

Electrolyte Priorities and Imbalances

Key: Electrolytes and Their Influence
Standard paramedic texts (eg., Brady:
Fluids and Electrolytes, '97 pp 290-292)

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Objectives

Upon completion of this lecture you should be able to discuss :

- Definition of electrolytes, cations and anions
- Distribution and relative concentrations of electrolytes
- Some introduction to the clinical conditions associated with electrolyte problems

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Objectives (cont.)

And you should be able to :

- Begin to correlate abnormal signs and symptoms with certain clinical situations in which patients are at risk for rapid deterioration
- Identify the need for prompt intervention in a patient with a certain (but not all) fluid and electrolyte emergencies
- Discuss priorities and relative risks associated with various fluid and electrolyte emergencies

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Priorities in Fluid and Electrolyte Management

When fluids and electrolytes are altered, they should be corrected in the following order:

- Volume
- pH
- Potassium, calcium, and magnesium
- Sodium and chloride

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Electrolytes

- Chemicals that carry an electrical charge (when dissolved in water) are ions
 - In human physiology these ions are referred to as electrolytes
- Positively charged electrolytes : cations
 - Na^+ , K^+ , Ca^{++} , Mg^{++}
- Negatively charged electrolytes : anions
 - Cl^- , HCO_3^- , HPO_4^{--}

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Electrolytes

- Unit of measurement: milliequivalent
 - electrolytes are expressed in:
 - equivalent ionic electrical charges
 - equivalent chemical activity
 - rather than molecular weights or mgs
- Unit of concentration in a physiologic spaces: milliequivalent per vol, or mEq/L

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Fluid and Cellular Electrolyte Equilibrium

- Electrolyte composition
 - cellular and non-cellular spaces differ in:
 - cation concentration
 - anion concentrations
- Composition and distribution
 - In intracellular fluid: K^+ and HPO_4^{2-}
 - In extracellular fluid: Na^+ and Cl^-

(see excellent tables in Key)

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Fluid and Cellular Electrolyte Equilibrium

Homeostasis or equilibrium

- Requires a maintenance of the normal, physiologic concentrations of water and electrolytes in the:
 - Cells
 - Intravascular fluid / blood
 - Interstitial fluid

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Equilibrium of Fluid, Electrolytes, and pH

- Volume
 - "Treat hypoxia ; treat shock"
 - Adequate tissue perfusion will often spontaneously correct fluid, electrolytes, and pH problems
- Fluids, electrolytes, and pH are intertwined
 - In correcting of any one facet, must be mindful of other / overall effects
 - For example, in correcting hypovolemia and pH

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Equilibrium and Disequilibrium of Electrolytes and pH

- Rapid NS volume replacement may :
 - alters pH
 - which in turn alters potassium distribution, shifting K^+ between the ECF and ICF spaces
- Shifts are important
 - consider the role of potassium
 - maintaining the resting membrane potential

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Equilibrium and Disequilibrium of Electrolytes and pH

- Significant and rapid K^+ shifting
 - back and forth between intracellular and extracellular in response to :
 - acid-base imbalances
- These shifts are important
 - vital organ function: the heart
 - propagation of electrical impulses

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Disequilibrium of Electrolytes and pH

Critical electrolyte shifts

- Propagation of electrical impulses
 - particularly important because of arrhythmias
 - PVCs
 - *V tach*
 - *V fib*

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Priorities in Fluid and Electrolyte Management

When fluids and electrolytes are altered, they should be corrected with the following order of priority and rapidity:

- Volume – immediately [minutes]
- pH – quickly [minutes to hours]
- Potassium, calcium, and magnesium
- Sodium and chloride – gradually [days]

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Priorities in Fluid and Electrolyte Management

Consequences of fluids and electrolyte alterations and related considerations [ABCDEs] in treatment :

- Inadequate Volume – hypovolemic shock [C]
- Acidotic pH – metabolic shock [C]
- High or low Potassium – arrhythmias [C]
- High or low Sodium – seizures [D]

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Summary

We have discussed :

- Electrolytes, cations and anions
- Relative concentrations of electrolytes
- Certain fluid and electrolyte situations in which patients are at risk for rapid deterioration
- The need for prompt intervention in a patient with a certain (but not all) fluid and electrolyte emergencies
- Priorities and relative risks associated with various fluid and electrolyte emergencies

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