DoM | DEPARTMENT of MEDICINE
Improving Lives

OBJECTIVES FOR COMMON CLINICAL PROBLEMS

Fluid, Electrolyte and Acid-Base Disorders

A. KNOWLEDGE: Students should be able to define, describe and discuss:

1. The pathophysiology of:
   - Hypo- and hypervolemia
   - Hypo- and hypernatremia
   - Hypo- and hyperkalemia
   - Hypo- and hypercalcemia
   - Simple and mixed acid-base disorders
   - Respiratory acidosis and alkalosis
   - Metabolic acidosis and alkalosis
2. Presenting symptoms and signs of the above disorders
3. The importance of total body water and its distribution
4. The differential diagnosis of hypo- and hypernatremia in the setting of volume depletion, euvolemia, and hypervolemia
5. How to distinguish hyponatremia from pseudohyponatremia
6. How to identify spurious hyperkalemia or acidosis-related hyperkalemia
7. Risks of too rapid or delayed therapy for hyponatremia
8. The most common causes of respiratory acidosis, respiratory alkalosis, metabolic acidosis and metabolic alkalosis
9. How to calculate the anion gap and explain its relevance to determining the cause of a metabolic acidosis
10. Changes in total body water distribution that occur with aging
11. Tests to use in the evaluation of fluid, electrolyte, and acid-base disorders
12. Indications for obtaining an ABG
13. The types of fluid preparations to use in the treatment of fluid and electrolyte disorders

B. SKILLS: Students should demonstrate specific skills, including:

1. History-taking skills: Students should be able to obtain, document, and present an age-appropriate medical history that differentiates among etiologies of disease, including:
    - Eliciting appropriate information from patients with volume overload, symptoms of heart failure, dietary sodium intake, changes in medications, noncompliance and intravenous fluid regimens
    - Eliciting appropriate information from patients with volume depletion, including recent weight loss, thirst, gastrointestinal losses, urinary losses, oral intake, insensible losses, and intravenous fluid regimens.
    - Eliciting appropriate information from patients with electrolyte problems, including use of diuretics and other medications, gastrointestinal losses, and history of relevant medical conditions (e.g., heart failure, liver disease, renal disease, pulmonary disease, central nervous system disease, and malignancy).

2. Physical exam skills: Students should be able to perform a physical exam to establish the diagnosis and severity of disease, including:
    - Measurement of orthostatic vital signs
    - Identification of signs of hyper and hypovolemia
    - Identification of signs of sodium disorders including lethargy, weakness, encephalopathy, delirium, seizures
    - Identification of signs of potassium disorders including weakness, fatigue, constipation, ileus, cramping, tetany, hypo- or hyperreflexia.
    - Identification of signs of calcium disorders including cramping, tetany, Chvostek's and Trousseau's sign, seizures, anorexia, constipation, polyuria, hypo- or hyperreflexia, delerium

3. Differential diagnosis: Students should be able to generate a prioritized differential diagnosis recognizing specific history, physical exam, and laboratory findings that distinguish between:
    - Hypo- and hypervolemia
    - Hypo- and hypernatremia
    - Hypo- and hyperkalemia
    - Hypo- and hypercalcemia
    - Respiratory acidosis and alkalosis
    - Metabolic acidosis and alkalosis

4. Laboratory interpretation: Order and interpret diagnostic and laboratory tests based on the differential diagnosis. These may include:
    - Serum electrolytes, Anion Gap, Urea, Cr
    - ABG
    - Serum and urine osmolality, urinary sodium
    - ECG findings in hyper- and hypokalemia

5. Management skills: Students should be able to develop an appropriate evaluation and treatment plan for patients that includes:
    - Write appropriate fluid orders for the treatment of hypo- and hypervolemia, hypo- and hypernatremia, hypo- and hyperkalemia, hypo- and hypercalcemia
    - Write appropriate orders for replacing sodium, potassium, calcium
    - Write appropriate orders for correcting hyperkalemia, hypercalcemia
    - Calculate the water deficit that needs to be corrected to treat hypernatremia
    - Identify indications for administration of bicarbonate

Approved by Department of Medicine Undergraduate Medical Education Committee
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