

Hypokalemia Care Bundle for Patients Enrolled in UNC OPAT Program

Objective: Provide protocolized management of hypokalemia in patients enrolled in the UNC OPAT Program. The following recommendations can be utilized to assess hypokalemia at any time point throughout the patient's OPAT course.

A. Management of Mild Hypokalemia (Potassium (K⁺) level: 3.0 – 3.4 mEq/L)

- a. Review patient chart for the following:
 - I. K⁺ levels during previous hospitalization
 - II. Need for potassium supplementation during previous hospitalization
 - III. Assess outpatient medication list for agents associated with hypokalemia (see Appendix B)
- b. Contact patient and assess utilizing hypokalemia dot phrase: **.OPATHYPOKALEMIA**
 - I. Make one attempt to contact patient to assess and document in weekly note
 - II. If patient is asymptomatic and no clear etiology for hypokalemia is found, counsel patient to increase intake of foods high in potassium (.OPATPOTASSIUMDIET)
 1. Consider lab recheck or need for supplementation based on change in K⁺ since discharge
- c. If patient endorses diarrhea, assess symptoms: **.OPATDIARRHEA**
 - I. If signs and symptoms are consistent with antibiotic-associated diarrhea:
 1. Proceed with counseling of diarrhea and dietary changes (.OPATDIARRHEACOUNSELING)
 2. Consider phone follow up with patient in 1-2 days to assess symptoms
 3. Consider lab recheck or need for supplementation based on change in K⁺ since discharge
 - II. If signs and symptoms are concerning for *Clostridium difficile* (watery diarrhea with > 3 bowel movements/day, fevers/chills, abdominal pain/cramping, elevated WBC)
 1. Order *C. diff* PCR, CBC w/ diff through home health nursing agency or local PCP/ED
 - a. If s/sx are severe and previous labs correlate with severe infection (e.g. elevated WBC), direct patient to local emergency department (ED)
 2. Follow up *C. diff* results with oral vancomycin prescription if indicated in addition to counseling patient on increasing intake of foods high in potassium
- d. If patient endorses nausea with vomiting from antimicrobial regimen:
 - I. Management strategies
 1. Assess timing of medication with nausea/vomiting
 - a. Ex: Change ertapenem from morning to evening administration
 2. Assess dietary intake prior to antimicrobial administration
 3. Rule out alternative causes for vomiting (e.g. food poisoning)
 4. Assess alcohol intake if patient is taking metronidazole
 5. Consider prescribing anti-emetic based on severity of symptoms
 - II. Counsel patient to increase intake of foods high in potassium (.OPATPOTASSIUMDIET)

1. Consider lab recheck or need for supplementation based on change in K⁺ since discharge
- e. If etiology of hypokalemia appears to be medication related:
 - I. Counsel patient to increase intake of foods high in potassium (.OPATPOTASSIUMDIET)
 - II. Consider lab recheck or need for supplementation based on change in K⁺ since discharge
 - III. If hypokalemia persists despite changes in dietary intake, alert patient's primary care provider for further management
- f. If repeat potassium remains in the mild hypokalemia range, repetition of the above pathway is not required

B. Management of Moderate Hypokalemia (K⁺ level: 2.5 – 2.9 mEq/L)

- a. Review patient chart for the following:
 - I. K⁺ levels during previous hospitalization
 - II. Need for potassium supplementation during previous hospitalization
 - III. Assess outpatient medication list for agents associated with hypokalemia (see Appendix B)
 - IV. Add on magnesium to chemistry panel
 1. See recommendations for magnesium repletion in Appendix C
- b. Contact patient and assess utilizing hypokalemia dot phrase: **.OPATHYPOKALEMIA**
 - I. Make at minimum 3 attempts to contact patient to assess and document findings in weekly monitoring note
 - II. If patient is asymptomatic and no clear etiology for hypokalemia is found, counsel patient to increase intake of foods high in potassium (.OPATPOTASSIUMDIET)
 1. Prescribe KCl supplementation to patient's preferred pharmacy
 - a. 20-40 mEq/day for 3-5 days in patients with normal renal function
 - i. Consider less aggressive repletion in patients with chronic kidney disease
 2. Recheck basic metabolic panel in 2-3 days
- c. If patient endorses diarrhea, assess symptoms: **.OPATDIARRHEA**
 - I. If signs and symptoms are consistent with antibiotic-associated diarrhea:
 1. Proceed with counseling (.OPATDIARRHEACOUNSELING)
 2. Prescribe KCl supplementation to patient's preferred pharmacy
 - a. 20-40 mEq/day for 3-5 days in patients with normal renal function
 - i. Consider less aggressive repletion in patients with chronic kidney disease
 3. Consider phone follow up with patient in 1-2 days to assess symptoms
 4. Recheck basic metabolic panel in 2-3 days
 - II. If signs and symptoms are concerning for *C. difficile* (watery diarrhea with > 3 bowel movements/day, fevers/chills, abdominal pain/cramping, elevated WBC)
 1. Order *C. diff* PCR, CBC w/ diff either via home health nursing agency or local PCP/ED

