



**Regions Hospital<sup>®</sup>**

**HealthPartners<sup>®</sup>**

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# Burn Care Update

Case Reviews

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# Types of Burns

- Thermal
  - Burns due to an external heat source
    - Raise the temperature of the skin and tissues
    - Cause tissue cell death or charring
- Radiation
  - Burns due to prolonged exposure to ultraviolet rays of the sun or other sources of radiation such as x-ray.

# Types of Burns

- Chemical
  - Burns due to strong acids, alkalis, detergents or solvents.
- Electrical
  - Burns from electrical current, either alternating (AC) or direct (DC).

# Pre-Hospital Evaluation

- **STOP THE BURNING PROCESS!!!!**
  - Water or wet burn dressings
  - Cooling burns more than 2-4 minutes after the burn does not save tissue, it makes the patient hypothermic
  - Continued cooling only indicated for thick fluids like tar, chemicals, or helping with pain control for burns less than 10% BSA



# Airway – Sx of impending disaster

- ◎ Singed nasal hair
- ◎ Blistering about the mouth
- ◎ Soot on tongue or in pharynx
- ◎ Wheezing
- ◎ Carbonaceous sputum
- ◎ Hoarse voice, difficulty swallowing
- ◎ Labored respiration
- ◎ Restlessness, confusion, combative behavior

# Breathing

- All patients should receive supplemental O<sub>2</sub>
- Breath sounds
  - Rate
  - Depth
  - Chest wall motion
    - Especially important with trunk eschar



# Circulation

- Central pulses – what do you expect?
  - Tachycardic and hypertensive
  - Unusual to be hypotensive early postburn
- Peripheral pulses
  - Difficult to palpate with eschar, circumferential burns, secondary hypothermia

# Circulation-IV's

## Initial Transport

- **Desired** for pain control
- Typically unnecessary for resuscitation

## Secondary Transport

- Needed for pain control
- Needed for resuscitation (min postburn)



# Circulation IV's

## Pearls / Pitfalls

- Multiple attempts - initial transport
- Not placing IV through burn when needed
- Secure with dressing not tape



# Secondary Survey

D – E – F – G

- **D**isability:
  - Neurologic impairment
- **E**xposure:
  - Assess %BSAB
- **F**luid resuscitation
- **G**et ready for transfer!

# Exposure

- Identify associated injuries
- Determine body surface area burned (BSAB)
- Remove all clothing (ongoing burning)
  - Pitfall: can lead to hypothermia
- Remove all jewelry
  - Pitfall: potential for constriction with edema

# Identify Associated Injuries

- Common injuries
  - Inhalation injury
  - Lacerations
  - Long bone fractures
  - Pelvic fractures
  - Abdominal injuries

- Treatment
  - Advanced Airway
  - Control external bleeding
  - Splint fractures
  - Treat hypotension

