INTRAVENOUS FLUID THERAPY CLINICAL CARE RECOMMENDATIONS

Clinical Assessment

• Vital signs on admission
• Evaluate hydration status clinically

Monitoring

• Vital signs per nursing protocol
• Document intake and output
• Ongoing assessment for signs of dehydration
  o Dry mouth and tongue
  o Crying without tears
  o Decreased urine output
  o Delayed capillary refill
  o Poor skin turgor
  o Weight loss
• Observe for clinical signs of hyponatremia
  o Lethargy
  o Irritability
  o Weakness
  o Seizures

Fluids, Electrolytes, Nutrition

• Consider enteral fluids before administering IV fluids
• IV bolus
• Selection of Intravenous Fluids
• Given concern for excess ADH secretion, providing IVF at a volume greater than maintenance is discouraged. Instead, monitor for ongoing losses and replace as needed.
• Advance oral intake and reduce IVF as clinically tolerated

Laboratory Studies

• Baseline electrolytes may be considered when starting IVF therapy in hospitalized children.
• Obtain daily sodium levels in patients at high risk for ADH secretion receiving maintenance fluids
• Obtain sodium levels in other patients receiving prolonged maintenance IVF
• If serum Na is less than 130 mEq/L or greater than 150 mEq/L, obtain repeat electrolytes every 6 hours until corrected
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TARGET POPULATION

Inclusion Criteria
- All inpatients except those listed below

Exclusion Criteria
Patients with:
- Acute kidney injury
- Chronic renal failure
- Hypernatremia
- Endocrine or renal abnormalities leading to electrolyte derangements
- Oncology treatment protocol
- Admission to NICU

BACKGROUND | DEFINITIONS

Intravenous maintenance fluid therapy consists of water and electrolytes to replace daily losses in ill children in whom enteral fluids are insufficient. Based on the Holliday Segar formula, hypotonic fluids have been widely used in pediatrics for several decades. However, accumulating evidence shows that using hypotonic fluids may lead to an increased risk of hyponatremia. Studies have been limited by a significant number of surgical patients and varying intravenous fluid (IVF) regimens including fluids containing less than ½ normal saline (NS). Besides the use of hypotonic fluids, many hospitalized children are felt to have non-osmotic stimuli for anti-diuretic secretion (e.g. post-surgical patients, respiratory infections, neurologic disease) which leads to a decrease in free water excretion and may contribute to hyponatremia. Symptomatic hyponatremia manifests as central nervous system symptoms including lethargy, irritability, weakness, seizures, coma, and even death. These clinical care recommendations were developed with the aim of decreasing iatrogenic hyponatremia in hospitalized children.
Definitions

- **Hyponatremia**: serum sodium (Na) less than or equal to 135 mEq/L
- **Hypotonic fluids**: fluids with a lower osmotic pressure than blood (e.g. dextrose 5% in 0.45% sodium chloride [D5 1/2NS], dextrose 5% in 0.225% sodium chloride [D5 ¼ NS])
- **Isotonic fluids**: fluids with osmotic pressure equal to blood (e.g. dextrose 5% in 0.9% sodium chloride [D5 NS])

**CLINICAL ASSESSMENT**

- Vital signs on admission
- Evaluate hydration status clinically

**MONITORING**

- Vital signs per nursing protocol
- Document intake and output
- Ongoing assessment for signs of dehydration
  - Dry mouth and tongue
  - Crying without tears
  - Decreased urine output
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  - Poor skin turgor
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  - Lethargy
  - Irritability
  - Weakness
  - Seizures

**FLUIDS, ELECTROLYTES, NUTRITION**

- Consider enteral fluids (oral, nasogastric [NG]) before administering IV fluids
- NG feeds have been safely used in infants hospitalized with bronchiolitis
- **IV bolus**: initial 20 mL/kg NS or lactated Ringer’s (LR) for rehydration; repeat as clinically indicated
- **Selection of Intravenous Fluids**
  - Hypotonic Fluids (less than ½ NS) should not be used to provide routine fluid maintenance therapy
    - For the rare patient with hypernatremic dehydration, particularly one with diabetes insipidus or any excess in free water losses, there is a place for hypotonic solutions such as D5 ¼ NS or even dextrose 5% in water [D5W], depending on their clinical circumstances and other losses
  - Patients who are considered to be at high-risk of antidiuretic hormone (ADH) secretion (e.g. post-surgical patients, respiratory infections, neurologic disease), isotonic saline (e.g. D5 NS) for maintenance requirements is recommended
  - Patients not at risk of ADH secretion, D5 1/2NS and D5 NS are recommended
• Current data cannot definitively state there is an increased risk of hyponatremia with ½ NS compared to NS.
  o In a small, randomized control trial of non-surgical, non-ICU hospitalized children, serum Na levels were similar at 24 hours and 48 hours in those receiving D5 NS compared to those receiving D5 ½ NS.\textsuperscript{5}

However, D5 NS is preferred as there is no reported increased risk of adverse effects from using NS.

• Given concern for excess ADH secretion, providing IVF at a volume greater than maintenance is discouraged. Instead, monitor for ongoing losses and replace as needed.
• Advance oral intake and reduce IVF as clinically tolerated

LABORATORY STUDIES | IMAGING

• Baseline electrolytes may be considered when starting IVF therapy in hospitalized children, if this may change management
• Obtain daily sodium levels in patients at high risk for ADH secretion receiving maintenance fluids
  o Even patients receiving isotonic fluids can develop hyponatremia\textsuperscript{2}
• Obtain sodium levels in other patients receiving prolonged maintenance IVF
• If serum Na is less than 130 mEq/L or greater than150 mEq/L, obtain repeat electrolytes every 6 hours until corrected
REFERENCES


5. Freidman J BC, DeGroot J, et al. Maintenance Intravenous Fluid in Hospitalized Children: A Randomized, Double Blind, Controlled Trial of 0.9% NaCl/Dextrose 5% vs. 0.45% NaCl/Dextrose 5%. In: Pediatric Academic Societies Annual meeting; 2013; Washington DC; 2013.
CLINICAL IMPROVEMENT TEAM MEMBERS

Jenny Reese, MD | Hospitalist Medicine
Alison Brent, MD | Emergency Medicine
Mike DiStefano, MD | Emergency Medicine
Douglas Ford, MD | Nephrology
Ada Koch, PharmD | Clinical Pharmacist
Christina. Olson, MD | Hospitalist Medicine
Barry Seltz, MD | Hospitalist Medicine
Kaitlin Widmer, MD | Hospitalist Medicine
Karen Wilson, MD | Hospitalist Medicine
Denise Pickard, RN, MSN | Clinical Care Guideline Coordinator

APPROVED BY

Pharmacy and Therapeutics Committee - August 2014
Approved by: The Children’s Hospital Colorado Guideline Review Committee - August 2014

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<td>Daniel Hyman, MD, MMM, Chief Quality Officer, Children’s Hospital Colorado</td>
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REVIEW/REVISION SCHEDULE

Scheduled for full review on November 20, 2018

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