Pediatric Burns

Brendan Campbell, MD, MPH
Samantha Pelow, APRN
Jen Tabak, RN, MSN
What is a Clinical Pathway?

An evidence-based guideline that decreases unnecessary variation and helps promote safe, effective, and consistent patient care.
Objectives of Pathway

- To decrease variability in the management of patients with burns
- To appropriately triage, diagnose and classify burns in the pediatric patient
- To provide appropriate burn care management for inpatients, including fluid resuscitation, dressing changes, and pain management
- To better delineate discharge criteria for admitted burn patients
Why is Pathway Necessary?

• Burn injury can range in severity from superficial and able to be treated at home, to a full partial thickness, to full thickness requiring higher levels of care and burn specialty centers.

• Currently at CCMC, no standardized approach exists for the management of the burned child from the ED, admission criteria, management while inpatient, discharge criteria and follow up recommendations

Standardization will help to:

• Set expectations for patients, families and providers

• Assure all burns are treated the same by all providers

• Delineate criteria for admission, transfer and safe discharge of patients with appropriate follow up
## Definitions

<table>
<thead>
<tr>
<th>Depth</th>
<th>Cause</th>
<th>Appearance</th>
<th>Sensation</th>
<th>Healing Time (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superficial</td>
<td>Ultraviolet exposure</td>
<td>Dry, red</td>
<td>Painful</td>
<td>3-5</td>
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<tr>
<td></td>
<td>Very short flash</td>
<td>Blanches with pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Superficial partial thickness</td>
<td>Scald (spill or splash)</td>
<td>Blisters</td>
<td>Painful to temperature and air</td>
<td>7-20</td>
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<tr>
<td></td>
<td>Short flash</td>
<td>Moist, red, weeping</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Blanches with pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deep partial thickness</td>
<td>Scald (spill)</td>
<td>Blisters (easily unroofed)</td>
<td>Perceptive of pressure only</td>
<td>&gt;21</td>
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<tr>
<td></td>
<td>Flame</td>
<td>Wet or waxy dry</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Oil</td>
<td>Variable color (patchy to cheesy white to red)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Grease</td>
<td>Does not blanch with pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full thickness</td>
<td>Scald (immersion)</td>
<td>Waxy white to leathery gray to charred and black</td>
<td>Deep pressure only</td>
<td>Never (if &gt;2% TBSA)</td>
</tr>
<tr>
<td></td>
<td>Flame</td>
<td>Dry and inelastic</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Steam</td>
<td>No blanching with pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Grease</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Chemical</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Electrical</td>
<td></td>
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</tbody>
</table>
# Burn Classifications

<table>
<thead>
<tr>
<th>Criteria and Care</th>
<th>Minor Burn</th>
<th>Moderate Burn</th>
<th>Major Burn</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Criteria</strong></td>
<td>&lt;10% in adults, &lt;5% in children or elderly, &lt;2% for full-thickness burn</td>
<td>10–20% in adults, 5–10% in children or elderly, 2–5% for full-thickness burn</td>
<td>&gt;20% in adults, &gt;10% in children and elderly, &gt;5% for full-thickness burn</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>Low-voltage burn, suspected inhalation injury, circumferential burn, concomitant medical problem predisposing to infection (e.g., diabetes, sickle cell disease)</td>
<td>High-voltage burn, chemical burn, any clinically significant burn to face, eyes, ears, genitalia, or major joints, clinically significant associated injuries (e.g., fracture, other major trauma)</td>
<td></td>
</tr>
<tr>
<td><strong>Care</strong></td>
<td>Outpatient management</td>
<td>Admission to a hospital with experience in managing burns</td>
<td>Referral to a burn center</td>
</tr>
</tbody>
</table>

* TBSA denotes total body-surface area. Data are from the American Burn Association\textsuperscript{37} and the American College of Surgeons.\textsuperscript{38}
“A moist environment for the wound accelerates healing by preventing cellular dehydration and stimulating collagen synthesis and angiogenesis....”
This is the Pediatric Burn Clinical Pathway. We will be reviewing each component in the following slides.
Initial care:

- Work up includes:
  - History and physical
  - Burn description (TBSA, burn depth)
- Other exams should be considered based on presentation or mechanism
- ED classification of burn type (Minor, Moderate or Severe)
- If severe page Pediatric Surgery if not already present in the event of trauma activation
**Inclusion Criteria:** Infants and children presenting to the ED with burn injury

