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IMPROVEMENT  
PROGRAM



**JOSEPH M. STILL**  
BURN CENTERS, INC.

# Burn Care for Non-Burn Centers

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**Bounthavy Homsombath, MD, FACS**

*Medical Director, JMS Augusta*

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The presenter has no relevant financial relationships to disclose

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# Objectives



- Primary and secondary survey components
  - Calculating % TBSA
  - Resuscitation formulas
  - Burn center referral criteria
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# Initial Assessment and Management

- Prior to resuscitation, patients need to be stabilized
- **Overlook THE BURN!!!**



# Primary and Secondary Survey



## Primary survey

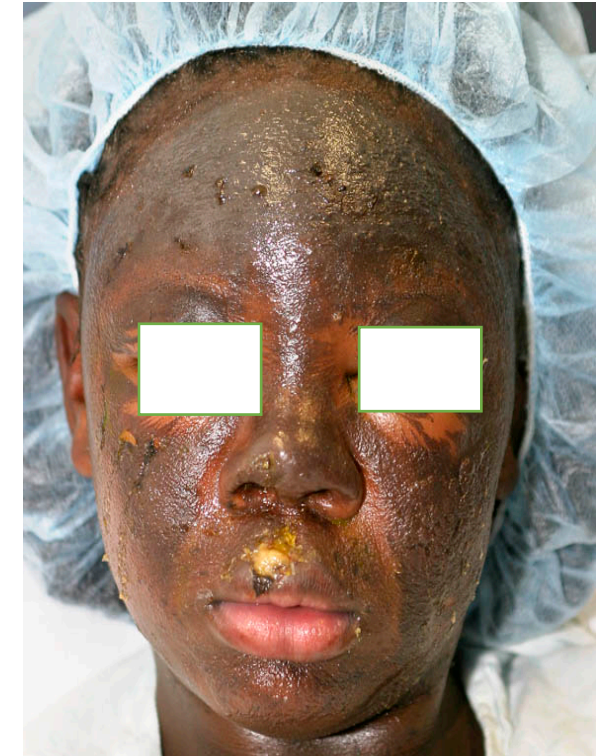
- A – Airway
- B – Breathing
- C – Circulation
- D – Disability
- E – Exposure

## Secondary survey

- History
- Complete head-to-toe physical exam
- Estimation of TBSA
- Labs

# Airway Assessment

- Assume traumatic injury
  - Maintain in-line cervical immobilization
- Airway control:
  - Chin lift/Jaw thrust
  - Insert oral pharyngeal airway
  - Assess need for ET intubation
    - Intubate early
    - Greatest fluid shifts first 8-12 hours





# Breathing & Ventilation

- Assess rate and depth of respiration
- Administer high flow oxygen using a non-rebreather system
- Monitor ventilation/chest wall excursion closely in patients with circumferential burns of the torso and neck



# Circulation

- Monitor
  - Skin
  - Vitals - BP, pulse rate
  - Evaluate for early signs of shock
- Establish IV access site
- Assess circulatory status of circumferentially burned extremities



PEDIATRIC BURNS AND SCALDS-MODERN THERAPEUTIC CONCEPTS, NF epeneu and Chiru Daniela Alina, 2015



# Circumferential Burns



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- Circumferential full-thickness (3<sup>rd</sup> degree) burn can impair circulation
- 5 P's (**P**ain, **P**allor, **P**ulselessness, **P**aresthesia and **P**aralysis) may be unreliable
- Monitor by physical exam, Doppler signals
- Evaluate for decompression

# Circulation and Cardiac Status



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- “Normal” heart rates for burn patients are in range of 100 – 120 bpm
- Tachycardia ( $> 120$ bpm)
  - Pain, anxiety, hypovolemia, inadequate oxygenation