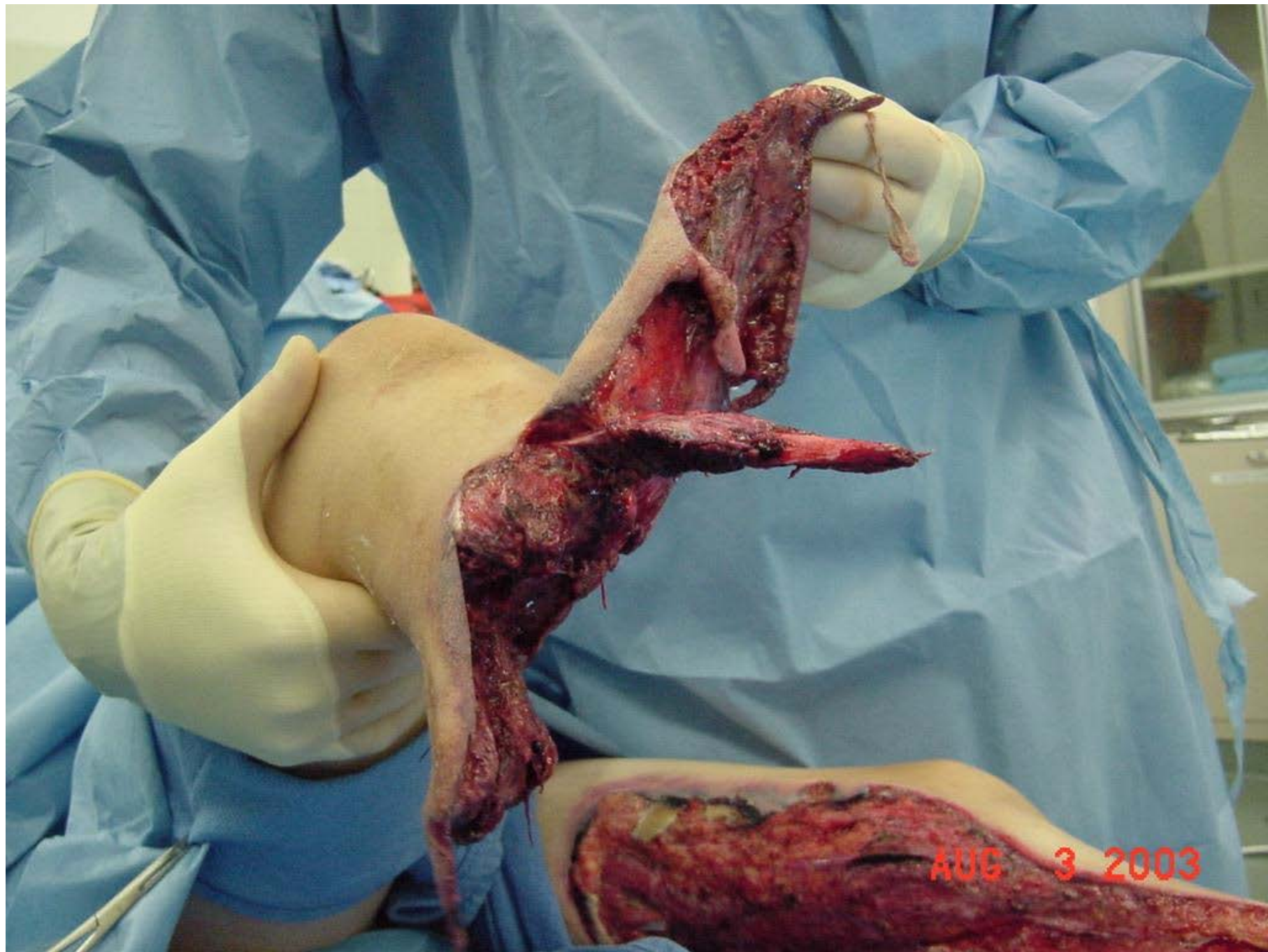












# Fluids - Prehospital

## Age Based

- Infants (< 1yr) 125 mL/h
- Kids (1-12yr) 250 mL/h
- Adults (> 12yr) 500 mL/h

\*Recommended for Prehospital IVF rate

# Case 1

- 28 y/o male
- Oil vessel spontaneously combusted
- Thrown back
- Engulfed but wearing protective gear
- BiLat hand pain, L hand “numbness”
- Burns to face and hands



# Case 1



# Case 1

- 2% BSA Burns
  - All 2<sup>nd</sup> degree but L hand deepest area
- “Numbness” resolved
- Extended wear antimicrobial dressing
- DSCH PBD 1
- F/u in Dickinson

# Case 2

- 41 y/o male
- Mobile home fire – went back inside
- Jumped through window – LOC
- RSI due to agitation
- Burns to back & L UE
- 2L LR en route



# Case 2



# Case 2

- 8% BSA burns – 2<sup>nd</sup> degree
- Extubated PBD 1
- Foley removed PBD 3 (retention)
- DSCH PBD 6
  
