Trauma:
Burns: Thermal, Electrical and Chemical

Goals: To minimize tissue damage and patient morbidity due to thermal, electrical and chemical injuries, and due to inhalation injury
Inclusion Criteria: Patients of all ages with thermal, electrical or chemical burns
Exclusion Criteria: No specific exclusions
Refer to: Carbon Monoxide Exposure, Cyanide Toxicity, Eye Injury, Hemorrhage Control/Tourniquet, Pain Management, Shock, Toxic Chemical Exposure and Trauma CPGs; Destination Policy

CRITICAL POINTS:
- **Hypotension in the setting of thermal burns suggests other traumatic injuries (e.g. blast, fall, assault).**
- **Airway management, pain management and heat loss prevention are the key interventions.**

Observe Body Substance Isolation Precautions and employ appropriate PPE

Basic Level

1. Assess and support ABCs according to UNIVERSAL CARE – ADULT or UNIVERSAL CARE – PEDIATRIC and according to the Trauma CPG, as clinically indicated:
    a. A and B (Airway and Breathing): Look closely for evidence of inhalation injury (e.g. hoarseness, stridor, sooty sputum, facial burns, or singed nasal/facial hair) and be prepared for early and aggressive **airway management**, especially if history of closed-space thermal injury
        i. Monitor closely for swelling and other causes of airway/respiratory compromise
    b. C (Circulation): Control obvious external hemorrhage, per Hemorrhage Control/Tourniquet CPG
    c. D (Disability): Assess and document GCS; and assess pupillary size and reactivity
        i. At least two sets of measurements, 5 to 10 minutes apart, is the absolute minimum
        ii. Reassess and document every 5 to 10 minutes in patients with significant injury or instability
        iii. Remove contact lenses, if possible, especially for facial burns or chemical exposure
    d. E (Exposure/Environmental): Assess for other injuries and remove restricting items/clothing:
        i. Remove and secure any jewelry, belts, shoes and other items from burned areas
        ii. Remove burned or singed clothing that is not stuck to the skin
2. Positioning:
    a. Initiate Spinal Motion Restriction, if indicated, per Spinal Motion Restriction Policy
    b. If spinal injury is not suspected, place the patient in a position of comfort (for facial burns, slight head elevation is preferable)
    c. If there is evidence of shock, treat the patient according to the Shock CPG
3. Administer supplemental oxygen, as needed, to maintain SpO_2 of at least 94% with continuous monitoring
4. Initiate burn care measures and steps to **prevent heat loss**:
    a. Thermal injury: Apply clean, dry sheet and thermal blanket (if available)
    b. Chemical injury: Brush off dry chemical and flush with water to remove residual chemical
5. SAMPLE history and detailed, secondary physical examination, as time permits
6. Initiate transport as soon as possible (refer to Burn Center Transport Criteria in Table 1, below)
7. Once advanced level care arrives on scene, give report and transfer care

Table 1: Patients Requiring Transport to a Burn Center	
• Burns greater than 10% TBSA, regardless of depth • Burns of face, eyes, ears, hands, feet, genitalia, perineum or involving major joints • Full-thickness (3rd-degree) burns of any size in any age patient • Electrical burns, including lightning injury • Chemical burns	• Inhalation injury (including smoke inhalation) • Burns associated with other traumatic injuries (e.g. fractures) • Burns in patients with pre-existing medical conditions or comorbidities (e.g. elderly, immunocompromised, diabetic, respiratory conditions, cardiac history, etc.) • Burns in patients needing special social, emotional or rehabilitative intervention

Advanced Level

8. Initiate continuous ECG and $PetCO_2$ monitoring for all patients meeting Burn Center transport criteria
9. Establish large-bore IV/IO access, preferably in an uninjured extremity:
    a. Vascular access may be obtained in an extremity with thermal burns, but it may be difficult to secure because standard tape and dressings will not adhere well
    b. Initiate fluid resuscitation to maintain adequate perfusion (Lactated Ringers preferred, if available)
    c. If the thermal burn clearly exceeds 20% TBSA, administer IV/IO fluid at the following initial rates:
        i. Adults at least 14 years of age: 500 mL/hr

i. Children 6 to 13 years of age: 250 mL/hr
i. Infants and children up to 5 years of age: 125 mL/hr

    d. Do not exceed 1 liter of total IV/IO fluids unless authorized by BioTel
    e. Contact BioTel for fluid resuscitation orders in patients with congestive heart failure, cardiac disease or age greater than 65 years
    f. Monitor patient's clinical response
10. Monitor SpCO (carbon monoxide) levels, if possible, especially for closed-space or suspected inhalation injury
11. Monitor airway and respiratory status, and anticipate need for advanced airway placement
12. **Treat pain** according to the Pain Management CPG
13. For additional patient care considerations not covered under standing orders, consult BioTel

Special Circumstances

1. **Closed space fires:**
    a. Consider smoke inhalation, with or without associated thermal inhalation injury
    b. Consider carbon monoxide toxicity – treat according to the Carbon Monoxide Exposure CPG
        i. Pulse oximetry (SPO_2) monitoring may not be accurate
    c. Consider cyanide toxicity in a patient with depressed level of consciousness, respiratory distress/failure and cardiovascular collapse – treat according to the Cyanide Toxicity CPG
2. **Illicit drug lab incident:**
    a. Consider the possibility of toxic chemical exposure and need for HAZMAT assistance
    b. Notify BioTel or receiving hospital
3. **Chemical injuries:** (refer to Toxic Chemical Exposure CPG)
    a. Alkali (more severe damage): Perform copious irrigation with water or Normal Saline en route
    b. Acid (generally less severe): Perform copious irrigation with water or Normal Saline en route
    c. Hydrofluoric Acid (HF): Hexafluorine solution is preferred for irrigation, if available (e.g. work site)
    d. Cyanide: Refer to Cyanide Toxicity CPG
4. **Electrical injuries (AC or DC current):**
    a. Verify scene safety, especially disabling of the electrical source prior to patient assessment
    b. Primary assessment: focus on cardiac dysrhythmia and cardiac arrest
        i. Resuscitation with good outcome may be possible even in patients who appear dead, with dilated pupils (refer to the Cardiac Arrest and other symptom-specific CPGs)
        ii. AC current: more likely to cause cardiac dysrhythmias, especially ventricular fibrillation
        iii. DC current: more likely to cause deep tissue damage, but cardiac dysrhythmia (especially asystole) is not uncommon
    c. Assess for all sites of burn injury: if the patient became part of the circuit, there will be an additional site near the contact with the ground
        i. Electrical injuries are often full-thickness, with significant deep tissue damage
        ii. Assess for potential compartment syndrome and rhabomyolysis
    d. Associated mechanical injury may be present, due to falls or violent, involuntary muscle contraction