**Exclusion Criteria:** As determined by provider

**Initial Evaluation:**
- Triage per ED protocol
- MD/AP and RN to perform brief rapid assessment history & physical
- Describe the burn:
  - TBSA – use Lund and Browder Chart to accurately determine % of body surface area with Partial Thickness/Full Thickness burns (see Appendix A)
  - Burn Depth – Superficial, Partial Thickness, Full Thickness (FT)
- Place patient in Resuscitation Room if:
  - >25% TBSA (Level 1 activation)
  - Suspected inhalation injury (diagnose with flexible bronchoscopy)
  - Altered mental status or LOC at scene or in ED
  - Associated major trauma

**Minor (<5% TBSA) or Moderate (5-10% TBSA)**

**Severe (>10% TBSA)?**

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**Modified Lund-Browder Chart**
Initial Care:

Minor (less than 5% TBSA)
- Establish IV to administer pain medications/fluids
- Consult Pediatric Surgery
- Consider SCAN consult if there is concern for suspected child abuse
- Establish admission criteria

Moderate (5-10% TBSA)
- Pain Medications:
  - Ketorolac IV 0.5 mg/kg IV q6hr (max 15 mg/dose) or Ibuprofen PO 10 mg/kg/dose q6hr (max 800 mg/dose)
  - Acetaminophen PO 15 mg/kg/dose q6hr (max 1000 mg/dose, max 75 mg/kg/day, not to exceed 4000 mg/day)
  - Morphine IV 0.05 mg/kg q3hr PRN (max per dose: infants: 2 mg/dose; 1-6 yr old: 4 mg/dose; 7-12 yr old: 8 mg/dose; >12 yrs: 10 mg/dose)
  - Fentanyl Intranasal 1-2 mcg/kg x1 (max 50 mcg/dose) if no IV access

- Fluids:
  - Consider maintenance IVF or bolus if patient is NPO or concern for dehydration exists

- Vaccinations:
  - Assess the need for Tetanus vaccine and/or Tetanus Immunoglobulin (Appendix B)

- Consultations/Notifications:
  - If >5% TBSA: Immediately call the Local Fire Marshal and complete Burn Injury Reporting Form (see Appendix C)
  - Consult Pedi Surgery/Trauma (860-220-4311) if:
    - >5% TBSA partial thickness burn, any full thickness burn or provider discretion
    - Consult SCAN if concern for Suspected Physical Abuse (Suspected Physical Abuse Pathway)
  - <2 yrs old, delayed presentation, history not consistent with injury
Pain Medications:

- **Ketorolac IV** 0.5 mg/kg IV q6hr (max 15 mg/dose)
- **Ibuprofen PO** 10 mg/kg/dose q6hr (max 800 mg/dose)
- **Acetaminophen PO** 15 mg/kg/dose q6hr (max 1000 mg/dose, max 75 mg/kg/day, not to exceed 4000 mg/day)
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Appendix B: Guidelines for when to consider Tetanus vaccine and/or Tetanus Immunoglobulin
Minor (<5% TBSA) or Moderate (5-10% TBSA)

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Appendix C: The State of Connecticut requires that the Burn Injury Reporting Form be filled out and the Fire Marshall be notified for burns >5% TBSA

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The State of Connecticut requires that the Burn Injury Reporting Form be filled out and the Fire Marshall be notified for burns >5% TBSA.
Initial Care:

Major burns (>10% TBSA)

- Immediate trauma consult
- If > 25% must be a trauma activation
- Establish and IV, start IVF and obtain labs under direction of the trauma team
Admission to Pedi Surgery/Trauma Service?

