ADULT ELECTROLYTE REPLACEMENT PROTOCOLS

SUMMARY
Standing electrolyte replacement protocols are available for use in adult patients admitted to Orlando Health hospitals. These are instituted upon direct physician order entry into Sunrise XA. The protocols are listed below.

SPECIFIC REQUIREMENTS:

- Intravenous piggyback infusions of electrolytes must be administered with free-flow protected infusion devices (i.e. infusion pump).
- Patients must meet the following criteria prior to initiation of the ICU Potassium, Calcium, Magnesium, and/or Phosphorus Replacement Protocols:
  - CrCl ≥ 45 mL/min
  - Weight ≥ 40 kg
- Low-dose Magnesium/Potassium Replacement Protocol if CrCl < 45 mL/min and/or weight < 40 kg (See Low-Dose Electrolyte Replacement Protocol)
- Patients on HD, PD, CRRT, Therapeutic Hypothermia are excluded from CrCl cut-offs
- The electrolyte replacement protocols, calcium chloride (ICU/ED only) or calcium gluconate (all levels of care), magnesium sulfate, potassium chloride, or potassium phosphate, may be ordered individually or in combination.

POTASSIUM REPLACEMENT PROTOCOL – INTRAVENOUS

- Recommended rate of infusion is 10 mEq/hr
- Maximum rate of intravenous replacement is 20 mEq/hr with ***continuous ECG monitoring*** (the maximum rate may be increased to 40 mEq/hr in emergency situations)
- Standard concentrations: 10 mEq/50 mL, 10 mEq/100mL, 20 mEq/50 mL and 20 mEq/100 mL
  - Maximum concentration for central IV administration = 20 mEq/50 mL
  - Maximum concentration for peripheral IV administration = 10 mEq/50 mL

Current Serum Potassium Level	***Central*** **IV Administration**	***Peripheral*** **IV Administration**	Monitoring
3.7– 3.9 mEq/L	No replacement required	No replacement required	No additional action
3.4 – 3.6 mEq/L	20 mEq IV over 1 HR x 2	10 mEq IV over 1 HR x 4	Recheck serum potassium level 1 hour after infusion complete
3.0 – 3.3 mEq/L	20 mEq IV over 1 HR x 4	10 mEq IV over 1 HR x 8	Recheck serum potassium level 1 hour after infusion complete
< 3.0 mEq/L	20 mEq IV over 1 HR x 6 **AND** Call Physician	10 mEq IV over 1 HR x 12 **AND** Call Physician	Recheck serum potassium level 1 hour after infusion complete
• If both potassium and phosphorus replacement required, subtract the mEq of potassium given as Potassium Phosphate from total amount of potassium required. (Conversion: 3 mmol KPO_4 = 4.4 mEq K^+) • Call pharmacy for assistance if needed.			

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POTASSIUM REPLACEMENT PROTOCOL – ORAL or ENTERAL (PT)

- Standard dosage forms: KCl 20 mEq tablet or KCl 10% solution (20 mEq/15 mL)

Current Serum Potassium Level	Total Potassium Replacement	Monitoring
3.7 – 3.9 mEq/L	No replacement	No additional action
3.4 – 3.6 mEq/L	40 mEq KCl PO/Per feeding tube Q2H x 2 doses	Recheck serum potassium level 2 hours after last oral dose
3.0 – 3.3 mEq/L	40 mEq KCl PO/Per feeding tube Q2H x 3 doses	Recheck serum potassium level 2 hours after last oral dose
< 3.0 mEq/L	40 mEq KCl PO/Per feeding tube Q2H x 5 doses	Recheck serum potassium level 2 hours after last oral dose

MAGNESIUM REPLACEMENT PROTOCOL

- Infusions should be no faster than 1 gm of magnesium sulfate every 30 minutes.
- Standard concentrations: 1 gm/100 mL and 2 gm/50 mL

Current Serum Magnesium Level	Total Magnesium Replacement	Monitoring
1.5 – 2.0 mEq/L	2 grams magnesium sulfate IV over 1 HR	No additional action
1.0 – 1.4 mEq/L	2 grams magnesium sulfate IV over 1 HR x 2 doses	Recheck serum magnesium level 2 hours after infusion complete
< 1.0 mEq/L	2 grams magnesium sulfate IV over 1 HR x 3 doses **AND** Call Physician	Recheck serum magnesium level 2 hours after infusion complete

PHOSPHORUS REPLACEMENT PROTOCOL — INTRAVENOUS

- Replacement must be ordered in mmol of phosphorus.
- Recommended rate = 3 mmol/hr (= 4.4 mEq/hr of K)
- Maximum rate = 10 mmol/hr (= 15 mEq/hr of K)
- Use sodium phosphate for patients with serum potassium > 4.5 mEq/L and serum sodium < 145 mEq/L
- Standard concentrations:
    - Potassium phosphate: 15 mmol/250 mL and 21 mmol/250 mL
    - Sodium phosphate: 15 mmol/250 mL, 21 mmol/250 mL, and 30 mmol/250 mL

Current Serum Phosphorus Level	Total Phosphorus Replacement	Monitoring
2.0 – 2.3 mg/dL	15 mmol Potassium Phosphate IV over 4 HR	Recheck serum phosphorus level the next morning
1.0 – 1.9 mg/dL	21 mmol Potassium Phosphate IV over 4 HR	Recheck serum phosphorus level 2 hours after infusion complete
< 1.0 mg/dL	30 mmol (15 mmol x 2) Potassium Phosphate IV over 8 HR **AND** Call Physician	Recheck serum phosphorus level 2 hours after infusion complete

