Electrical**
 - Low vs. high voltage

SEVERITY

- **Extent of Injury**
 - Total Burn Surface Area % (TBSA)
 - Rule of Nines
 - Palmar Method
 - Lund and Browder Chart
- **Wound Depth**
 - Superficial
 - Superficial-partial
 - Deep partial
 - Full
 - Deep full

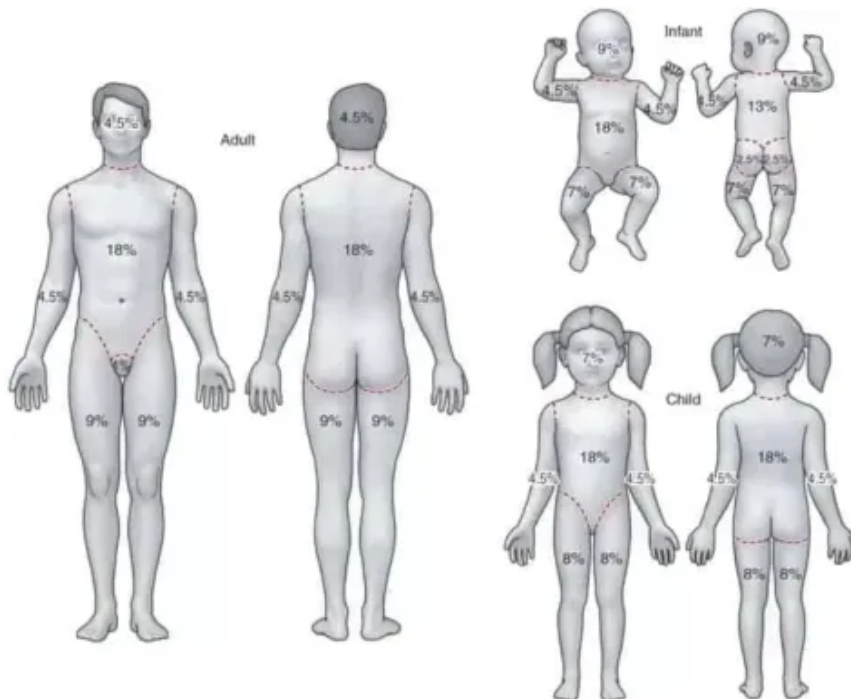


DETERMINED BY: TEMPERATURE OF SOURCE, LENGTH OF EXPOSURE, DERMAL THICKNESS, PATIENT AGE, BLOOD SUPPLY

EXTENT OF INJURY

(AKA TOTAL BURN SURFACE AREA)

RULE OF NINES



Each area of the body is divided into multiples of 9%.
Quick, easy way to estimate TBSA%

