NEUROICU Guideline: Osmotherapy for Treatment of Intracranial Hypertension

Hypertonic Saline- 5% NaCl

Goal: To treat intracranial hypertension in severely brain-injured patients who are not eligible for or refractory to mannitol

Patient Eligibility:
1. Patient must be in the NeuroICU and administration of therapy must be per protocol.
2. Patient must have severe intracranial hypertension (ICP ≥ 20mmHg)
3. At least one of the following criteria must be met (see NeuroICU Mannitol algorithm)
   a. Mannitol failure: mannitol has failed to lower ICP to less than 20mmHg within 20 minutes of administration
   b. Mannitol is contraindicated:
      i. Serum osmolar gap > 20
      ii. Mannitol has been administered within the past 6 hrs
      iii. Mannitol is associated with a drop in CPP < 70mmHg
      iv. Significant intravascular volume depletion exists:
         ▪ Based on a clinical assessment by the NeuroCritical Care Service which synthesizes exam findings, laboratory results, and other pertinent clinical data
         ▪ For example: CVP < 6; net negative fluid balance; elevated BUN/creatinine ratio
4. There must be a failure of 5%NaCl to lower ICP:
   a. 20 minutes after administration of 5%NaCl- ICP remains above 20mmHg OR
   b. Severe intracranial hypertension (ICP ≥ 20mmHg) recurs within 4 hrs of administration of 5%NaCl

Contraindications:
1. ICP < 20 mmHg
2. Severe CHF
   a. Hypoxia due to pulmonary edema
   b. Pink, frothy secretions
   c. Severe pulmonary edema on CXR
3. Significant volume overload:
   a. Based on a clinical assessment by the NeuroCritical Care Service which synthesizes exam findings, laboratory results, and other pertinent clinical data
   b. Use caution if CVP ≥ 15 mmHg or PAOP ≥ 12 mmHg
4. Serum Na⁺ ≥ 160 mmol/L
5. Chronic hyponatremia
6. Diabetes Insipidus (DI)
7. Relative Contraindication: Primary intracerebral hemorrhage
**Monitoring:**
All patient receiving HTS for the treatment of intracranial hypertension must have the following parameters monitored and documented:

1. Central venous pressure via a central venous catheter OR pulmonary artery occlusion pressure via a pulmonary artery catheter
2. Intracranial pressure monitoring
3. Serum $\text{Na}^+$ every 2 hrs
4. All other monitoring and documentation per NeuroICU protocol

**Documentation:**
Treatment Checklist **must** be completed prior to the administration of HTS. This form is returned to the Nurse Manager or CNS.

**Protocol:**

** Use must be approved by Neurocritical Care Attending
** HTS must be infused into a central venous catheter.

1. **STAT** serum $\text{Na}^+$ must be checked and recorded under the following conditions:
   a. Last serum $\text{Na}^+$ value was obtained $> 2$ hrs prior to planned HTS administration **OR**
   b. Mannitol has been administered since the last serum $\text{Na}^+$ value was obtained.

2. If $\text{ICP} \geq 20$mmHg **AND** serum $\text{Na}^+ < 160$ mmol/L **AND** all of the above criteria are met, patient is eligible to receive $5\%\text{NaCl}$

3. Administer $150$ml bolus of $5\%\text{NaCl}$:
   a. MD will order a **one-time dose**: $5\%\text{NaCl} 150$ml IV over 9 minutes and follow-up **STAT** serum $\text{Na}^+$ 2 hours post administration.
   b. Serum $\text{Na}^+$ levels must be checked and recorded 2 hours post administration. Notify MD if serum $\text{Na}^+ > 160$mmol/L.
   c. Administration of HTS may **not** be repeated more frequently than every 4 hours
   d. Each administration must be performed in accordance with this protocol including reviewing the algorithm.

4. If $5\%\text{NaCl}$ bolus fails to lower ICP below $20$mmHg within $20$ minutes of administration OR ICP increases above $20$mmHg within $4$ hours of administration, a continuous IV infusion of $3\%\text{NaCl}$ may be considered. (*See NeuroICU Osmotherapy Guidelines for Treatment of Intracranial Hypertension: Hypertonic Saline- $3\%\text{NaCl}$)