Time to IV access and initiation of  
resuscitative fluids

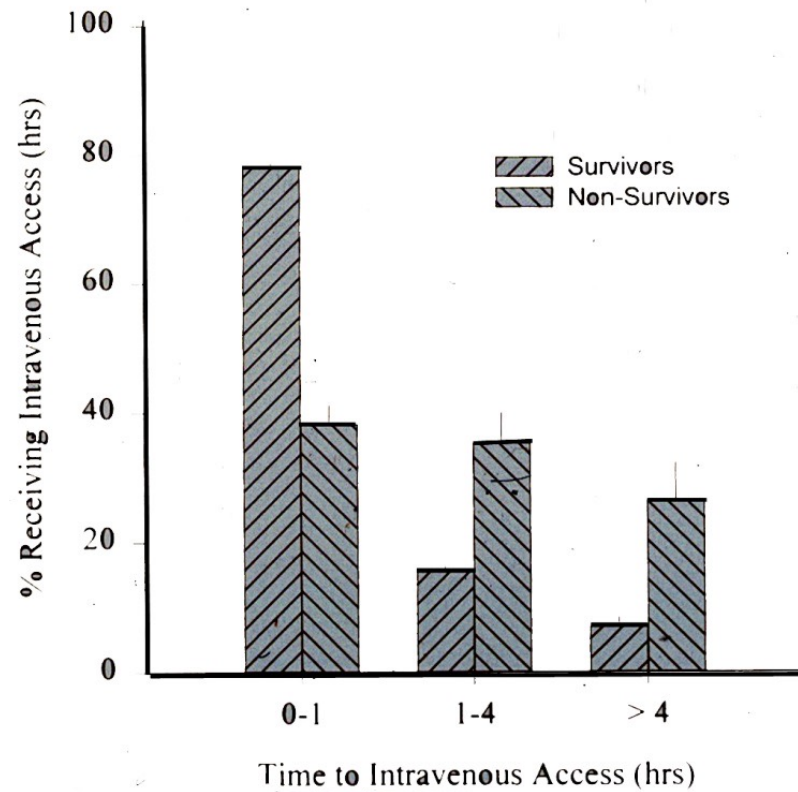
**Very Important**

# Circulation



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**Time to Intravenous Access:  
Survivors vs. Non-Survivors**



- Delays of resuscitation by 2 hours can significantly impact mortality

# Access and Initial Fluid Rates



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- Patients with  $\geq 20\%$  TBSA burns should receive 2 large bore, peripheral venous catheters
  
- Pre-hospital (initial) fluid rates
  - $\leq 5$  yrs.                      125ml LR/hour
  - 6-13 yrs.                        250ml LR/hour
  - $\geq 14$  yrs.                      500ml LR/hour

# Secondary survey



- Follows Primary Survey
- After resuscitation efforts are well established
- Complete head-to-toe evaluation
- Rule out additional trauma
- History & physical exam
  - Complication begin with poor H and P's
- Radiographic & laboratory studies



# Secondary survey



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- Obtain current weight
- Determine TBSA of burn
- Determine adjusted fluid rates
- Monitor fluid resuscitation

# Secondary survey



- Manage wound care
- Obtain basic admission labs and x-rays
- Manage pain and anxiety
- Provide psychological support

# Injury Circumstances



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Mechanism	Important history questions
Flame	Indoors or outdoors? Loss of consciousness? Clothes caught on fire?
Scald	Type and temperature of liquid?
Chemical	What agent? Duration of contact? Any contamination done?
Electrical	What voltage? Was there an associated fall? Loss of consciousness? Any CPR?
Concern for abuse/neglect	History consistent with injury pattern? Delay seeking care?

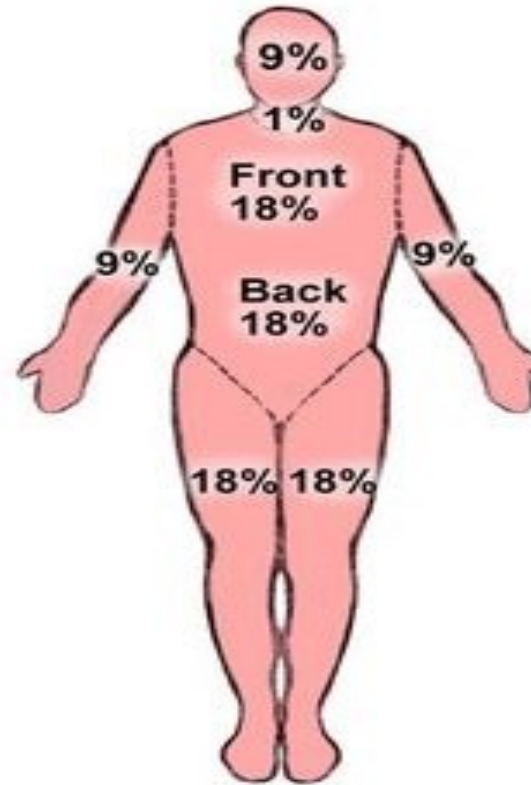
# Extent of Burn



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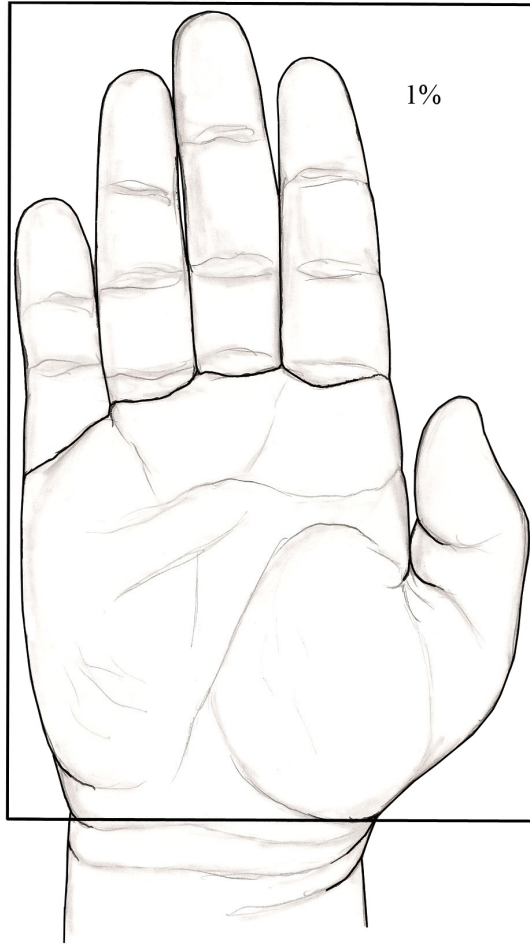
- Apply the Rule of Nines in 2nd and 3rd degree areas