- If Potassium and Phosphorus replacement required, subtract the mEq of Potassium given as Potassium Phosphate from the total amount of Potassium required (Conversion: 3 mmols Potassium Phosphate = 4.4 mEq Potassium)
- Call pharmacy for assistance if needed

PHOSPHORUS REPLACEMENT PROTOCOL – ORAL or ENTERAL (PT)

- Standard dosage forms: Potassium Phosphate-Sodium Phosphate 155 mg – 852 mg – 130 mg tablet (250 mg Phosphorus per tablet)

Current Serum Phosphorus Level	Total Phosphorus Replacement	Monitoring
2.4 – 3.0 mg/dL	Two 250 mg tablet x 1 (16 mmol)	Recheck serum Phosphorus level 4 hours after last oral dose
1.5 – 2.3 mg/dL	Two 250 mg tablet Q2H x 3 (48 mmol)	Recheck serum Phosphorus level 4 hours after last oral dose
< 1.5 mg/dL	Use IV Replacement if ordered or call physician	
Note: 1 Tablet contains 8 mmol Phosphate; 13 mEq Sodium; 1.1 mEq Potassium		

CALCIUM REPLACEMENT PROTOCOL

- You must specify the salt form (gluconate or chloride)
- Calcium *chloride*:
  - Reserved for ICU/ED only
  - Must be administered via a central line
  - Maximum rate = 1 gm IV over 10 minutes
- Calcium *gluconate:*
  - Administration via a central line is *preferred*; however, it may be given peripherally with adequate IV access.
  - Maximum rate = 3 gm IV over 10 minutes
- Standard concentrations:
  - Calcium *chloride*: 1 gm/50 mL, 2 gm/100 mL, 3 gm/150 mL
  - Calcium *gluconate:* 1 gm/50 mL, 2 gm/100 mL

Current Ionized Calcium Level	Total Calcium GLUCONATE Replacement	Total Calcium CHLORIDE Replacement (ICU/ED only)	Monitoring
0.8 – 1.0 mmol/L	2 grams IV over 1 HR x 2	2 grams IV over 1 HR	No additional action
< 0.8 mmol/L	2 grams IV over 1 HR x 3	3 grams IV over 1 HR **AND** Call Physician	Recheck serum ionized calcium 2 hours after infusion complete

ADULT LOW-DOSE ELECTROLYTE REPLACEMENT PROTOCOL

SPECIFIC REQUIREMENTS:

- Patients with the following criteria may be initiated on the LOW-DOSE Potassium or Magnesium replacement protocols:
  - CrCl < 45 mL/min
  - Weight < 40 kg
- Patients on HD, PD, CRRT, Therapeutic Hypothermia are excluded from CrCl cut-offs
- The electrolyte replacement protocols, Magnesium Sulfate, or Potassium Chloride, may be ordered individually or in combination.
- Calcium and/or Phosphorus replacement needs to be ordered individually as required

LOW DOSE POTASSIUM REPLACEMENT PROTOCOL – INTRAVENOUS

- Recommended rate of infusion is 10 mEq/hr
- Maximum rate of intravenous replacement is 20 mEq/hr with *continuous ECG monitoring* (the maximum rate may be increased to 40 mEq/hr in emergency situations)
- Standard Concentrations: 10 mEq/50 mL, 10 mEq/100mL, 20 mEq/50 mL and 20 mEq/100 mL
  - Maximum Concentration for Central IV administration = 20 mEq/50 mL
  - Maximum Concentration for Peripheral IV administration = 10 mEq/50 mL

Current Serum Potassium Level	Central/Peripheral IV Administration	Monitoring
3.7– 3.9 mEq/L	No replacement required	Recheck serum potassium in AM
3.4 – 3.6 mEq/L	10 mEq IV over 1 HR x 1	Recheck serum potassium level 2 hours after infusion complete
3.1 – 3.3 mEq/L	20 mEq IV over 2 HR (10 mEq x 2)	Recheck serum potassium level 2 hours after infusion complete
2.3 - 3.0 mEq/L	30 mEq IV over 3 HR (10 mEq x 3)	Recheck serum potassium level 2 hours after infusion complete
< 2.3 mEq/L	40 mEq IV over 4 HR (10 mEq x 4) **AND** Call physician	Recheck serum potassium level 2 hours after infusion complete

LOW DOSE POTASSIUM REPLACEMENT PROTOCOL – ORAL or ENTERAL (PT)

- Standard dosage forms: KCl 20 mEq tablet or KCl 10% solution (20 mEq/15 mL)

Current Serum Potassium Level	Total Potassium Replacement	Monitoring
3.7 – 3.9 mEq/L	No replacement	Recheck serum potassium in AM
3.1 – 3.6 mEq/L	20 mEq KCl PO/Per feeding tube x 1 dose	Recheck serum potassium level 4 hours after last oral dose
< 3.1 mEq/L	20 mEq KCl PO/Per feeding tube Q2H x 2 doses	Recheck serum potassium level 4 hours after last oral dose

LOW DOSE MAGNESIUM REPLACEMENT PROTOCOL

- Infusions should be no faster than 1 gm of magnesium sulfate every 30 minutes.
- Standard Concentrations: 1 gm/100 mL and 2 gm/50 mL

Current Serum Magnesium Level	Total Magnesium Replacement	Monitoring
1.5 – 1.9 mg/dL	1 grams Magnesium Sulfate IV over 1 HR	Recheck serum magnesium level in AM
0.9 – 1.4 mg/dL	2 grams Magnesium Sulfate IV over 1 HR	Recheck serum magnesium level 2 hours after infusion complete
< 0.9 mg/dL	2 grams Magnesium Sulfate IV over 1 HR **AND** Call Physician	Recheck serum magnesium level 2 hours after infusion complete