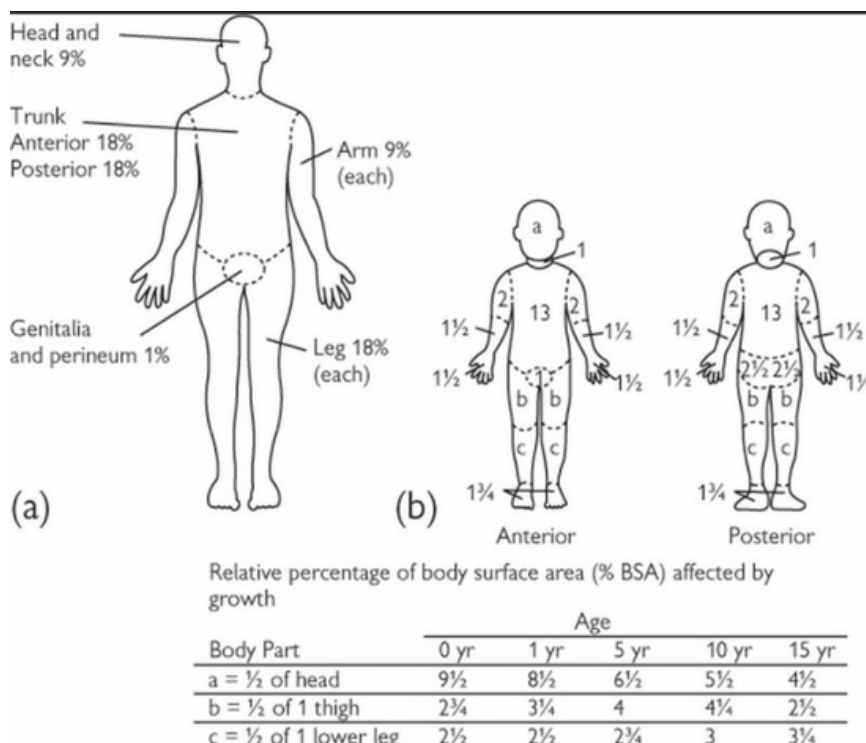
PALMAR METHOD



Palmar, palm + fingers
of patient = 1%

Great for patchy burns or subtracting
unburned areas from large burned
areas

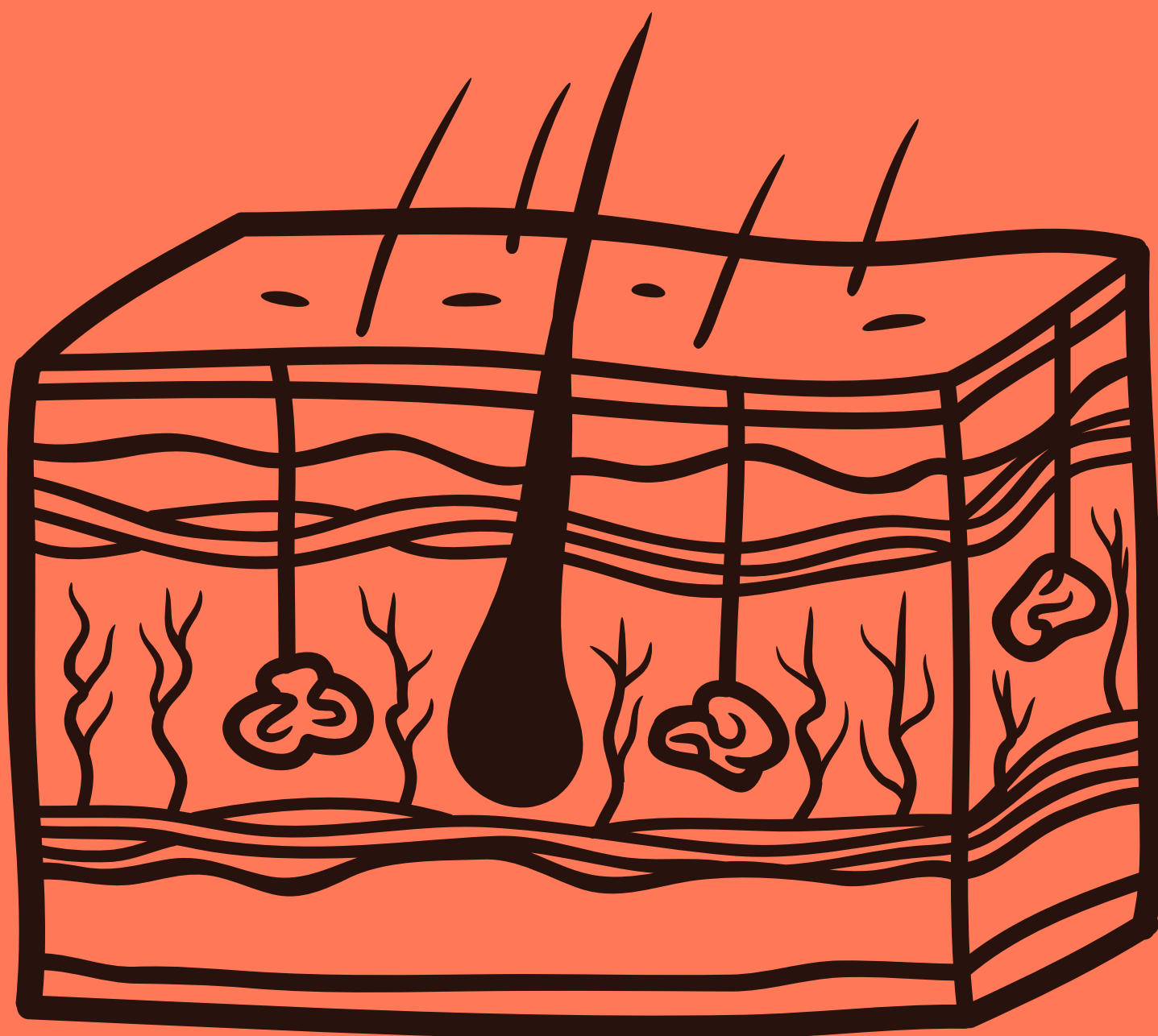
LUND AND BROWDER CHART



Allows for more exact percentage
calculation in children. Providers
complete a Lund and Browder
Chart for every burn patient

Fact: 1% TBSA = 1 day in the hospital; so a 50% TBSA patient will spend roughly 50 days on the burn unit

WOUND DEPTHS



SUPERFICIAL THICKNESS

(AKA FIRST DEGREE)

NOT included in TBSA%

- Epidermis ONLY
- Dry (NO blisters)
- Red
- Capillary refill present
- Painful
- 5 to 7 days to heal



A sunburn is a great example of a 1st degree burn



SUPERFICIAL PARTIAL THICKNESS

(AKA SECOND DEGREE)

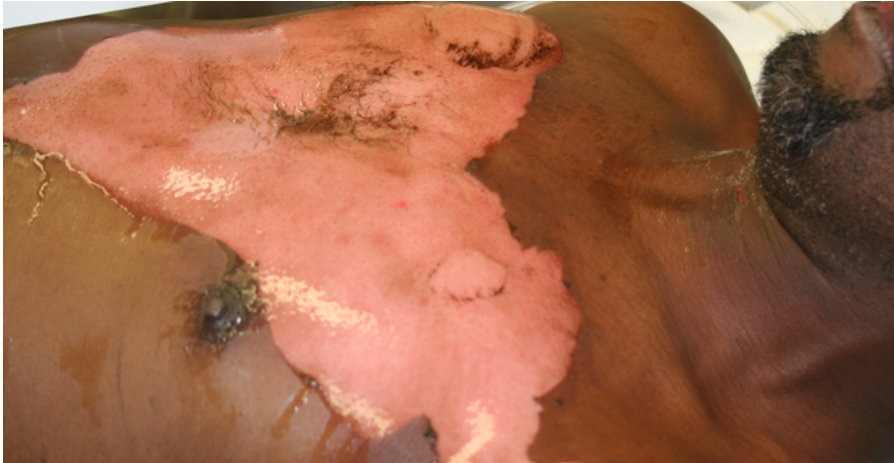
- Epidermis AND upper 1/3 of dermis
- Blistered, wet, weepy
- Red
- Capillary refill present
- Painful
- 7-14 days to heal



DEEP PARTIAL THICKNESS

(AKA SECOND DEGREE)

- Epidermis AND bottom $\frac{2}{3}$ of dermis
- Blisters may be present
- Red to pale pink
- Slow capillary refill
- Decreased sensation
- >21 days to heal
- Prone to scarring
- Poor blood supply = potential conversion to full thickness



Look for skin buds and bleeding to see if a 2nd degree wound is healing

FULL THICKNESS

(AKA THIRD DEGREE)

- Epidermis and ALL of dermis
- Leathery, dry, and firm
- Colors vary, but typically white/tan
- Capillary refill absent
- May see thrombosed vessels
- No sensation to immediate area (nerve endings gone)
- Requires grafting if larger than quarter-size