Child body	% of total
Part	BSA
Arm	9%
Head and neck	18%
Leg	14%
Anterior trunk	18%
Posterior trunk	18%



Adult body	% of total
Part	BSA
Arm	9%
Head	9%
Neck	1%
Leg	18%
Anterior trunk	18%
Posterior trunk	18%

# Extent of Burn



Patient's palmar surface (hand + fingers)  
is 1% TBSA

# Factors in Burn Depth



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- Temperature
- Duration of contact
- Dermal thickness
- Blood supply

**Remember:** Very young and elderly have thinner skin



# Adjusted Fluid Rates

Category	Age and weight	Adjusted fluid rate
Flame or scald	Adults and older children ( $\geq 14$ years old)	<b>2</b> ml LR x kg x % TBSA
	Children ( $< 14$ years old)	<b>3</b> ml LR x kg x % TBSA
	Infants and young children ( $\leq 30$ kg)	<b>3</b> ml LR x kg x % TBSA Plus D <sub>5</sub> LR at maintenance rate
Electrical injury	All ages	<b>4</b> ml LR x kg x % TBSA

# Monitoring and Adjustments



- Monitor vital signs frequently
- Insert Foley catheter for burns  $\geq 20\%$  TBSA
- Adjust fluids hourly based on urine output
- Insert nasogastric tube for:
  - Intubated patients
  - Patients with associated trauma

# Additional Priorities



- Assess extremity perfusion
- Manage pain and anxiety
- Assess for psychological trauma

# Additional Studies (if indicated)



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Indication/concern	Study
Inhalation injury	ABG with Carboxyhemoglobin
Cardiac ischemia	EKG
Associated trauma	Type and screen (hemorrhage) Ultrasound, CT scans Extremity X-rays
Abuse/neglect	Skeletal survey x-rays

- Often associated with elevated carboxyhemoglobin levels
- Elevated cyanide levels found in many people found dead at the scene of the fire
- Cyanide levels  $>40$  mmol/L or 1 mg/L indicate toxicity
  - Results too delayed to be clinically useful in real time
- Lactate  $\square$  8 has a strong correlation with elevated cyanide levels
- Synergistic with CO

Baud FJ, Barriot P, Toffis V, et al. Elevated blood cyanide concentrations in victims of smoke inhalation. *NEJM*. 1991;34:1761-1766

Baud FJ. Cyanide: Critical issues in diagnosis. *Hum Exp Toxicol*. 2007;26:191-201

Baud FJ, Haidar MK, Jouffroy R, et al. Determinants of lactic acidosis in acute cyanide poisonings. *Crit Care Med*. 2018;46:e523-529

Culnan DM, Craft-Coffman B, Bitz GH, et al. Carbon monoxide and cyanide poisoning in the burned pregnant patient: An indication for hyperbaric oxygen therapy. *Ann Plast Surg*. 2018;80:S106-S112.

# Cyanide Symptoms



- General: weakness, lethargy, malaise, collapse
- Neuro: headache, dizziness, vertigo, anxiety, agitation, confusion, seizures, coma
- GI: abdominal pain, nausea, vomiting
- Cardiopulmonary: shortness of breath, chest pain, apnea
- Similar symptoms to CO

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# Cyanide Signs



- Variable vital signs including initial hypertension and bradycardia, reflex tachycardia, then hypotension
- Cherry red skin color, bright red retinal artery and veins
- Mydriasis
- Bitter almond smell on breath

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# Cyanide Treatment



- Cyanokit® (Meridian Medical)
  - Hydroxocobalamin combines with CN to form cyanocobalamin (Vit B12)
  - Cyanocobalamin this is renally excreted.
  - Note: Hydroxocobalamin
    - Not compatible with many ICU drugs
    - Needs a dedicated line to administer
    - May falsely alter laboratory values
    - Falsely elevates serum creatinine

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# Burns in Pregnancy



- Treat the mother as the primary patient—assess and resuscitate
- Depending upon severity/extent of burn, can become obstetric emergency
- May need early delivery, in consultation with obstetrics service

- Size of burns
  - $\geq 10\%$  TBSA partial thickness burns
  - Any 3rd degree burn
  
- Injury mechanisms that warrant specialized care
  - Electrical
  - Chemical
  - Inhalation



- Special locations involving functional and cosmetic components
  - Hands and feet
  - Face
  - Perineum/genitalia
  - Across major joints

- Special considerations
  - Pre-existing medical problems
  - Burns with concomitant trauma
  - Burned children in hospitals not equipped for children
  - Patients who require special social, emotional or rehabilitation intervention