PROTOCOL

Title: Nurse-Managed Electrolyte Protocol
Area/Department: Vanderbilt University Hospital (VUH) Intensive Care Units

The following protocol, once initiated by a provider’s order for a specific patient, has been approved for implementation by RN, LPN, Other: [specify]

Protocol: Outlines the specific interventions that Registered Nursing staff are to follow for a patient admitted to the VUH intensive care unit (ICU) with electrolyte imbalance(s).

INCLUSION CRITERIA

Patient must meet ALL inclusion criteria below:

• Patient age 16 years or older;
• Patient currently admitted to VUH ICU;
• Patient does not have an active order for transfer out of the ICU;
• Active order for “Initiate Adult Electrolyte Replacement Protocol” with electrolyte(s) selection:
  o Calcium;
  o Magnesium;
  o Potassium; and/or
  o Phosphorous; and
• Patient does not currently have any known or documented contraindications below:
  o Hemodialysis/peritoneal dialysis;
  o Creatinine clearance (CrCl) less than 20 mL/min;
  o Chronic adrenal insufficiency;
  o New electrical burns;
  o Rhabdomyolysis;
  o Diabetic ketoacidosis;
  o New crush injury;
  o Hypothermic patients; and/or
  o Tumor lysis syndrome.

EXCLUSION CRITERIA

Patient meets any one of the following exclusion criteria:

• Patient age less than 16 years;
• Patient not currently admitted to VUH ICU intensive care unit;
• Patient has an active order for transfer out of the ICU; or
• No active order for “Initiate Adult Electrolyte Replacement Protocol” with appropriate electrolyte(s) selection:
  o Calcium;
  o Magnesium;
  o Potassium; and/or
• Patient has any known or documented contraindications below:
  o Hemodialysis/peritoneal dialysis;
  o CrCl less than 20 mL/min;
  o Chronic adrenal insufficiency;
  o New electrical burns;
  o Rhabdomyolysis;
  o Diabetic ketoacidosis;
  o New crush injury;
  o Hypothermic patients; and/or
  o Tumor lysis syndrome.

INTERVENTIONS
• Screen patient for inclusion and exclusion criteria;
• Enter order(s) for calcium, magnesium, potassium, and/or phosphorous doses with lab monitoring as indicated in the tables below:

**Calcium Replacement**

<table>
<thead>
<tr>
<th>Ionized Calcium Level</th>
<th>Dose and Route</th>
<th>Enter Repeat Ionized Calcium Laboratory Order:</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 4.0 mg/dL</td>
<td>No repletion necessary</td>
<td>No repletion necessary</td>
</tr>
<tr>
<td>3.5-3.9 mg/dL</td>
<td>4 g calcium gluconate IV</td>
<td>With next AM labs</td>
</tr>
<tr>
<td>3-3.4 mg/dL</td>
<td>6 g calcium gluconate IV</td>
<td>4 hours after replacement</td>
</tr>
<tr>
<td>2.5-2.9 mg/dL</td>
<td>8 g calcium gluconate IV</td>
<td>4 hours after replacement</td>
</tr>
<tr>
<td>&lt; 2.5 mg/dL</td>
<td>10 g calcium gluconate IV and <strong>notify provider immediately</strong></td>
<td>4 hours after replacement</td>
</tr>
</tbody>
</table>

**Magnesium Replacement**

<table>
<thead>
<tr>
<th>Magnesium Level</th>
<th>Dose and Route</th>
<th>Enter Repeat Magnesium Laboratory Order:</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 2.0 mg/dL</td>
<td>No repletion necessary</td>
<td>No repletion necessary</td>
</tr>
<tr>
<td>1.3-1.9 mg/dL</td>
<td>4 g magnesium sulfate IV</td>
<td>Not required</td>
</tr>
<tr>
<td>≤ 1.2 mg/dL</td>
<td>8 g magnesium sulfate IV</td>
<td>6 hours after replacement</td>
</tr>
</tbody>
</table>
Potassium Replacement

