

CORE SKILLS**FLUID AND ELECTROLYTE MANAGEMENT****INTRODUCTION**

Many infants and children are hospitalized in the United States each year for fluid and electrolyte disorders. Dehydration from gastroenteritis alone accounts for more than 200,000 pediatric hospitalizations each year. An understanding of pediatric fluid therapy is one of the most important advances of pediatric medicine and a cornerstone of current inpatient pediatric practice. Although the majority of previously healthy hospitalized children can compensate for errors in calculations of fluid therapy, mistakes, even in healthy children admitted for minor illnesses, can have devastating outcomes. Patients with underlying disease processes are at even greater risk for adverse outcomes if fluids and electrolytes are not meticulously managed. Pediatric hospitalists should be experts at managing frequently encountered fluid and electrolyte abnormalities.

KNOWLEDGE

Pediatric hospitalists should be able to:

- Discuss the physiology of fluid and electrolyte homeostasis and the changes that occur with growth and development.
- Discuss how maintenance fluid calculations are based upon water and electrolyte homeostasis using various methods such as the body surface area or Holliday Segar methods. Describe the methods used for calculation of excessive fluid losses due to causes such as diarrhea, increased ostomy output, burns, and vomiting; identify the best fluid replacement type for each.
- Describe common errors in clinical estimations of dehydration and fluid and electrolyte requirements.
- Explain the rationale, indications and contraindications for oral rehydration, including the correct glucose and electrolyte composition and technique for administration.
- Discuss the benefits of and barriers to use of nasogastric tubes for administering enteral fluids.
- Discuss the options and indications for different methods of parenteral fluid administration, including intravenous, intraosseous, and subcutaneous.
- Review the indications for administering a parenteral fluid bolus for resuscitation and explain the rationale for the use of isotonic fluids for rehydration.
- Discuss the benefits and risks of repeated lab testing and intravenous access placement, including cost, pain, effect on clinical management, family/caregiver perceptions, staff time, and others.
- Compare and contrast true hyponatremia with pseudohyponatremia and give examples of conditions in which these exist.
- List differential diagnoses for hyponatremia and hypernatremia.
- Summarize the management of hypo- and hypernatremia, attending to duration of corrective therapy and potential complications during correction.
- Distinguish between hyperkalemia and pseudohyperkalemia and give examples of the conditions in which these exist.
- List differential diagnoses for hypokalemia and hyperkalemia.
- Distinguish hypocalcemia from pseudohypocalcemia and give examples of the conditions in which these exist.
- Discuss the interaction of fluid and electrolytes with acid/base balance.
- Describe common acid/base disturbances that accompany the most frequently encountered causes of fluid deficit and give examples of exacerbating issues such as underlying co-morbidity and use of over-the-counter medications.

SKILLS

Pediatric hospitalists should be able to:

- Accurately calculate maintenance fluid and electrolyte requirements for hospitalized infants and children.
- Promptly adjust maintenance fluids for increased insensible losses and ongoing fluid and electrolyte needs.
- Estimate the degree of dehydration for children of various ages based upon clinical symptoms and signs.
- Recognize common presenting signs and symptoms in infants and children that are associated with an excess or deficit of each common electrolyte and glucose.
- Correctly estimate osmolar disturbance by interpreting electrolyte, glucose and blood urea nitrogen results.
- Calculate and administer an isotonic fluid bolus correctly when indicated.
- Obtain intravenous or intraosseous access in moderate to severely dehydrated patients.

- Assess the success of fluid resuscitation by interpreting clinical change and laboratory values.
- Calculate and administer maintenance and deficit fluid replacement for isotonic, hypertonic, and hypotonic dehydration.
- Interpret urine and serum electrolytes and osmolality, as well as fluid status (hypo, hyper or isovolemic), to determine the etiology for hyponatremia or hypernatremia.
- Correct hyponatremia using appropriate replacement or restriction of fluids, sodium chloride, and medications depending upon the diagnosis.
- Correct hypernatremia using an appropriate electrolyte composition and rate of fluid replacement, as well as medications depending upon the diagnosis.
- Correct hypoglycemia using an appropriate replacement solution.
- Interpret EKG findings in the context of specific electrolyte abnormalities.
- Safely prescribe electrolyte replacement therapy and institute proper monitoring for arrhythmias.
- Correct symptomatic hyperkalemia using a combination of therapies to stabilize cardiac conduction, redistribute potassium to the intracellular space and remove it from the body.

ATTITUDES

Pediatric hospitalists should be able to:

- Consult pediatric subspecialists appropriately to expedite the diagnosis and management of serious electrolyte disorders.
- Recognize the benefits of oral rehydration and advocate for its use when indicated and clinically appropriate.
- Coordinate subspecialty and primary care follow up for patients with persistent disturbances at discharge as appropriate.
- Consider cost-effectiveness, pain, and patient safety when creating plans for the treatment of fluid deficits.

SYSTEMS ORGANIZATION AND IMPROVEMENT

In order to improve efficiency and quality within their organizations, pediatric hospitalists should:

- Lead, coordinate or participate in plans to develop institutional policies to safely monitor and administer fluids and electrolytes.
- Work collaboratively with others such as surgeons, intensivists, and advanced practice nurses to establish venous access when needed.
- Lead, coordinate or participate in developing guidelines for the treatment of fluid and electrolyte abnormalities in the hospital and community.