DEEP FULL THICKNESS

(AKA FOURTH DEGREE)

- Extends to subcutaneous tissue (fat, muscle, connective)
- Leathery, dry
- Black, charred
- Cap refill absent
- No sensation to immediate area
- Requires extensive plastic or orthopedic surgery (i.e. flap coverage or amputation)



High voltage electrical injury that contracted and required amputation at the wrist





**TRIAGE
&
DECON**

TRIAGE

- If facility is overwhelmed, or in a burn mass casualty event, utilize the below triage categorizations for burn patients.
 - When burn is the only obvious injury
 - Taking into consideration inhalation injury

Category	Signs
Green Patients	<10% TBSA 2nd/3rd degree No inhalation injury Normotensive GCS >14
Yellow Patients	10–20% TBSA 2nd/3rd degree Suspected inhalation injury or possible intubation required Normotensive GCS >14
Red Patients	>20% TBSA 2nd/3rd degree Burns with trauma and/or airway compromise

Age, in years	Percent TBSA burn size									
	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	≥ 90
0-1.9										
2-4										
5-19	Outpatient			Delayed			Immediate			
20-29										
30-39										
40-49										
50-59										
60-69					Low survival, may opt for expectant management					
≥ 70										

TRIAGE

Consider--

- Direct exposure to ionizing radiation may change above triage category.
- Concomitant injuries from effect of the blast—
 - Follow ATLS guidelines

DECONTAMINATION

- Ensure staff don appropriate PPE.
- Follow hospital policy and procedure for decontamination process.

FACE AND EYES

- Clean face with soap and water.
- Irrigate eyes with saline or water to minimize tissue damage.
 - Eyelids must be forced open to allow flushing of the eye.
 - May utilize Morgan lens--ensuring extreme caution with placement.
 - Remove contact lenses and **discard**.

ASPHALT/TAR

- Not a chemical burn, but a contact thermal burn.
- Asphalt/tar itself is not toxic, but can result in deep burns.
- Priority is emergent cooling of the tar, NOT removal!
- Removal of tar is done with petroleum-based ointment.
 - Will be completed in burn center.

DECONTAMINATION

CHEMICAL AGENTS

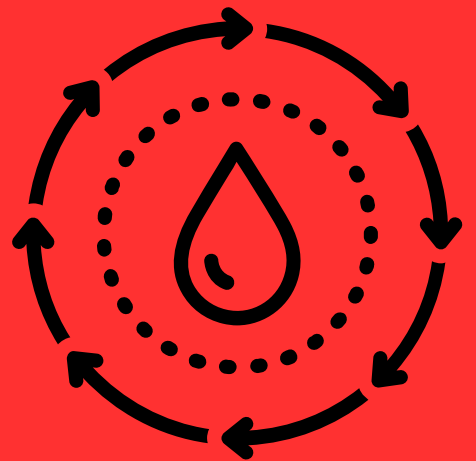
- Wet the patient to prevent re-aerosolizing and remove clothing in a head-to-toe and front-to-back manner--remove all jewelry.
- Place belongings in a sealable plastic container.
- Wash with copious amounts of soap and water.
- Skin pH goal= 5.5

RADIATION EXPOSURE

- Determined by a radiation meter or Geiger-Mueller meter.
- Three forms of radiation exposure:
 - External irradiation → transient exposure to radiation with no physical contact with radionuclides
 - Injury only present in proximity of source
 - No decontamination needed
 - Patient is no risk to others
 - Internal contamination → inhalation, ingestion, or transdermal absorption
 - Rapid decontamination of open wounds needed to decrease systemic absorption
 - Maintain proper PPE during care. For ex) pulmonary secretions may be contaminated
 - External contamination → results from the presence of radionuclides on exposed skin or clothing
 - Requires immediate decon! Continued hazard to patient and those in contact with them until decon is complete
- Decontaminate with soap and water! Goal is to dilute and neutralize particles without spreading them--patient should never be submerged.
- Can utilize a soft brush or surgical sponge to clean intact skin.
- Soap and water is first line for cleaning--iodine wash is second line .