- Did not respond to follow up calls

# Case 3

- 31 y/o male
- Explosion refilling kerosene heater
- Burns to face, BiLat feet & R hand
- Elective RSI for facial swelling

# Case 3





# Case 3

- 7% BSA burns – 2<sup>nd</sup> & 3<sup>rd</sup> degree
- Extubated PBD 1
- PBD 6 STSG BiLat feet & R hand

# Case 3



# Case 3

- DSCH PBD 12 (POD 6)
- Follow up in Greeley, CO

# Case 4

- 66 y/o male
- Mobile home fire
- Walked to ambulance
- RSI en route due to Mental status changes



# Case 4



# Case 4

- Extubated PBD 3
- STSG scalp PBD 9



# Case 4

- DSCH PBD 12 (POD 3)
- Burn Clinic PBD 19 (POD 10)
- STSG look great, donor healed
- Follow up with PMD

# Case 5

- 45 year old male and 4 year old son with burns
- Fire the previous night in a fire pit
- The following morning the 4 year old reportedly threw diesel fuel on the embers
- Injury time was 10am
- Arrived to OSH by private vehicle
- Arrival to Regions
  - 45 year old arrived at 1520
  - 4 year old at 1616

# Dad

- Saw his son on fire and pulled him out of the flames
- Intubated and foley placed prior to transfer
- IVF at 125/hr LR
- No PMH, PSH, Meds, Allergies
- Smoker, alcohol, marijuana and meth
- Vital Signs: BP 148/88 Pulse 68 Temp 95.4 ° F  
SpO2 100%

# Dad

- 5% superficial partial thickness burns to bilateral forearms and proximal palms, small area on right anterior thigh
- Minimal vent settings. Reviewed CXR.
- Quick wean
- Extubated at 1650

















# Dad

- General: Drowsy, NAD
- Cardiovascular: Regular rate and rhythm.
- Pulmonary: Clear to auscultation bilaterally, no respiratory distress
- CV: Hypertension, likely related to pain.
- Other exam normal

# Dad

- Allow to eat
- Remove Foley
- Brother and sister present – live locally
- Burn Dressings: Xeroform/Bacitracin
  - Right Hand: Red/Open areas on palm and wrist
  - Right Forearm: Redness, Blisters debrided
  - Left Hand: Red open areas on fingers, palm and wrist
  - Left Forearm: Redness, Blisters debrided
  - Right Thigh: Red/Open Blister

# Dad

- Plan
  - Chemical dep consult
  - Demo given to wife
  - Discharged on PBD #1
  - Stayed at hospital with son



# Son

- Prior to transfer, he was intubated, a foley was placed, and he underwent escharotomies to BLE.
- He received a total of 1300ml LR prior to arrival at Regions. He had 100ml of UOP per foley prior to leaving the OSH, and only 4ml on UOP en route.

# Son

- Difficulty ventilating.
  - ? Emergent fasciotomies
- Survivable?
- Patient be transported by air with family member.
- Departure from the OSH was delayed and patient underwent BLE escharotomy.

# Son

- Full thickness burns to anterior torso, majority of BLE. Partial thickness burns to face, back, most of BUE and hands. 75% TBSA















Small Adult 10  
2 11 10 9 8 7 6  
20-26cm









# Son

- General: intubated, sedated
- Cardiovascular: Regular rate and rhythm.
- Pulmonary: Clear to auscultation bilaterally, on ventilator
- Other exam WNL



# At Regions

- Underwent escharotomies to BLE prior to transfer here (4/17/17) and further escharotomies to BLE upon arrival here (4/17/17).
- Hgb 16.7 UOP okay. Why?
- Creatinine 0.75 (0.55 - 1.18 mg/dl)

