Burn Consensus Statement – FAQ

BACKGROUND – MAJOR BURN

Burn injury distinguishes itself from all other trauma by its unprecedented inflammatory response during the initial 24-48 hours. Myocardial depression and increased capillary permeability result in rapid and extensive fluid shifts and the depletion of intravascular volume. Early and appropriate fluid resuscitation is essential to acute burn management and is aimed at avoiding burn shock.

QUESTION 1: HOW DO I ASSESS THE BURN PATIENT?

ATLS principles will guide the initial assessment and resuscitation of the burn injured patient using the mnemonic ABCDE in a systematic approach.

A=AIRWAY

Assessment and management is a critical first step in burn care. Advance airway management may be required for those who present in acute respiratory distress. Indications for intubation may include any of the following: **singed nasal hair, eyebrows are NOT considered a reason to intubate.*

- **Respiratory distress**
- **Stridor**
- **Accessory muscle use**
- **Sternal retraction**
- **Extent of the burn (TBSA ≥ 40 % - 50%)**
- **Extensive and deep facial burns**
- **Burns inside the mouth**
- **Upper airway trauma**
- **Altered mentation**
- **Decreased level of consciousness where airway protective reflexes are impaired**
- **Hypoxia/hypercarbia**
- **Hemodynamic instability**
- **Inability to clear secretions or respiratory fatigue**
- **Suspected inhalation injury, history of being burned in an enclosed space**
- **Swelling on laryngoscopy**

B=BREATHING & VENTILATION

- Requires the continued assessment and monitoring of breathing.
- Administer oxygen at 15 L/min via non-rebreather mask.
- Exercise caution when interpreting oxygenation in the patient with potential carbon monoxide poisoning.
- Symptoms of cyanide toxicity include shortness of breath, respiratory rate changes, chest tightness, headache, vertigo, confusion, irritation to eyes, mucous membranes and occasionally cherry red skin

and bitter almond scent. In confirmed or suspected cyanide toxicity, the hydroxocobalamin (Cyanokit) should be administered.

- Cyanide toxicity should be suspected in patients who remain in shock refractory to resuscitative efforts, high-flow oxygen, with persistent metabolic acidosis and a serum lactate level of ≥ 8 mmol/L.

C=CIRCULATION WITH HEMORRHAGE CONTROL

*Current American Burn Life Support (ABLS) **2023** guidelines provide revised resuscitation formulas.*

INITIAL FLUID RATE AS A STARTING POINT → Adults with ≥20% & children with ≥15% Total Body Surface Area (TBSA) 2nd & 3rd degree burn require burn fluid resuscitation.

- During the Primary Survey, **INITIAL FLUID** management for all major burns is **BASED ON AGE** and initiated **PRIOR TO** calculating the exact TBSA.

Following are the pre-hospital and early emergency care initial fluid rates for major burns:

AGE	FLUID RATE
≤ 5 years of age	**125 mL Lactated Ringers (LR) per hour**
6-12 years old	**250 mL LR per hour**
13 years and older	**500 mL LR per hour**

KEY POINTS:

- TBSA burn percentage is determined by adding up only those body areas with 2nd and 3rd degree burn.
- Lactated Ringer's (warmed) is the preferred crystalloid used in the initial fluid resuscitation.
- A urinary catheter is required to monitor the effectiveness of fluid resuscitation. A urometer is preferred vs straight drainage bag for monitoring hourly urine output.
- Continuous **hourly** assessment of hourly urine output and other physiologic parameters are essential.
- Over and under fluid resuscitation must be avoided as they have been determined to impact morbidity and mortality.

ADJUSTED FLUID RATE

- During the Secondary Survey, the TBSA is calculated and body weight in kilograms is confirmed. We then initiate the ADJUSTED FLUID RATE.

We do NOT subtract the administered INITIAL FLUID RATE VOLUME from the ADJUSTED FLUID.

- As per the ABA "If initial fluid resuscitation is delayed there is no "catching up". The hourly rate should be started and adjusted regardless of time since the injury."