- Before entering every potassium replacement order for potassium ≤ 3.9, review phosphorous level to determine which potassium product to administer:
  - If phosphorous level > 2.5 mg/dL, enter orders for potassium replacement using potassium chloride (KCl) with lab monitoring provided in potassium replacement table below;
  - If phosphorous level ≤ 2.5 mg/dL, enter orders for potassium replacement using potassium phosphate (KPhos) with lab monitoring provided in the phosphorous replacement table under “phosphorous replacement” section;
- Replacement of potassium by mouth (PO) or per tube (PT) is preferred if patient able to tolerate other enteral medications. If intravenous replacement is required, follow the instructions below:
  - If central line is present and continuous cardiac monitoring, administer ordered potassium dose at rate of 20 mEq/hr;
  - If peripheral access only, administer ordered potassium dose at rate of 10 mEq/hr;

<table>
<thead>
<tr>
<th>Potassium Level</th>
<th>Dose and Route</th>
<th>Enter Repeat Potassium Laboratory Order:</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 4.0 mEq/L</td>
<td>No repletion necessary</td>
<td>No repletion necessary</td>
</tr>
<tr>
<td>3.3-3.9 mEq/L</td>
<td>KCl 40 mEq controlled-release tablet PO or KCl 40 mEq oral powder packet PT or KCl 40 mEq IV if enteral route not available</td>
<td>Not required</td>
</tr>
<tr>
<td>3-3.2 mEq/L</td>
<td>KCl 60 mEq controlled-release tablet PO or KCl 60 mEq oral powder packet PT or KCl 60 mEq IV if enteral route not available</td>
<td>With next AM labs</td>
</tr>
<tr>
<td>2.6-2.9 mEq/L</td>
<td>KCl 80 mEq IV and notify provider immediately</td>
<td>Immediately after replacement and with next morning labs</td>
</tr>
<tr>
<td>&lt; 2.6 mEq/L</td>
<td>KCl 100 mEq IV and notify provider immediately</td>
<td>Immediately after replacement and with next AM labs</td>
</tr>
</tbody>
</table>

Phosphorous Replacement

- Before entering every phosphorous replacement order for phosphorous ≤ 2.5 mg/dL, review potassium level to determine which phosphorous product to administer:
  - If potassium ≥ 4 mEq/L, enter orders for phosphorous replacement using sodium phosphate (NaPhos) with lab monitoring as indicted in the phosphorous replacement table below;
  - If potassium level < 4 mEq/L, enter orders for phosphorous replacement using KPhos with lab monitoring provided in the phosphorous replacement table below;
- Replacement of phosphorous by mouth or per tube is preferred if patient able to tolerate other enteral medications.

<table>
<thead>
<tr>
<th>Phosphorous Level</th>
<th>Dose and Route</th>
<th>Enter Repeat Phosphorous Laboratory Order:</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 2.5 mg/dL</td>
<td>No repletion necessary</td>
<td>No repletion necessary</td>
</tr>
<tr>
<td>2-2.5 mg/dL</td>
<td>KPhos Neutral tablet: 2 tabs PO/PT q4h x 3 doses or KPhos 15mmol IV or NaPhos 15mmol IV</td>
<td>With next AM labs</td>
</tr>
</tbody>
</table>
1.6-1.9 mg/dL  
KPhos Neutral tablet: 2 tabs PO/PT q4h x 4 doses or  
KPhos 30mmol IV or  
NaPhos 30mmol IV  
With next AM labs

< 1.6 mg/dL  
KPhos 45 mmol IV or  
NaPhos 45mmol IV  
and notify provider immediately  
6 hours after replacement

- Circumstances of when to notify the provider for further instructions:
  - Ionized calcium < 2.5 mg/dL;
  - Potassium level < 2.9 mEq/L;
  - Phosphorus level < 1.6 mg/dL;
  - If potassium does not increase to ≥ 4 mEq/L after 2 recommended replacement doses.

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REFERENCES

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