# Son

- Versed gtt for sedation, fentanyl gtt for pain, rocuronium Q1h PRN for vent dyssynchrony
- Pulm: intubated.
- CV: no acute issues at this time.
- GI: NPO, placement of NJ feeding tube, initiate tube feeds tonight
- GU: foley in place, fluid titrating to UOP per protocol
- FEN: Nurse-driven fluid replacement protocol
- Heme/Prophylaxis: no DVT ppx indicated in this age group
- Consults: PICU, ophthalmology

# Son

- Pulm: Acute respiratory failure. Wean vent settings as able, respiratory acidosis. Reviewed CXR, advanced ETT by 2 cm.
- CV: Hypotension upon arrival but improved with fluid resuscitation. LR started at 500cc/hr and titrated to 650cc/hr after patient initial UOP was 4cc/hr.
  - Patient with clinical evidence of myoglobinuria. Patient then met goal and IV fluids were kept at 650cc/hr.
  - FFP given. The following hour the patient with >35cc and his IV fluids titration began.

# Son

- GI/FEN: NJ placed at bedside, TF started.
- GU: Foley in place. UOP goal 12-20cc/hr.
- Heme: Hgb 16.7 No indication to transfuse.
- Musculoskeletal: Bedside escharotomies to BLE
- ID: SIRS. Leukocytosis to 50.8 Fever. No antibiotics.

# Son

- CNS/Psych
- Agitated and with pain behaviors on arrival.
- Plan
  - Fentanyl and Versed, Rocuronium infusions for security of ETT.



# Son

- OR 4/17/2017
- Escharotomies of B feet, BLE, and abdomen (total of 5 incisions)
- ETT exchanged in OR for 4.5 cuffed tube, air leak resolved. ETT secured to teeth.

# Son

- 4/18
- In: 6236.5 [IV:5756.5; Blood:300; Tube Feeding:180]
- Out: 433 [Urine:433]
- SIRS. Leukocytosis decreased to 26.3. Fever. No indication for broad spectrum coverage.
- OR
  - Tangential excision and cadaver to R foot, RLE, R trunk
  - Tangential excision and cadaver to L foot, LLE and L trunk
- 2 attending surgeons

# Son

- 4/18
- Large amount of UOP as resuscitation is complete
- Hgb 5.6 PRBC
  - Given 1 adult unit

# Son

- 4/19
- **Neuro:** Tylenol for baseline pain with fentanyl gtt. Start methadone with PRN oxycodone. Versed/Precedex for acute anxiety/agitation. Wean sedation as tolerated. Fentanyl drip for pain
- **Pulm:** Acute respiratory failure. Minimal vent settings.ETT secured to teeth.
- **CV:** Tachycardic likely related to hypermetabolism of burns and pain. Start beta blocker after transfusions for anemia if still tachycardic.
- **GU:** Foley in place. UOP goal 12-20cc/hr. Creatinine 0.61 (0.55 - 1.18 mg/dl)
- IV fluids saline locked.
- **Heme:** Hgb 10 after 2U PRBCs for post-operative hgb 5.6.
- **ID:** SIRS. Leukocytosis resolved. Fever to 103. No indication for broad spectrum coverage



# Son

- 4/21 Discussion with Shriners in Cincinnati
- CPS referral made

# Son

- 4/23
- CVL clotted and replaced emergently
- Worsening respiratory status
  - CXR
    - consolidation in the right apex and medial right lung base suggesting worsening atelectasis or infiltrate
    - small pneumothorax.
  - VBG back pH 6.975 pCO<sub>2</sub> 89.3 pO<sub>2</sub> 36 HCO<sub>3</sub> 20.8
  - Has been progressively worsening overnight, requiring maximal ventilator support and now prone. Remains intubated and sedated.

