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Pediatric ED Management of Burns

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Guideline:	Pediatric ED Management of Burns	Revised Date:	March 2025
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# I. Purpose

To guide the initial Pediatric Emergency Department (ED) triage and treatment of burn patients.

# II. Population and Injury Characteristics

This protocol applies to the pediatric patients with burn injuries seen in Monroe Carell Jr. Children's Hospital at Vanderbilt (Monroe Carell).

### III. Burn Alert/Consult Criteria

The Pediatric Burn Team should be notified for all pediatric patients with a burn, regardless of size and depth. Follow the Burn Alert Criteria (also in Appendix I) for activating burn alerts. All leveled burns must be partial and/or full thickness burns. Superficial (first degree) burns should not be leveled.

- a. Burn Alert Level I
  - i. ≥15% TBSA partial and/or full thickness burns without concurrent trauma
  - ii. Intubated burn patient or burn patient with unstable airway
  - iii. High voltage (>240v) or lightening electrical injury
  - iv. Chemical burns ≥15% TBSA or Hydrofluoric acid injury >1% TBSA
  - v. Blast or explosion with burn injuries also requires Level I Trauma alert
  - vi. Frostbite injury to extremity that is frozen/thawed within the last 24 hours with moderate to severe hypothermia (body temperature: 30-34°C / core temperature: <30°C)
  - vii. Arrival of 3 or more patients from the same incident regardless of acuity
- b. Burn Alert Level II
  - i. 5-14% TBSA partial and/or full thickness burns
  - ii. Non-intubated inhalation injury (including chemical)
  - iii. Low voltage ( $\leq$ 240v) electrical injury or neuropathy
  - iv. Chemical burns <15% TBSA or Hydrofluoric acid injury ≤1% TBSA
  - v. Frostbite injury to extremity that is frozen/thawed within the last 24 hours with mild hypothermia (core temperature 34-35.9°C) or normothermia
- c. Burn Consult
  - i. Any burn injury not meeting burn alert criteria
  - ii. Frostbite injury to extremity that has been thawed >24 hours
  - iii. Soft tissue disorders or injuries such as TENs, SJS, soft tissue degloving, and crush injuries

Special considerations: Emergency Medicine, Trauma, or Burn Attendings ONLY may up/downgrade levels. Residents, Fellows, and ED staff DO NOT level patients. LifeFlight flight crew will level their patients. Unless requested by an Emergency Medicine Attending, the Communications Center personnel will assign a level.

# IV. Burn Wound Assessment

- a. Burn Depth
  - i. Superficial (First Degree) Burns<sup>1</sup>: extend only into the epidermis and are not counted towards the percentage of total body surface area (%TBSA). These burns do not blister, they are red and painful (e.g. a sunburn) and heal in 3-4 days without scarring.
  - ii. Partial Thickness (Second Degree) Burns<sup>1</sup>: extend through epidermis and into the dermis. Superficial partial thickness burns extend only through the upper (papillary) dermis and will heal within 3 weeks with appropriate wound care and therapy. These

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burns are uniformly pink, moist, blanching, and painful. Superficial partial thickness burns are unlikely to result in scarring or functional deficits. Deep partial thickness burns extend into the deeper layers (reticular) of dermis and are white or mottled white/red/dark pink and typically dry, not as painful, and may not blanch. Deep partial thickness burns may heal on their own, but the risk of scarring and functional impairment is higher than with grafting in many cases.

- iii. Full Thickness (Third Degree) Burns<sup>1</sup>: extend through the dermis and into subcutaneous fat. All the skin appendages, reservoirs of skin which allows lesser burns to heal, have been injured and these burns will only minimally heal by epidermal migration. Therefore, full thickness burns need excision and grafting except for very small burns and burns in areas with excess skin.
- b. Burn Size Assessment
  - i. Palmar method<sup>2</sup>: The patient's palm from the wrist crease to the tip of the longest finger (Figure 1, below) equals 1% total body surface area (TBSA).
  - ii. Rule of 9s<sup>3</sup>: Divides the adult body into factors of 9 to estimate burn size and is adapted for young children who have differing body proportions (Figure 2, below).



# V. Burn Wound Management

a. Burn Team Consults

The Burn Team should be consulted for all pediatric burns regardless of burn depth and size. It is the goal of the Burn Team to respond to the consult within 15 minutes.