- Burns on the head, face, palms, hands, feet, chest, perineum, joints or anything circumferential
- Greater than 5% TBSA
- Uncontrolled pain
- Suspected abuse

Admission Criteria:
- Burns on head, face, palms, hand, feet, chest, perineum, joints, or anything circumferential, per attending discretion
- Moderate or major burn per attending discretion
- Uncontrolled pain
- Suspected physical abuse (see Suspected Physical Abuse Pathway)
- Any patient with burn wounds that are not completely healed must be re-admitted to the Pediatric Surgery service

Pain Medications:
- Acetaminophen PO 15 mg/kg/dose q6hr PRN (max 75 mg/kg/day, not to exceed 4000 mg/day)
- Ketorolac IV 0.5 mg/kg q6hr PRN (max 120 mg/day)
- Hydrocodone/Acetaminophen PO 0.1 mg/kg q6hr PRN (do not exceed 75 mg/kg/day of acetaminophen) OR Morphine IV 0.05 mg/kg q3hr PRN

Fluids/Electrolytes/Nutrition:
- If maintenance IVF is required, use D5 NS with KCl 20 mEq/L
- Regular diet (if not going to OR for debridement)
- Consider NGT for supplemental nutrition if caloric intake low

Burn wound care:
- Bacitracin, Telfa, Kling wrap BID or PRN (first dressing by Pedi Surg, then RN thereafter)
- Mepilex Ag or Mepitel Ag may be applied and left in place for 7 days
• **Medications:**
  - Pain management depending on severity

• **Fluids/Electrolytes/Nutrition:**
  - Use D5 NS with KCl 20 mEq/L for maintenance fluid, if needed
  - Have a low threshold to place Nasogastric tube if intake is poor
    - Proper nutrition is essential for wound healing

• **Wound Care:** either,
  - Bacitracin (copious amounts), Telfa, Kling wrap BID
  - Aquacel Ag done at 24 hours and every 3 days at bedside
  - Mepilex/Mepitel Ag

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**Admit to Pedi Surgery/Trauma Service**

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- Consider NGT for supplemental nutrition if caloric intake low

**Burn wound care:**
- Depends on burn location and surgeon discretion.
  - Bacitracin, Telfa, Kling wrap BID or PRN (first dressing by Pedi Surg, then RN thereafter)
  - Mepilex Ag or Mepitel Ag may be applied and left in place for 7 days
Discharge Criteria:

- Less than 5% TBSA
- pain controlled on oral regimen
- no concerns for NAT
- family education complete
- wound care supplies ordered
- follow-up appointment in place (PCP vs Pediatric surgery clinic)

Medications on discharge:

- Ibuprofen AND Hydrocodone/Acetaminophen
  - Dispense only a 3 day supply of hydrocodone/acetaminophen

Discharge Criteria:

Pain control on PO pain regimen, no active concerns for suspected abuse, family education complete, wound care supplies provided, appropriate follow up in place (PCP as needed for minor burns; Pedi surgery clinic 860-545-9520, 1st available appointment)

Discharge Medications:

Ibuprofen PO 10 mg/kg q6hr PRN (max 1.2 g/day) AND Hydrocodone/Acetaminophen PO 0.1 mg hydrocodone/kg/dose q6hr PRN (max 5-10 mg hydrocodone/dose; max acetaminophen 4000 mg/day or 75 mg/kg/day) *Dispense only 3 days worth.
Review of Key Points

- Triage and classification of the burn done by the ED to determine severity
- Trauma consult if >5% TBSA; trauma activation for major burns
- Admission orders becoming standardized for admitted burn patients
- Discharge criteria and instructions should be the same for any burn.
Quality Metrics

• Percent utilization of order set (admitted patients only)
• Percentage of patients treated and released from the ED
• Percentage of patients admitted to MS6
• Percentage of eligible patients with notification to Fire Marshal for burn >5% TBSA
• Percentage of patients transferred to a burn center
• LOS for admitted patients (days)

• **Burn classification**. Children’s Hospital of Philadelphia, 2017, Philadelphia, PA.

• **Modified Lund-Browder Chart**. UpToDate, 2018.
Pathway Contacts

• Brendan Campbell, MD, MPH,
  o Department of Pediatric Surgery and Trauma

• Samantha Pelow, APRN,
  o Department of Pediatric Surgery and Trauma

• Jen Tabak, RN, MSN,
  o Trauma Program Coordinator
Thank You!

About Connecticut Children’s Clinical Pathways Program

Clinical pathways guide the management of patients to optimize consistent use of evidence-based practice. Clinical pathways have been shown to improve guideline adherence and quality outcomes, while decreasing length of stay and cost. Here at Connecticut Children’s, our Clinical Pathways Program aims to deliver evidence-based, high value care to the greatest number of children in a diversity of patient settings. These pathways serve as a guide for providers and do not replace clinical judgment.

This Educational Module was edited by:
Abby Theriaque, APRN
Educational Module Specialist