# Son

- Vecuronium for paralysis.
- Pulm: intubated, on maximal vent settings this morning, right chest tube placed due to pneumothorax. Placing on oscillator, being evaluated for potential ECMO if not improving on oscillator. Chest tube placed
- Transfer to Shriner's Cincinnati on hold due to worsening status.
- Weighing the risks of transport and the desirability to remain in a burn center, the idea of ECMO has been put aside. Family has been updated by the burn team of the gravity of the situation, chaplaincy involved.
- Bair hugger applied and fluid warmer added, temp slowly climbing to a tmax of 94.5F

# Son

- 4/24
- improved overnight, able to wean ventilator to less worrisome settings. Acidosis improved, both respiratory and metabolic
- Off paralytic later in the afternoon

# Son

- 4/27
- Transfer to Shriners



# Problem List

- Acute respiratory failure with hypoxia (HRC)
- At high risk for compartment syndrome
- Traumatic rhabdomyolysis (HRC)
- Acute respiratory acidosis
- Acute traumatic pain
- Oliguria
- Hypotension
- Severe protein-calorie malnutrition (HRC)
- Fever
- Inability to swallow
- Tachycardia
- Acute blood loss as cause of postoperative anemia
- Hypomagnesemia

# Pediatric

- 2140 hrs
- Rural address
- 2 y.o. female with burns
- Mom greets you at the door, child can be heard screaming in the house

# Pediatric

- Airway: Intact
- Breathing: Child is screaming
- Circulation: Obviously
- Disability: Nothing obvious, child is acting appropriately considering her injuries

# Pediatric

- Expose: Child with burns to face, chest, abdomen, buttocks and back
- Estimate % of burn surface area









# Pediatric

- Fluids: Yes or No
  - IV fluids are not necessarily indicated in the early stages of pediatric burns
  - If an IV can be established...Great!!! It is also useful for narcotics

# Pediatric

- GET...as in: Vitals, Past medical history, How the burn occurred, Medications, Allergies...

# Pediatric

- Pt mother states that she was giving the child a bath. She left the child in the water and stood up and turned to get some soap. She suddenly heard the child screaming and thinks she turned the hot water on.
- Vital signs: 106/45, P120, RR24. SpO2 97%
- PMH negative, no meds, no allergies



# Pediatric

- Head to toe
  - Exam is within normal limits excluding the burn

# Pediatric

- EMT-B's apply moist dressings and transport to local community hospital. Mom rides with.
- Transport time was 21 minutes.

# Pediatric

- Issues with prehospital care and/or assessment??
  - Are the burns consistent with the story?
    - Most of the time they are
    - Pediatric burns should always be a concern
    - Don't be judgmental, gather information and raise red flags

# Pediatric

- Issues with prehospital care and/or assessment??
  - Wet dressings
    - Not necessary for most transports
    - Will not change the course of the burn and will make the patient hypothermic
    - A clean, dry sheet is fine. Don't spend money on “burn packs” or sterile sheets

# Pediatric

- And what about the IV?
  - It would have been nice in this case. More information to come...



# Pediatric

- Pt arrives in the ED at 2215
- Pt is alert and quiet
- Estimated burn total burn surface area (TBSA) is 33%.
- “Most looks like 2<sup>nd</sup> degree burns”

# Pediatric

- Mom states that patient was in the bathtub standing. As she was filling the tub, she stepped away for a moment to get a towel and bath soap and the patient turned the water to hot.
- MD- “Story is not consistent with burn appearance.”
- No communication noted between mom and boyfriend.

# Pediatric

- Pt placed on 100% blowby O2
- 23g IV established and LR started at 100cc/hr.
- 1mg Morphine given
- Foley catheter placed
- Consult call to Regions Burn Center made

# Pediatric

- Ground transportation arranged and patient was discharged from ED at 2320 for 90 minute ride to Regions.
- Transport uneventful, mom accompanied medics.

# Pediatric

- Pt arrives at Regions Burn Center at 0054.
- Burns cleaned and debrided and dressed with Glucan Pro 3000 and Silver Sulfadiazene.
- Additional Morphine given for cares.
- IV fluids: LR at 20cc/hr and D5LR at 43cc/hr.
- Urine output ranging from 6-15cc/hr overnight.