- i. Wound Care: It is always the goal for initial debridement to occur in the ED for proper evaluation of the burn size and depth. The %TBSA cannot be determined prior to initial debridement.
- b. Sedation: The Burn team will evaluate the patient and coordinate analgesia management for debridement with the ED Team. Sedation should be anticipated for patients with burns that are estimated to be >5% TBSA; however, depending on patient tolerance, patients with burns <5% may require sedation.
- c. Debridement without sedation: Patients not sedated during initial debridement may benefit from anxiolytic administration in combination with a narcotic (such as fentanyl and midazolam) to improve tolerance of debridement and reduce anxiety with future dressing changes.

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# VI. Burns <15% TBSA

These patients do not require resuscitation. The decision to admit or discharge from the ED is at the discretion of the Burn Attending and any other consulting services. Should the patient be admitted primarily for the burn injury, they will be admitted to the pediatric acute care floor under the Burn Surgery – Pediatric Burn service. Further details on the admission of pediatric burn patients can be found in the Pediatric Burn Admission, Transfer, & Discharge protocol.

- a. Acute Care Admission:
  - i. Pain Control: All pediatric patients with burns should be given the following (barring any contraindications):
    - 1. Acetaminophen 15mg/kg (max 1000mg) PO/IV q6hr scheduled
    - 2. Ibuprofen 10mg/kg (max 600mg) PO q6hr scheduled
    - 3. Oxycodone 0.15mg/kg (max 10mg) q4hr PRN
    - 4. Hydromorphone 0.015mg/kg (max 0.2mg) IV q3hr PRN
  - ii. Discharge from ED

The following are general guidelines for Burn Clinic follow-up. However, if there are concerns for wound conversion, wound infection, inability to tolerate wound care at home, or any other concerns, a sooner referral may be warranted.

- 1. Ambulatory Referral to Burn Clinic
  - (a) Patients discharged in daily dressing: Follow up in 3-5 days
- 2. Patients discharged in silver dressing
  - (a) ≤10% covered in silver: Follow up in 5-7 days
  - (b) >10% covered in silver: Defer to Burn Team to set up outpatient sedation *Refer to the Pediatric Burn Mepilex Takedown in Clinic CPG for more details.*
- 3. Pain control: All pediatric patients with burns should be given the following (barring any contraindications):
  - (a) Acetaminophen 15mg/kg (max 1000mg) PO q6hr scheduled
  - (b) Ibuprofen 10mg/kg (max 600mg) PO q6hr PRN
  - (c) Oxycodone: Narcotics are *not* required for all burn injuries. Many pediatric patients have good pain control with scheduled non-narcotics; however, the following is a guideline for patients who may require narcotics for wound care:
    - (i) Discharge with daily dressing changes: Oxycodone 0.15mg/kg once daily PRN wound care pre-med, to be given 30 minutes prior to wound care. Provide enough doses to ensure they have medication from ED discharge to Burn Clinic follow up.
    - (ii) Discharge in silver dressing with plan to remove in clinic: Oxycodone 0.15mg/kg once 30 minutes prior to burn clinic follow-up

*Opioid prescriptions that exceed 3 days should have the following language included on the prescription, "EXEMPT – Severe Burns" to be complaint with the Tennessee Law.* 

- 2. Pruritus:
  - (a) Cetirizine<sup>1</sup>
    - (i) 6mo-5yo: 2.5mg qHS scheduled
    - (ii) 6-11yo: 5-10mg qHS scheduled
    - (iii) ≥12yo: 10mg qHS scheduled
- 3. Nutrition

Encourage high calorie, high protein diets and an age-appropriate multivitamin daily

- (a) Multivitamin daily (age-appropriate form/dose)
  - (i) 0-2yo: Poly-Vi-Sol without Iron 1mL PO daily
  - (ii) 2-5yo: Pediatric multivitamin 1 chewable tablet PO daily
    (1) Or Poly-Vi-Sol without Iron 2mL PO daily
  - (iii) >5yo: Pediatric multivitamin 2 chewable tablet PO daily

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### VII. Burns ≥15% TBSA

- These patients require resuscitation and admission to the Pediatric Critical Care Unit under shared service between Pediatric Intensive Care and Burn Surgery – Pediatric Burn services. The ED management of pediatric burn patients requiring resuscitation is as follows:
  - i. Resuscitation Fluid: The following fluid rates should be started during the primary survey:

Age/Weight of Child	Initial fluid rate & type (prior to burn size calculation)
<6 years old	125mL/hr of LR + maintenance rate D5LR*
6-14 years old	250mL/hr of LR
>14 years old	500mL/hr of LR

\*Maintenance rate calculation using 4-2-1 rule

 ii. Fresh Frozen Plasma (FFP): Patients with a TBSA ≥15% require a second PIV for administration of FFP bolus(es). A type and screen and consent should be obtained by the ED and FFP bolus stared in the ED whenever possible. If a patient has a delayed presentation >8 hours post-burn, the FFP bolus may be omitted and FFP drip started immediately at the discretion of the Burn Attending.

TBSA	FFP Bolus
<15%	None
15-50%	1 weight-based unit (10mL/kg)
>50%	2 weight-based units (10mL/kg)

- iii. Labs: Initial labs should be obtained by the ED whenever possible:
  - 1. Type & Screen
  - 2. CBC
  - 3. CMP
  - 4. Magnesium
  - 5. LFT
  - 6. Lactate
  - 7. Urine toxicology
  - 8. Urine hCG for pubescent females
- iv. Foley catheter: Patients require placement of a foley catheter which is ideally placed during initial debridement if not already in place prior to arrival. Urine output should be closely monitored and documented (ideally hourly) whenever possible. Notify the Burn Team should the patient's urine output be <1mL/kg/hr.</p>
- v. Nasogastric (NG) Feeding Tube: Patients will require NG feedings which will begin on admission to the PICU. To reduce discomfort, this should be placed and bridled during the initial, sedated debridement.
- vi. Pain management: Patients require multimodal pain control to address the background, episodic, and neuropathic pain that burns cause. In the absence of contraindications, the burn team recommends that all burn patients be started on the following:
  - 1. Acetaminophen 15mg/kg (max 1000mg) PO/IV q6hr scheduled
  - 2. Ibuprofen 10mg/kg (max 600mg) PO q6hr scheduled
  - 3. Oxycodone 0.15mg/kg (max 10mg) PO q4hr PRN
  - 4. Hydromorphone 0.015mg/kg (max 0.2mg) IV q3hr PRN

Patients in the emergency department may benefit from the use of fentanyl for quick onset pain control or other narcotic medications such as morphine. Pain management may be left to the discretion of the emergency medicine provider. For additional guidance on pain control, refer to the Pediatric Burn Pain Management Guideline.

vii. Anxiety management:

A Child Life Consult should be placed for all burn patients. While in the Emergency

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Department, intranasal or intravascular midazolam may be useful to reduce anxiety. Patients with a delayed transfer from MCJ ED to PICU should be started on the following:

- 1. Gabapentin 5mg/kg (max 300mg) PO TID scheduled
- 2. Clonidine
  - (b) 2-10yo: 0.05mg/day patch
  - (c) >10yo: 0.1mg/day patch

# VIII. Burns Rehabilitation Therapy

Burns in any location can result in functional deficits without constant use and attention to home exercise programs. Patients should be encouraged to continue to use burned upper extremities for all ADLs. Assistive devices should be withheld unless recommended by PT/OT to improve activity tolerance. Please see Appendix III for a list of links to instructional videos for each body location. These videos are available in English and Spanish. Home exercise programs should start the day of the injury.

- a. Physical Therapy Consult
  - The burn team will place a PT consult for all admitted patients with burns. Patients discharged from the ED with limited use of the burned extremity, impaired mobility, or crossing joints (i.e. foot, knee, hip) will benefit from a PT consult in the ED prior to discharge. If PT is unavailable, the patient should be encouraged to utilize the extremity as much as possible to reduce stiffness as the burn heals. Please request a PT visit in the burn clinic referral comments when there are concerns for limited mobility.
- b. Occupational Therapy Consult
  - The burn team will place an OT consult for all admitted patients with burns. Patients discharged from the ED with limited use of burned extremities or burns that cross joints (i.e. hands, neck, axilla) will benefit from an OT consult in the ED prior to discharge. When OT is unavailable, the patient should be encouraged to utilize the body area as much as possible and conduct stretches to reduce stiffness as the burn heals. Please request an OT visit in the burn clinic referral comments when there are concerns for limited range of motion.

