Fluid Resuscitation in the Surgical Intensive Care Unit Module

MAP < 65 mmHg and/or Oliguria

- Insert central venous catheter
- Transfuse RBCs if active bleeding or Hgb < 7 gm/dL
- Bolus 2 liters IV of crystalloid solution

CVP > 12 mmHg?

No

Serum Na < 150 meq/L

Yes

3% Sodium Chloride Module

No

Initiate work-up to assess cardiac sufficiency or ingestion of osmotic agent.
3% Sodium Chloride not indicated

Yes

Persistent End-organ hypoperfusion?

Yes

Return to top of algorithm
University of Pennsylvania Medical Center
Department of Surgery: Traumatology/Critical Care Division

3% Sodium chloride Administration Module

**Does Patient Qualify for 3% NaCl?**
- Located in Founders 5 or Rhoads 5 ICU bed
- MAP < 65 mm Hg and/or oliguria (urine output < 0.5 ml/kg/hr)
- Approved by Critical Care Attending physician?
- Serum Na⁺ < 150 mEq/L
- Hemoglobin ≥ 7 mg/dL
- Central venous catheter in place
- Patient without congestive heart failure

**YES to ALL**
- Refer to 3% NaCl Protocol
- Order 3% NaCl 500 mL IV once
- 3% NaCl must be infused via central line
- Draw serum Na⁺ within 1 hr of completion of each infusion
- May repeat administration to meet determinants of adequate organ perfusion

**NO to ANY**
- Patient does not qualify for 3% NaCl Administration

**Return to Fluid Resuscitation Module**
3% Sodium Chloride for Fluid Resuscitation

**Goal:** To resuscitate patients with hypovolemia defined as MAP < 65mm Hg and/or oliguria.

**Patient Eligibility:**
1. Patients must be in a surgical intensive care unit bed under the care of the Surgical Critical Care service and administration of therapy must be per protocol.
2. Patients must be hypovolemic with a MAP < 65mm Hg and/or oliguria (urine output < 0.5 ml/kg/hour).

**Contraindications:**
1. Serum sodium ≥ 150 mEq/L
2. MAP ≥ 65 mmHg and urine output ≥ 0.5 ml/kg/hour
3. Dialysis dependency
4. History of congestive heart failure
5. Current symptoms of congestive heart failure
   - Hypoxia due to pulmonary edema
   - Pink, frothy secretions
   - Severe pulmonary edema on chest X-ray
6. Hemoglobin < 7 gm/dL

**Monitoring:**
All patients receiving 3% sodium chloride for the treatment of hypovolemia must have the following parameters monitored and documented:
1. Central venous pressure via a central venous catheter prior to administration and 1 hour after completion of the infusion
2. Blood pressure and heart rate prior to administration and 1 hour after completion of the infusion
3. Serum sodium prior to infusion and within 1 hour after completion of each dose of 3% sodium chloride administered

**Protocol:**
- Use must be approved by a surgical critical care service attending
- Orders may not be placed as recurring or PRN orders
- 3% sodium chloride must be infused into a central venous catheter

1. Serum sodium must be < 150 mEq/L to receive an infusion of 3% sodium chloride
2. One time dose of 500 ml 3% sodium chloride ordered
   a. Infusion rate specified at 250-999 ml/hr to be delivered using the Alaris pump
   b. 250 ml of the 500 ml 3% sodium chloride bag may be specified to be administered. The patient will be re-assessed after 250 ml is administered to determine if the additional 250 ml is required. An order will be written
for administration of the remaining 250 ml of 3% sodium chloride infusion.

3. Each administration must be performed in accordance with this protocol including reviewing the algorithm.

4. Treatment endpoints:
   The infusion of 3% sodium chloride will be discontinued under the following circumstances:
   a. Serum sodium has increased to $\geq 150$ mEq/L
   b. MAP has increased to $\geq 65$ mm Hg
   c. Urine output has increased to $\geq 0.5$ ml/kg/hour
   d. Lactate has normalized (serum lactate < 1.8 mmol/L)
   e. Signs/symptoms of congestive heart failure or intravascular volume overload develop

5. The maximum volume of 3% sodium chloride that may be administered to a patient is 2 liters in a 24 hour time period.

6. If additional volume resuscitation should be required in the initial 24 hour time period other etiologies of hypovolemia, such as hemorrhage, should be considered.

7. If the patient has ongoing hypovolemia requiring resuscitation in the subsequent 24 hour time period, review and repeat the protocol. Each administration of 3% sodium chloride must be performed in accordance with this protocol. A maximum of 2 liters 3% sodium chloride may be administered in the subsequent 24 hour time period.