ICU Fluid Resuscitation and Monitoring for Patients with severe burns

Monitoring

- ☐ Intravascular arterial blood pressure
- ☐ CVC (preferably supradiaphragmatic)
- ☐ $ScvO_2$ q3h x 24h then R/A
- ☐ CVP as per ICU protocol
- ☐ Lactate q3h x 24-72h
- ☐ ABGs as per ICU protocol
- ☐ Bladder pressures q6h from 12-72h post burn
  - ☐ Increase frequency if pressures > 15mmHg
- ☐ For facial burns or inhalation injury
  - ☐ Consult Ophthalmology
  - ☐ Consider bronchoscopy

General Management

- ☐ HOB @ 30°
- ☐ Gastric prophylaxis with PPI
- ☐ DVT prophylaxis
- ☐ Burn dressings as per Plastic Surgery
- ☐ Elevate all burned body parts when possible
- ☐ Start uninterrupted enteric feeds as early as possible (as per Dietician) unless legitimate concern for splanchnic hypoperfusion or abdominal compartment syndrome
- ☐ Fecal contaminant system for perineal burns as directed by ICU or Burn Physician
- ☐ Attempt to minimize opioid administration and utilize PRN opioids as soon as feasible

Initial Goals

- ☐ Urine output minimum 30 ml/hr, maximum 50 ml/hr
- ☐ Temperature > 37°C
- ☐ MAP > 65 mmHg
- ☐ $ScvO_2$ > 70%
- ☐ Lactate < 4 mmol/L
- ☐ Hgb > 70
- ☐ Plt > 50 (*Actively bleeding or imminently going to OR)*

Initial Fluid Resuscitation

STEP 1: Calculate initial 24h resuscitation fluid requirements = (2cc of Ringers Lactate)(kg)(%TBSA)/24h: ½ of this IVF is administered in the first 8 hrs (post-burn) and the second ½ is administered in the remaining 16 hrs.

STEP 2: Determine the administered pre-hospital IVF volume, subtract this from your above calculation, and adjust your treatment appropriately.

STEP 3: Monitor urine output hourly and if out of range for two consecutive hours, decrease or increase the RL infusion by a third (1/3) to maintain output between 30-50 ml/hr. Avoid boluses if possible.

NOTE: Hour to hour fluid resuscitation is critical, particularly during first 24 hrs.

OVER-RESUSCITATION CAN BE AS HARMFUL AS UNDER-RESUSCITATION.

STEP 4: If urine output is < 15 ml/hr for two consecutive hours despite increasing fluid rate **OR** patient requires twice current calculated rate for more than two hours:

CALL ICU FELLOW OR ATTENDING, flush urinary catheter, assess breath sounds and bladder pressure. Consider initiating 5% albumin infusion at 1/3 of current resuscitation rate and make up the remainder of the rate with RL, and/or consider selective use of FFP. Titrate rate as above based on urine output.

STEP 5: At 8 hrs post-burn, calculate **PROJECTED** 24 hr resuscitation if fluid rates are kept constant. If the projected 24 hr resuscitation requirements exceeds 6ml/kg/%TBSA burn or 350 ml/kg total, the following steps are recommended:

1) **Initiate 5% albumin infusion** at 1/3 of current resuscitation rate and make up the remainder of the rate with RL. Titrate infusion to urine output as described above. After 24 hrs post burn, titrate the infusion down to maintenance and continue with albumin until 48 hrs post burn.
2) Watch for signs of **intra-abdominal hypertension** (bladder pressure > 15 mmHg, increased airway pressures, decreased urine output, hypotension) and **extremity compartment syndrome** (absent Doppler signal or pulses that are diminishing on serial exams q30-60 mins should prompt consideration of escharotomy).

Recommendations for hypotension

True hypotension MUST BE correlated with urine output.

If MAP is consistently < 65 mmHg and there is evidence of poor end-organ perfusion (U/O < 30 ml/hr, lactate > 4.0, $ScVO_2$ < 70%) the following steps are recommended:

1) **Volume status:** If CVP < 5 or pulse pressure variation < 15 and patient is not breathing spontaneously, administer a fluid bolus of 0.5-1L RL in attempt to improve MAP (it is UNCOMMON to achieve CVP goals of 10-12 in severe burn patients).
2) **Vasopressors:** If MAP is persistently < 65 mmHg, initiate Levophed at 1-20 ug/min to maintain MAP > 65 mmHg (massive burn patients commonly require Levophed 1-5 ug/min due to extensive vasodilatory shock secondary to the massive systemic inflammatory response associated with severe burns).
3) **MAP goal:** If persistently requiring Levophed (1-5 ug/min) consider a MAP goal of > 55 as long as urine output > 30 ml/hr, $ScVO_2$ > 70%, and lactate < 4.
4) **Ca^{2+} and Cortisol** (*discuss with ICU Fellow/Attending before initiation of treatment):* If patient exhibits catecholamine-resistant shock (defined as SBP < 90 mmHg after 1hr of aggressive IVF and vasopressor administration), consider adrenal insufficiency (check a random cortisol and start hydrocortisone 100mg IV q8h) or hypocalcemia (maintain ionized calcium > 1.1 mmol/L.
5) **FFP**: Consider FFP in large burns, refractory shock, burns complicated by inhalational injury with evidence of profound vasodilatory shock, or when the 8 hour check projects > 6 cc/kg/TBSA. Standard applications apply for the correction of consumptive or dilutional coagulopathy.

Last updated December 9th, 2025