# Pediatric

- Evaluated by MD and nurse clinician the following morning.
- Calculated burn % is 35.78%.
- BSA to the back is deep pink in color with a slightly dry appearance.
- Right upper arm is pale pink in color.
- Anterior trunk up to the right shoulder and down the right arm are pale pink to white.

# Pediatric

- Feeding tube to be established later in the day.
- Social service consult initiated with referral to Child Protection.

# Pediatric

- Central access being obtained and Pt blood pressure becomes “soft”.
- Mottling noted in bilateral lower extremities.
- Pt becomes profoundly lethargic.
- Pt had received Morphine and Versed for dressing change.

# Pediatric

- Anesthesia is called for intubation.
- Arterial line is established.
- Blood pressure improved with increase in IV fluid. Continued to have poor perfusion so dopamine was started.
- Chest x-ray shows proper ETT placement as well as a fractured collarbone.
- Propofol and Morphine infusions initiated.

# Pediatric

- IV fluid rate increased to 113cc/hr with LR and D5LR.
- Pt had much more stable vital signs throughout the evening and overnight.
- Dopamine weaned to off overnight.
- Pt with minimal urine output despite IVF and Albumin.
- Concerns??



# Pediatric

- Post burn day #2
- Burns looking worse; almost all look full thickness except to her face.
- Silver Sulvadiazene dressings discontinued due to a low white count, burns dressed with Xeroform and Bacitracin.
- Relatively stable day with urine output adequate but marginal.

# Pediatric

- RN's note that pt abdomen becoming distended.
- Bladder pressures via Foley catheter method initiated.
- At 0100, abdominal pressure noted to be 20cm water pressure noting the progression of abdominal compartment syndrome.

# Pediatric

- Pt is becoming more difficult to ventilate as her lungs are becoming squeezed by her abdomen.
- Ventilator showing high peak pressure, low tidal volumes, O2 sats decreasing and blood pressure decreasing.

# Pediatric

- Plan to take pt to the OR for open laparotomy within the next hour.
- Pt continued to get worse and OR had to be brought to her. She was not stable enough to transport.
- 0220 Pt had bedside emergent decompressive laparotomy with removal of intraabdominal fluid.

# Pediatric

- Social worker and child protection continue to be involved and meet with mom.
- Mom confesses to coming home from work at around 5:30pm and noticing the burns. She put patient in the bathtub and cleaned and pulled dead skin off the burns at that time.

# Pediatric

- Pt became less responsive and would not eat or drink so she called 911 at 2140.
- Boyfriend is arrested and is not saying what happened.
- Estimated time of burn was 2pm.



# Pediatric

- Pt had a “normal” hospital course and was extubated on hospital day 21.
- “What about the burns?”