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### IX. Appendix I: Algorithms

Pediatric ED Management Burns under 15%.pdf

### Pediatric ED Managment of Burns <15% TBSA



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# [CPG] Pediatric ED Management of Burns 15% and greater.pdf



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# X. Appendix II: Pediatric Burn Alert Criteria

Vanderbilt Peds Emergency Medicine Burn Alert Criteria

# Burn Alert Level I

- ≥ 15% total body surface area (TBSA) full/partial thickness burns without concurrent trauma
- Any intubated burn patient or burn patient with unstable/ unsecure airway
- High voltage electrical (> household voltage 240) or lightening injuries
- Chemical burns that involve >15% TBSA (Hydrofluoric acid injuries > 1% TBSA)
- Extremities: frozen or thawed within the last 24 hours, and body temp: moderate (core body temp 30-34°C/86-93°F) to severe (core body temp <30°C/<86°F) hypothermia</li>
- Arrival of 3 or more patients from the same incident regardless of acuity

# Burn Alert Level II

- 5-14% total body surface area (TBSA) of partial and/or full thickness (2<sup>nd</sup> and 3<sup>rd</sup> degree) burns
- Non-intubated inhalation injuries, including chemical inhalation
- Low voltage electrical (</= household voltage 240) with burn injury or neuropathy
- Chemical burns <15% TBSA (Hydrofluoric acid injuries < 1% TBSA)
- Extremities: frozen or thawed within the last 24 hours, and body temp: mild hypothermia (core body temp 34-35.9°C)

All leveled burns should be 2<sup>nd</sup> or 3<sup>rd</sup> degree (partial or full thickness). First degree burns should not be leveled.

# <u>Burn Consult</u>

- Any burn injury not meeting burn alert criteria
- Frostbite injury thawed extremities >24 hours
- Soft tissue disorders or injuries such as TENs, SJS, soft tissue degloving, and crush injury

# SPECIAL CONSIDERATIONS

- Emergency Medicine, Trauma or Burn Attendings ONLY may up/downgrade patients
- Residents, Fellows, and ED staff DO NOT level patients
- LifeFlight flight crew will level their patients
- Unless requested by an EM Attending, the Communications Center personnel will assign a level

# XI. Appendix III: Burn Rehabilitation Videos

# Burns 202 Overview of Stretches

https://www.youtube.com/watch?v=Q42sdcSqewk&list=PLFEMTIzjmLeUC- tONmpxadXa\_7rusm\_B6

#### Burns 301 Pediatric Palm Stretch

https://www.youtube.com/watch?v=MJmt8svIlmo&list=PLFEMTIzjmLeUC-tONmpxadXa 7rusm B6

Burns 302 Burn Hip and Groin Stretches <u>https://www.youtube.com/watch?v=53OE-kiRYyo&list=PLFEMTIzjmLeUC-tONmpxadXa\_7rusm\_B6</u>

# Burns 303 Burn Elbow Stretch

https://www.youtube.com/watch?v=InXIpAwAacA&list=PLFEMTIzjmLeUC-tONmpxadXa 7rusm B6

# Burns 304 Shoulder Burn Stretches

https://www.youtube.com/watch?v=VsNVr9X0Ves&list=PLFEMTIzjmLeUC-tONmpxadXa\_7rusm\_B6

#### Burns 305 Foot and Leg Stretches

https://www.youtube.com/watch?v=1 8FWOd7f3I&list=PLFEMTIzjmLeUC- tONmpxadXa 7rusm B6

#### Burns 306 Burn Hand Stretches

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https://www.youtube.com/watch?v=VPCN6XZ3P5M&list=PLFEMTIzjmLeUC-tONmpxadXa\_7rusm\_B6

### Burns 307 Burn Wrist Stretches

https://www.youtube.com/watch?v=MJ6F\_F6BsR8&list=PLFEMTIzjmLeUC- tONmpxadXa\_7rusm\_B6

# Burns 308 Burn Neck Stretches

https://www.youtube.com/watch?v=eKg m BkJD4&list=PLFEMTIzjmLeUC- tONmpxadXa 7rusm B6

### Burns 309 Face Stretching

https://www.youtube.com/watch?v=rYAziBODWho&list=PLFEMTIzjmLeUC- tONmpxadXa 7rusm B6

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