Runoff water from radiation decon must be collected appropriately--notify facilities and EHS after decon completed for appropriate treatment and disposal!

BACK TO THE BASICS: A, B, C



A: AIRWAY

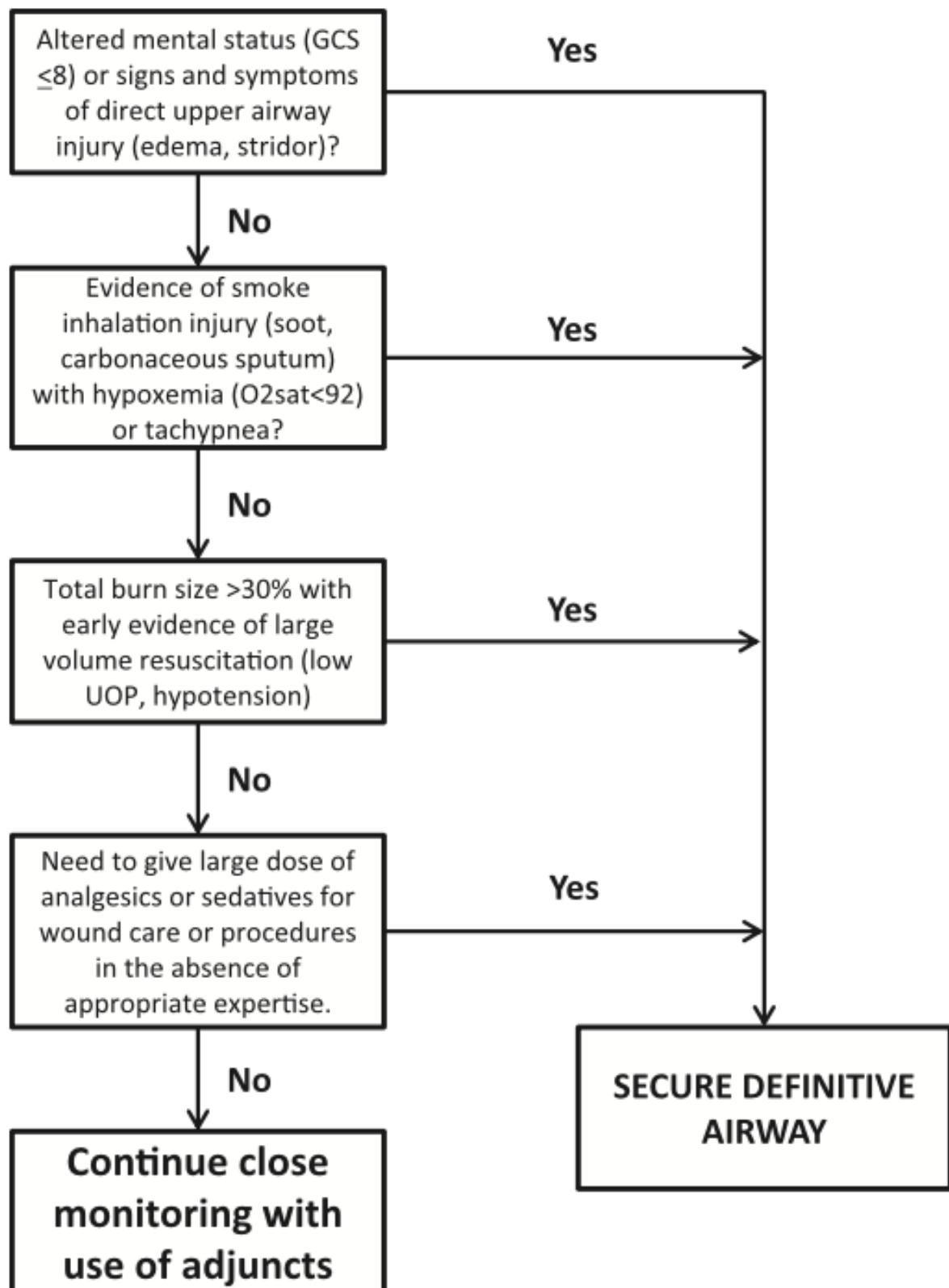


Figure 2. Proposed decision matrix for airway management during burn disasters.

