

| Adult Critical and Intermediate Care Electrolyte Replacement Protocol | |
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BACKGROUND

Standing electrolyte replacement protocols are needed for use in adult patients admitted to a critical or intermediate care unit. In order to activate the electrolyte replacement protocol, the prescriber must first order the “Adult Electrolyte Replacement Protocol – Critical/Intermediate Care” powerplan. The prescriber’s order for the “Adult Electrolyte Replacement Protocol – Critical/Intermediate Care” powerplan authorizes the nurse to order and administer all electrolyte replacement doses (ordered via separate electrolyte-specific subphases) and laboratory orders as defined per protocol. If the prescriber determines that more aggressive electrolyte replacement is warranted, the protocol should NOT be ordered. Portions of the electrolyte replacement protocol may be suspended or altered during times of critical electrolyte product shortages. Any changes to the protocol due to medication shortages will be communicated to the providers and nurses.

Replacement protocols should NOT be used in the following patients:

- Patients with a serum creatinine (SCr) > 2 mg/dL
- Patients with urinary output < 30 mL/hr for more than 4 hours
- Patients who weigh < 50 kg
- Patients requiring renal replacement therapy
- Patients with diabetic ketoacidosis (DKA)
- Patients undergoing targeted temperature management (i.e., therapeutic hypothermia)

The prescriber should be notified if the patient’s electrolyte deficiency does not correct after two rounds of electrolyte replacement in 24 hours.

LABORATORY MONITORING

When the electrolyte replacement protocols are prescribed for a patient via CPOE, laboratory orders for an AM basic metabolic panel, magnesium level, phosphorus level and ionized calcium level will be automatically ordered for a duration of 10 days. If AM laboratory levels have not been ordered for the electrolytes included in the protocol, the nurse has the authority to place these orders. Additional monitoring is specified for the individual electrolytes.

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POTASSIUM CHLORIDE REPLACEMENT PROTOCOL

- Replacement doses are ordered by the nurse via “Potassium Replacement Subphase – Adult Critical/Intermediate Care” subphase
- Telemetry monitoring is required for infusion rates > 10 mEq/hr.
- If serum potassium level < 3 mEq/L, order URGENT magnesium level if no result in prior 24 hours.
- If serum potassium level > 3 mEq/L and the patient is able to tolerate a diet, enteral administration is preferred.
- A combination of enteral and parenteral replacement may be utilized
- In situations where multiple enteral doses are required, the doses will be administered every 4 hours to decrease GI discomfort.

| Serum Potassium Level (mEq/L) | Total Potassium Replacement | Enteral Administration | Central IV Administration (Rate 20 mEq/hr) | Peripheral IV Administration (Rate 10 mEq/hr) | Monitoring |
|-------------------------------|------------------------------------|--|--|---|--|
| 3.6 – 3.9 | 40 mEq | 40 mEq x 1 dose | 20 mEq IV Q1H x 2 doses | 10 mEq IV Q1H x 4 doses | Recheck serum potassium level with next AM labs |
| 3.3 – 3.5 | 60 mEq | 20 mEq x 3 doses | 20 mEq IV Q1H x 3 doses | 10 mEq IV Q1H x 6 doses | Recheck serum potassium level 2 hours after total replacement complete |
| 3 – 3.2 | 80 mEq | 40 mEq x 2 doses | 20 mEq IV Q1H x 4 doses | 10 mEq IV Q1H x 8 doses | |
| < 3 | 100 mEq and Notify Provider | 40 mEq PO x 1 dose PLUS 20 mEq/100 mL IV Q1HR x 3 doses if <u>central IV</u> access OR 40 mEq PO x 1 dose PLUS 10 mEq/100 mL IV Q1HR x 6 doses if <u>peripheral IV</u> access OR 40 mEq PO x 2 doses PLUS 20 meq PO x 1 dose if no IV access | 20 mEq IV Q1HR x 5 doses | 10 mEq IV Q1HR x 10 doses | |

