Potassium Replacement

SURGICAL CRITICAL CARE
Electrolyte Replacement Practice Management Guideline

ALL patients with renal or adrenal insufficiency are excluded from any electrolyte replacement protocol

Exclusions: Crush Injuries, Electrical Burns, Myoglobinuria, Rhabdomyolysis, DKA, HF burns

Notes:

- Expect to waste K+ with gentamicin, penicillin, and amphotericin administration, as well as with loop and thiazide diuretics
- A single albuterol nebulizer treatment may lower serum K+ by 0.2-0.4 mEq/L
- A single dose of succinylcholine will increase serum K+ by 0.5-1.0 mEq/L
- Hyperkalemia may occur with TMP/SMX therapy and with the use of hypertonic agents (e. g. D50, mannitol)
- A serum K+ of 3-4 mEq/L correlates with a 100-200 mEq K+ deficit. At a serum K+ of 2-3 mEq/L, the deficit is 200-400 mEq.
- Serum potassium may be expected to increase by ~0.25 mEq/L for each 20 mEq IV KCl infused
- When using PO or PT replacement, avoid slow-release tablets
- When a central access is present, mix 20-40 mEq KCl in 100 cc NS or ½ NS and infuse at a rate of 20 mEq/hr; however, if serum K+ is <2.5, 40 mEq/hr may be given with continuous cardiac monitoring
- When only peripheral access is available, mix 10 mEq KCl in 100 cc NS or ½ NS and infuse at a rate of 10 mEq/hr; 1-2 cc of plain 1% lidocaine may be added to each 100 cc bag for patient comfort
- PO/PT IF GI TRACT AVAILABLE

Serum K+	**Replace With**	**Recheck Level**
3.3-3.5 mEq/L	40 mEq KCl IV/PO/PT	Immediately After Replacement
3.0-3.2 mEq/L	60 mEq KCl IV/PO	Immediately After Replacement and With Next AM Labs
2.6-2.9 mEq/L	80 mEq KCl IV and NHO	Immediately After Replacement and With Next AM Labs
<2.6 mEq/L	10 mEq KCl IV Infuse as 50mEq/hr X 2 **if central line is present and with continous cardiac monitoring**; **NHO**	Immediately After Replacement and With Next AM Labs

Zaloga GP, K.R., Bernards WC, Layons AJ, Fluids and Electrolytes.
Critical Care, ed. T.R. Civetta JM, Kirby P.Vol. 1. 1997, Philadelphia: Lippincott-Raven. 23.63.
Panello JE, Delloyer RP, Critical Care Medicine 2nd Edition 2002; St. Louis: Mosby, Inc. 1169
Polderman, et al. CCM 2000 June; 28(6) 2022-2025
Polderman et al. J. Neurology 2001 May; 94(5): 697-705

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Magnesium Replacement

SURGICAL CRITICAL CARE
Electrolyte Replacement Practice Management Guideline

ALL patients with renal or adrenal insufficiency are excluded from any electrolyte replacement protocol

Notes:

- Corrected serum Mg=measured serum Mg x 0.42 + 0.05 (4 - albumin in g/dL)
- PO replacement is preferred in asymptomatic patients able to tolerate PO or PT meds
- Expect magnesium depletion in patients with extensive GI losses (e. g. diarrhea, high NG output), burns, alcoholism, and those taking amino glycosides, loop diuretics, and amphotericin

Symptoms of hypomagnesemia

- arrhythmias
- weakness, including respiratory muscles
- failure of extubation trach collar trials ileus
- muscle fasciculations
- tremors
- personality changes
- vertigo
- seizures

Is patient symptomatic?

NO	YES
Magnesium sulfate 6g in 100cc D5W administered over 6 hrs and repeat qd x 3 days	Magnesium Sulfate 1-2g as a 10% solution over 30 minutes. Followed by the asymptomatic Treatment.
Re-Check magnesium level and if <2.0 mg/dl: Magnesium sulfate 6g in 100cc D5W administered over 6 hrs and repeat qd x 3 days **or** Start on oral Magnesium Therapy: Magnesium oxide 400mg to 1200 mg po qd	

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Calcium Replacement

SURGICAL CRITICAL CARE
Electrolyte Replacement Practice Management Guideline

ALL patients with renal or adrenal insufficiency are excluded from any electrolyte replacement protocol

Exclusions: Digoxin therapy, Head Injury

- For every 1 g/dL decrease of serum albumin less than 4.0 g/dL, add 0.8 mg/dL to total serum calcium level to correct value (normal serum calcium level at VUMC 8.5 - 10.5 mg/dL)
- IV replacement should be with calcium chloride (272 mg elemental calcium/1 gm CaCI2) if a central access is present; if not, use calcium gluconate (94 mg elemental calcium/1 gm calcium gluconate)
- Mix one amp (1 g) CaCI2 or two amps (2 g) calcium gluconate in 100 cc NS and infuse over one hour.

Causes of Hypocalcemia

- sepsis
- renal failure
- acute pancreatitis
- severe hypomagnesemia
- hypoparathyroidism
- Vitamin D deficiency

Symptoms of Hypocalcemia

- tetany
- peripheral or perioral parathesias
- carpal spasm
- siezure
- bronchospasm or laryngospasm
- Chevostek's sign
- Trousseau's sign

Is patient symptomatic?

NO		
Ionized Calcium	**Replace With**	**Recheck Level**
3.5-3.9 mg/dL	2g $CaCl_2$	With next AM Labs
3.0-3.4 mg/dL	3g $CaCl_2$	4 Hours After Replacement
2.5-2.9 mg/dL	4g $CaCl_2$	4 Hours After Replacement
< 2.5 mg/dL	5 g $CaCl_2$ **NHO**	4 Hours After Replacement

Chronic Therapy

- Calcium Carbonate : initially 1-2 g po TID and then taper to 0.5-1.0 g TID
- Vit. D to be ordered by MD if needed

YES
Calcium Chloride or Calcium gluconate 1 g over 30 min
If symptoms persist calcium infusion 1-2 mg 1 kg 1 hr

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Phosphorus Replacement

SURGICAL CRITICAL CARE
Electrolyte Replacement Practice Management Guideline

ALL patients with renal or adrenal insufficiency are excluded from any electrolyte replacement protocol

Exclusions: Rhabdomyolysis, DKA

Notes:

- Mix $NaPo_4$ in 100cc NS and infuse over 4 hours
- If patient can tolerate PO ot PT, phosphorus can be replaced with Neutra-Phos 500 mg bid-tid
- *** Phosphate may be ordered as a mixture of Na Phosphate and K Phosphate in the event that total K^+ delivered is too high ***

Serum Phos	Replace With	Recheck Level	mEq of Potassium Delivered if ordered as KPO_4
2.0-2.5 mg/dL	20 mmol $NaPO_4$ or KPO_4	With Next AM Labs	29.3 mEq K^+ (~7.3 mEq/hr based on 4 hr infusion)
1.6-1.9 mg/dL	30 mmol $NaPO_4$ or KPO_4	With Next AM Labs	44 mEq K^+ (11 mEq/hr based on 4 hr infusion)
<1.6 mg/dL	40 mmol $NaPO_4$ or KPO_4	6 hours after replacement	58.7 mEq K^+ (~14.7 mEq/hr based on 4 hr infusion)

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