A: AIRWAY

Burn considerations:

- Patients in enclosed spaces are at highest risk of needing airway management.
- Swelling is progressive.
- Supraglottic edema may occur without direct thermal injury to the airway--secondary to fluid shifts.
- Be aware of hoarseness or stridor.
- Tape should not be used on burned faces.
- Frequent suctioning may be required.

B: BREATHING

- Symptoms may progress for 72 hours after injury!
- Inhalation injury is not an indication for “prophylactic” intubation!
 - Closely monitor patient and treat with humidified oxygen.
- Singed nasal/facial hair alone do not necessarily warrant intubation.

C: CIRCULATION

- Burn size determines resuscitation needs!
- Superficial (first-degree) burn injury is NOT counted in TBSA.
- Goals of resuscitation:
 - Maintaining organ tissue perfusion and organ function.
 - Decreasing complications of inadequate or excessive fluid therapy.
 - Utilize the rule of 9's or palmar method to determine TBSA.

FLUID RESUSCITATION

- Burns <10% do not typically require fluid resuscitation.
- Burns <20% can effectively be resuscitated from burn shock orally.
 - Many patients up to 40% can be safely resuscitated in this manner.
 - Orally rehydrate with water, glucose, and electrolytes.
 - Goal = 8-10oz every 10-15 minutes.
- Burns >20% require IV fluid resuscitation--use the Parkland formula when possible.
- Monitor hourly urine output and titrate fluids accordingly.
 - Adults/Teenagers = 0.5mL/kg/hr (30-50ml/hr)
 - w/electrical injury = 75-100ml/hr until urine clears
 - Children 12 years or under = 1ml/kg/hr (30ml/hr until 30kg)
- Endpoints of resuscitation:
 - Vital signs
 - Level of consciousness
 - Hematocrit
 - Lactate
 - Base deficit

FLUID RESUSCITATION: ADULTS

For chemical and thermal burns:

$$\text{Total Fluid (mL)} = 2\text{mL} \times \text{Weight (kg)} \times \text{TBSA \%}$$

½ to be administered during the first 8 hours post-injury

½ to be administered during the following 16 hours

For electrical burns:

$$\text{Total Fluid (mL)} = 4\text{mL} \times \text{Weight (kg)} \times \text{TBSA \%}$$

½ to be administered during the first 8 hours post-injury

½ to be administered during the following 16 hours

Fluid of choice = LR

FLUID RESUSCITATION: PEDS

Patients 12 years and under:

$$\text{Total Fluid (mL)} = 3\text{mL} \times \text{Weight (kg)} \times \text{TBSA \%}$$

½ to be administered during the first 8 hours post-injury

½ to be administered during the following 16 hours

For electrical burns:

$$\text{Total Fluid (mL)} = 4\text{mL} \times \text{Weight (kg)} \times \text{TBSA \%}$$