ADULT & TEENAGERS (≥ 13 YRS)	*FLAME & SCALD*	***2 mL LR x patient's body weight in kg x % TBSA 2nd & 3rd burns = Estimated 24-hour total mLs ÷16= mL/hour STARTING RATE. Subsequent hourly rate see CRITICAL POINTS below***
	ELECTRICAL	***4 mL LR x patient's body weight in kg x % TBSA 2nd & 3rd burns = Estimated 24-hour total mLs ÷16= mL/hour STARTING RATE Subsequent hourly rate see CRITICAL POINTS below.***
PEDIATRIC (≤ 12 YRS)	*FLAME & SCALD*	***3 mL LR x patient's body weight in kg x % TBSA 2nd & 3rd burns = Estimated 24-hour total mLs ÷16= mL/hour STARTING RATE. Subsequent hourly rate see CRITICAL POINTS below*** **+ *Maintenance Fluid* = *D*5W Lactated Ringers* (D5LR) at maintenance rate as per' 4-2-1 formula'.** ***ABA recommends D5LR- may use D5NS if necessary.***
	ELECTRICAL	***4 mL LR x patient's body weight in kg x % TBSA 2nd & 3rd burns = Estimated 24-hour total mLs ÷16= mL/hour STARTING RATE. Subsequent hourly rate see CRITICAL POINTS below*** **+ *Maintenance Fluid* = *D*5W Lactated Ringers* (D5LR) at maintenance rate as per' 4-2-1 formula'.** ***ABA recommends D5LR- may use D5NS if necessary.***

CRITICAL POINTS

1. The ABA emphasizes that burn fluid resuscitation should follow critical care principles and be monitored **continuously** to ensure the best outcomes.

2. **Hourly urine output monitoring is essential** to guide and adjust fluid resuscitation rates effectively. This must be accompanied with circulatory and respiratory monitoring.

3. **As per the ABA "If initial fluid resuscitation is delayed there is no "catching up". The hourly rate should be started and adjusted regardless of time since the injury."**

4. **Warmed Lactated Ringers** is the fluid recommended for fluid resuscitation.

5. Because patients respond differently depending on the specifics of their burn injuries, fluid needs vary.

6. A significant delay in initiating resuscitation from time of burn injury should signal physician to contact burn care provider and/or plastic surgeon.

7. In the **pediatric patient**, the management of fluid involves adjusting resuscitation based on perfusion factors such as urine output, mentation, capillary refill, pulses, and venous blood gas/pH.

QUESTION 2: WHAT ABOUT IV FLUIDS IN CHILDREN?

- **Children ≤12 years old require maintenance fluids <u>in addition to</u> resuscitation fluid**.
- Blood glucose should be closely monitored due to limited glycogen stores in young children.
- The fluid of choice is **D5LR** or D5NS if necessary and is calculated and infused using the "4-2-1" formula.

4-2-1 Formula
4 mL/kg per hour for the 1st 10 kg body weight
+ 2 mL/kg per hour for the 2nd 10 kg body weight
+ 1 mL/kg per hour for each additional kg over 20 kilograms

QUESTION 3: HOW DO I KNOW I AM GIVING TOO LITTLE OR TOO MUCH FLUID?

- Perform hourly monitoring of urinary output parameters. Urine volumes less than or greater than these parameters require adjustments in fluid resuscitation rates. Refer to Table below.
- Fluid infusion rate should be **increased or decreased by up to one-third** if the urinary output falls below or exceeds the desired level by more than one-third every hour. Consultation recommended with TCP until definitive care has been established.
- Electrical injury may be minimal on the surface but significant internally. The continuous monitoring of urine output to maintain 75-100 ml per hour is critical for adults and children >30kg..

EXPECTED HOURLY URINE OUTPUT

Age/weight	Hourly urine output
Adult	30-50 mL/hour
Children > 30kg	0.5mL/kg/hour up to maximum of 50mL/hr
Child ≤ 30kg	1 mL/kg/hour
Adults & Children > 30kg – electrical injury with myoglobinuria	75-100mL/hour until urine clears
Children ≤ 30 kg – electrical injury with myoglobinuria	1-1.5 mL/kg/hour until urine clears

QUESTION 4: WHAT DO I PUT ON THE BURN?