MAGNESIUM SULFATE REPLACEMENT PROTOCOL

- Replacement doses are ordered by the nurse via “Magnesium Replacement Subphase – Adult Critical/Intermediate Care” subphase

| Serum Magnesium Level (mg/dL) | Total Magnesium Replacement | Monitoring |
|-------------------------------|---|--|
| 1.8 – 1.9 | 2 gm/50 mL IV x 1 dose | Recheck serum magnesium level with next AM labs |
| 1.5 - 1.7 | 4 gm/100 mL IV x 1 dose | Recheck serum magnesium level 2 hours after infusion |
| ≤ 1.4 | 4 gm/100 mL IV x 2 doses and Notify Prescriber | |

PHOSPHORUS REPLACEMENT PROTOCOL

- Replacement doses are ordered by the nurse via “Phosphorus Replacement Subphase – Adult Critical/Intermediate Care” subphase
- If the patient is able to tolerate a diet, enteral administration is preferred.
- All sodium phosphate orders will automatically be rounded to the nearest standardized dose (ie, 15, 30, or 45 mmol).
- Potassium phosphate may be utilized for replacement if potassium and phosphorus are low, but is outside the scope of this protocol. Potassium phosphate 3 mmol/mL contains potassium 4.4 mEq/mL.

| Serum Phosphorus Level (mg/dL) | Total Phosphate Replacement | Monitoring |
|--------------------------------|--|--|
| 2.5 – 3.5 | <p>Enteral Access: Neutraphos 1 EA PO TID x 3 doses</p> <p>No Enteral Access: Sodium phosphate 15 mmol IV x 1 dose</p> | Recheck serum phosphorus level with next AM labs |
| 1.5 – 2.4 | Sodium phosphate 30 mmol IV x 1 dose | Recheck serum phosphorus level 2 hours after infusion complete |
| ≤ 1.4 | Sodium phosphate 45 mmol IV x 1 dose and Notify Prescriber | |

CALCIUM GLUCONATE REPLACEMENT PROTOCOL

- Replacement doses are ordered by the nurse via “Calcium Replacement Subphase – Adult Critical/Intermediate Care” subphase
- Use current ionized calcium level if available. If unavailable, use corrected serum calcium level.
- Calculate corrected serum calcium level using equation below:
Corrected serum calcium = Serum calcium level + [(0.8)(4 – albumin in g/dL)]
- The use of calcium chloride for replacement is outside of the scope of this protocol.
- If patient is able to tolerate a diet, enteral replacement is preferred.

| Ionized Calcium Level (mg/dL) | Corrected Calcium Level (mg/dL) | Total Calcium Replacement | Monitoring |
|-------------------------------|---------------------------------|--|--|
| 3.5 – 3.9 | 7.8 – 8.3 | Enteral Access: Calcium carbonate 1,250 mg PO TID x 24 hours No Enteral Access: Calcium gluconate 1 gm/100 mL IV over 1 hour X 1 dose | Recheck serum ionized calcium level with next AM labs |
| 3 – 3.4 | 7 – 7.7 | Calcium gluconate 2 gm/100 mL IV x 1 dose | Recheck serum ionized calcium level 2 hours after infusion completed |
| ≤ 2.9 | ≤ 6.9 | Calcium gluconate 2 gm/100 mL IV x 2 doses and Notify Prescriber | |

REFERENCES & RELATED PROTOCOLS

1. Zaloga GP. Electrolyte disorders. In: Civetta JM, Taylor RW, Kirby RR (Eds.) Critical Care. 3rd ed. Lippincott, Philadelphia, PA; 1992: 481-505.
2. Spalding HK and Goodwin SR. Fluid and Electrolyte Disorders in the Critically Ill. Seminars in Anesthesia, Perioperative Medicine and Pain. 1999; 18(1); 15-26.
3. Geerse DA et al. Treatment of hypophosphatemia in the intensive care unit: a review. Crit Care. 2010; 14(4); R147.

Safe Preparation and Intravenous Administration of Potassium Chloride, Potassium Acetate, and Potassium Phosphate

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