½ to be administered during the first 8 hours post-injury

½ to be administered during the following 16 hours

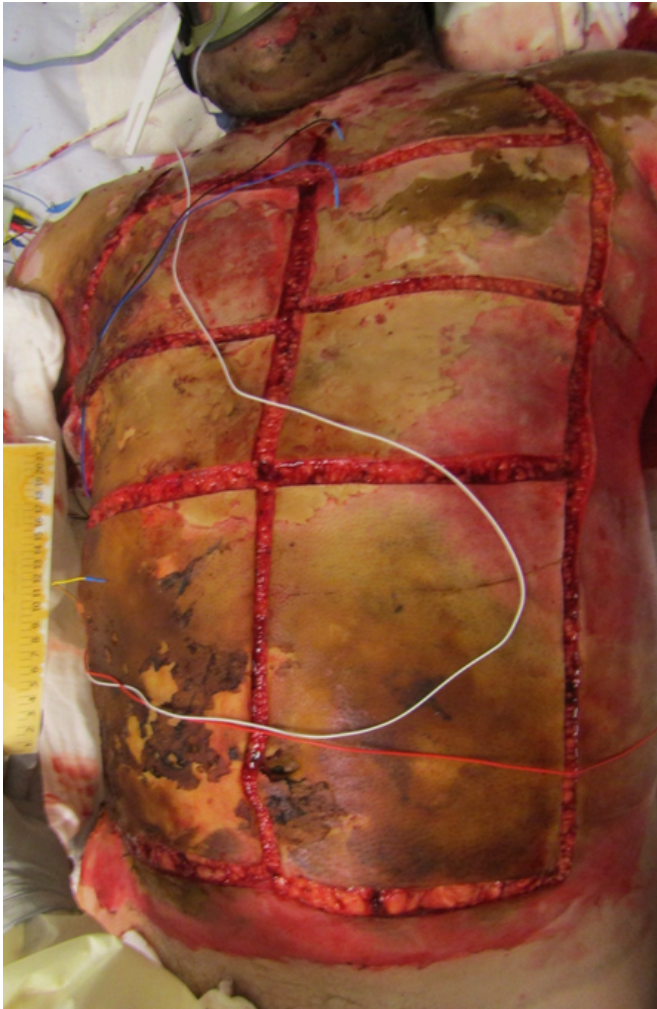
Fluid of choice = LR + Maintenance fluids = D5LR



**BURN
RELATED
TREATMENTS
&
PROCEDURES**

ESCHAROTOMIES

- Procedure done on full thickness , circumferential burns
- Electrocautery tool used to cut through eschar layer
- On extremities = improved perfusion to distal areas
- On chest wall = improved ventilation
- On abdomen = improved perfusion to abdominal organs
- On neck = decreased swelling around airway



DRESSINGS

101



KEEP IT SIMPLE

- 01. CONTACT LAYER OR SILVER DRESSING**
- 02. ABSORBENT LAYER**
 - BURN GAUZE
 - PADS
- 03. COMPRESSION LAYER**
 - ROLLED GAUZE
 - ACE
 - STRETCHNET

CONTACT LAYERS

EMOLLIENT LOTION

- Should only be used on first degree burns
- Frequent thin application to dry/flaky areas
- Can help alleviate itching
- The massage motion helps improve sensitivity to touch and scar formation

XEROFORM (AKA “XERO”)

- Yellow, petroleum-based gauze
- Often used in combination with an ointment
- Can be used alone on donor sites; will start to peel away once underlying skin is healed

BACITRACIN (AKA “BACI”)

- Antimicrobial
- Approximately 1 oz. will cover 3% TBSA
- Change every 1-3 days; use with contact layer

!!! **Apply bacitracin directly to xeroform. Should be prepared and applied as sterile as possible.**

SILVER DRESSINGS

THERABOND

- Silver absorbent foam
- Place “waffle” side to wound
- Used primarily for TENS/SJS
- Can be rinsed, rung out, and reapplied for up to 14 days

ACTICOAT

- Silver impregnated dressing
- Either side can be applied to wound
- Must be moist to release silver ions
- If wound bed is dry, moisten with sterile water prior to application; assess daily and rewet PRN
- Can remain in place for up to 7 days

MEPILEX AG

- Silver-impregnated absorbent foam
- Apply sticky side to wound
- Used over donor sites or exudative wounds
- Can stay in place for up to 7 days, unless overly saturated
- Check for oversaturation 24 hours after application and change as necessary

— All have antimicrobial properties; are available in various sizes; and are **VERY** costly (\$\$\$)