- Cover with dry sterile sheets (e.g. Medline sterile ¾ drape) otherwise, use clean dry sheets. The patient must be kept warm and dry to prevent hypothermia.
- Consultation through the Trauma Line is recommended for all >10% 2nd degree burn and any third-degree burn. See consultation criteria in the Burn Consensus Statement for full criteria.
- Patients being transferred for definitive care **should not** have any ointments or creams applied.

- Opiate pain control is delivered via the **intravenous route** in major burns. Small increments of **intravenous** analgesics should be initiated as early as possible. If transferring a patient, ensure adequate analgesia is available to maintain optimal pain control.
- Opiate IM injections **should not be** given in burns ≥ 10% TBSA due to peripheral shutdown which will delay drug absorption and impede effective pain relief. IV or IO administration is recommended.
- Do not cool burns > 10% TBSA as this may induce hypothermia. Cooling a burn using tap water up to 30 minutes for burns ≤ 5 % TBSA is acceptable.
- Burn care and appropriate dressing for burn patients not meeting criteria for transfer and able to be discharged and consulted by plastics later should be guided by local plastics or consulting plastic surgeon via the Trauma Line.

QUESTION 5: SHOULD I BE EXPECTED TO WEAR PPE WHEN PROVIDING CARE FOR THE BURN PATIENT?

- Sterile technique and standard precautions apply when caring for the burn patient. It is essential to adhere to infection control prevention with any invasive procedure.
- Appropriate use of personal protective equipment (PPE) should be used to protect both the patient who is at higher risk of infection and care providers vulnerable to exposure of contaminants.

QUESTION 6: WOULD HYPOTHERMIA HAVE AN EFFECT ON A BURN PATIENT?

- Hypothermia can have detrimental effects on any trauma patient and is present in a burn patient when the internal temperature is less than 36.5ºC. This differs from a healthy person in which the threshold is 35ºC. Hypothermia in the early phase of a major burn injury has been shown to worsen the prognosis in terms of mortality and duration of treatment, irrespective of other clinical factors.
  .

QUESTION 7: WHAT DO WE DO IF WE HAVE A COLD INJURY TO FEET/LEGS AND DON'T HAVE A SHOWER IN THE ED?

- If you have such a severe cold thermal injury going any distance up the legs the patient would be hypothermic and needs to be transferred for definitive care.
- Showers aren't necessary. A circulating foot bath that can be used for hands or feet would be effective.

QUESTION 8: WHAT DO WE DO WHEN A PATIENT HAS FROSTBITE?

- Transport to safe environment before attempts at rewarming are initiated as partial rewarming and refreezing can be harmful.
- Remove damp clothing and apply warm blankets.
- Provide hot fluids by mouth if patient alert and able to drink and no contraindications/other injuries.
- Affected areas are rewarmed by immersion in gently circulating water at a constant 38-40°C for 30-40 minutes. The temperature of the water may be determined using a temperature probe-tape the probe to inside of basin/tub.

- If no circulating water baths available- place limb in clean bucket with warm water running in.
- Fingers may be immersed in sterile bowl in hand washing sink with warm running water with cooled water allowed to trickle out.
- Feet/ legs: if patient able and accompanied - a shower stall with warm running water.
- Do not rub or massage injured areas as this may cause further injury.
- Patient with frostbitten feet should **not be walking** whenever avoidable.
- Excessive dry heat can cause a burn injury.
- The extremity should be elevated **above heart level** once rewarmed to minimize edema.
- Rewarming can be very painful- assess and provide adequate analgesia. Oral Ibuprofen may be used and may limit injury by blocking prostaglandin production. Stronger analgesics may be required to treat pain.
- Edema and blisters may develop over 12-24 hours. Cold injuries may progress for the first 72 hours making it difficult to determine the extent of injury on early examination.
- Edema and bullae do not appear until **after** rewarming.
- Clinical classification of frostbite injuries should be done **after** rewarming procedure.

*Refer to the Burn Consensus Statement May 2026 for further information on the care of a major burn.