# PBD #2



# PBD#11





# PBD#11



# PBD#11





# PBD#18 Integra





# PBD#18



# PBD #18 Integra





# PBD#18 Integra



# Pediatric

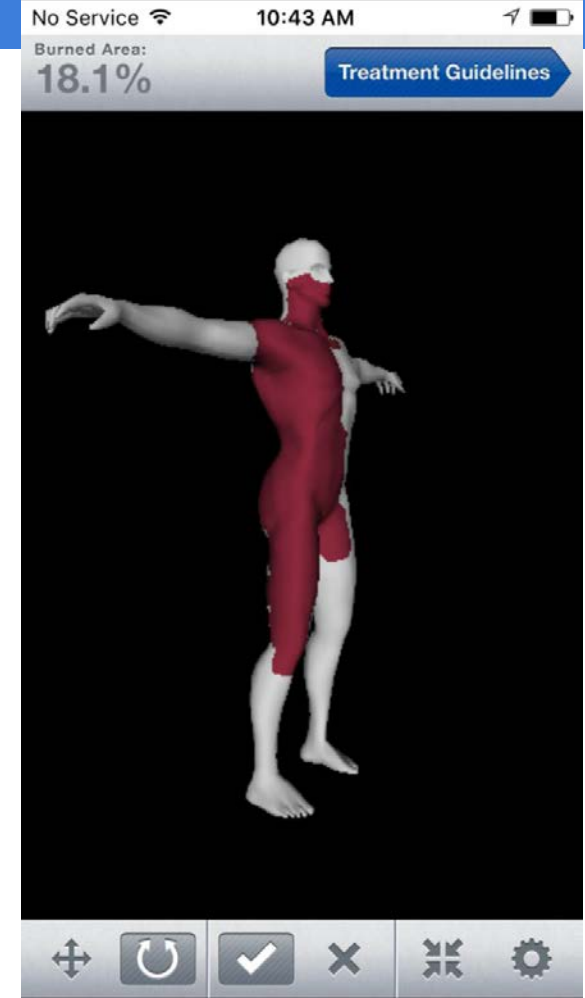
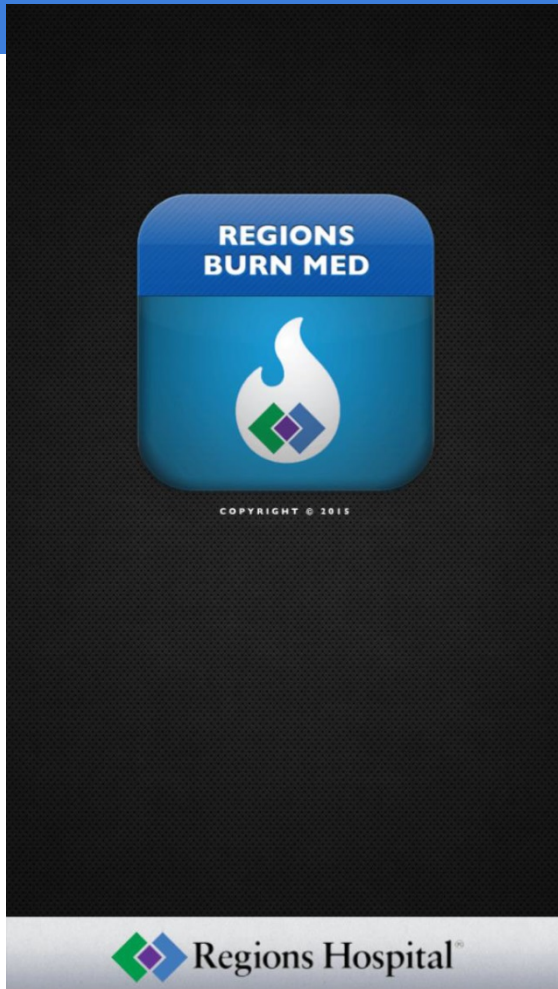
- Pt was discharged to medical foster care on hospital day 45.
- Mom was arrested and formally charged with felony child endangerment.
- Moms boyfriend is in jail awaiting sentencing.

# Telemedicine



VIDOPRO

# Regions Hospital Burn App





### Treatment Guidelines

#### Eight Hour Treatment Guidelines

- A. If [inhalation injury](#) is suspected administer 100% oxygen and consider intubation
- B. Administer fluids orally as tolerated
- C. Clean wound, [debride loose skin](#)
- D. [Circumferential](#) burns may need [escharotomy](#). Please contact [Regions Burn Center](#) 800-922-2876
- E. [Apply dressing](#).

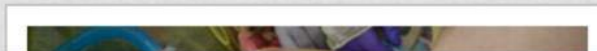
### Circumferential Burns

#### Case 1



*In this circumferential burn of a young African-American male, notice how the skin has become white and completely surrounds the leg. If left untreated, this condition will restrict blood flow to the legs and feet.*

#### Case 2



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3D Model



3D Model



3D Model



# Thank you