- a. If s/sx are severe and previous labs correlate with severe infection (e.g. elevated WBC), direct patient to local ED for testing and management
2. If patient is stable enough to remain at home vs. present to the ED, prescribe KCl supplementation to patient's preferred pharmacy
 - a. 20-40 mEq/day for 3-5 days in patients with normal kidney function
 - i. Consider less aggressive repletion in patients with chronic kidney disease
 - b. Recheck basic metabolic panel in 2-3 days
3. Follow up *C. diff* results with oral vancomycin prescription if indicated
- d. If patient endorses nausea with vomiting from antimicrobial regimen:
 - I. Management strategies
 1. Assess timing of medication with nausea/vomiting
 - a. Example: Change ertapenem from am to pm administration
 2. Assess dietary intake prior to antimicrobial administration
 3. Rule out alternative causes for vomiting (e.g. food poisoning)
 4. Assess alcohol intake if patient is taking metronidazole
 5. Consider prescribing anti-emetic based on severity of symptoms
 6. If patient is able to tolerate oral supplementation, prescribe KCl supplementation to patient's preferred pharmacy
 - a. 20-40 mEq/day for 3-5 days in patients with normal kidney function
 - i. Consider less aggressive repletion in patients with chronic kidney disease
 - b. Recheck basic metabolic panel in 2-3 days
 7. If patient unable to tolerate oral supplementation, direct patient to local ED for IV repletion
 - II. Alert patient's primary care provider for further management
- e. If etiology of hypokalemia appears to be medication related:
 - I. Counsel patient to increase intake of foods high in potassium (.OPATPOTASSIUMDIET)
 1. Prescribe KCl supplementation to patient's preferred pharmacy
 - a. 20-40 mEq/day for 3-5 days in patients with normal kidney function
 - i. Consider less aggressive repletion in patients with chronic kidney disease
 2. Lab recheck in 2-3 days
 - II. Alert patient's primary care provider for further management
- f. If repeat potassium remains in the moderate hypokalemia range, the patient should be re-accessed utilizing the above pathway

C. Management of Severe Hypokalemia (K⁺ level < 2.5 mEq/L)

- a. Review patient chart for the following:
 - I. K⁺ levels during admission
 - II. Need for potassium supplementation during admission

- III. Assess outpatient medication list for agents associated with hypokalemia (see Appendix B)
- IV. Add on magnesium to chemistry panel
- b. Contact patient and assess utilizing hypokalemia dot phrase: **.OPATHYPOKALEMIA**
 - I. Patient must be contacted to assess symptoms. If patient cannot be reached, attempts should be clearly documented in the chart
 - II. If patient is asymptomatic and no clear etiology for hypokalemia is found:
 1. Discuss importance of repleting potassium with patient
 - a. Decision between directing patient to local ED for intravenous repletion or oral supplementation should be made depending on patient specific factors (comorbid conditions, baseline potassium, concomitant medications, etc); however it should strongly be encouraged for patient to present to local ED for IV repletion and monitoring
 - i. If decision is made to replete patient with oral supplementation:
 1. 40-80 KCl mEq/day for 5-7 days in patients with normal renal function. Consider less aggressive dosing in patients with chronic kidney disease
 2. Provide magnesium supplementation if indicated
 2. Recheck basic metabolic panel in 1 day
 - III. If patient is experiencing any s/sx of weakness, fatigue, etc:
 1. Recommend patient present to the nearest ED for IV repletion of potassium
 - c. If patient endorses diarrhea, assess symptoms: **.OPATDIARRHEA**
 - I. If signs and symptoms are consistent with antibiotic-associated diarrhea:
 1. Decision between oral repletion versus directing patient to local ED for intravenous repletion should be made depending on patient specific factors
 - a. If patient is experiencing any s/sx of weakness, fatigue, etc
 - i. Recommend patient present to the nearest ED for IV repletion of potassium
 - ii. Follow up with patient in 1 day and recheck labs as needed based on potassium supplementation received
 - b. If patient is NOT experiencing any s/sx associated with hypokalemia or refuses to present to nearest ED for management:
 - i. Prescribe KCl supplementation to patient's preferred pharmacy
 1. 40-80 mEq/day for 5-7 days in patients with normal renal function
 2. Recheck basic metabolic panel in 1 day
 3. Phone follow up with patient in 1 day
 - II. If signs and symptoms are concerning for *Clostridium difficile* (watery diarrhea with > 3 bowel movements/day, fevers/chills, abdominal pain/cramping, elevated WBC)
 1. Patient should be directed to local ED for *C diff* testing, IV potassium repletion and monitoring

- d. If patient endorses nausea with vomiting from antimicrobial regimen:
 - I. Management strategies
 - 1. Direct patient to local ED for IV potassium repletion and monitoring as patient is unlikely to tolerate oral repletion
- e. If etiology of hypokalemia appears to be medication related:
 - I. Decision between directing patient to local ED for intravenous repletion versus oral supplementation should be made depending on patient specific factors and current symptoms; however the safest management strategy is recommending the patient to present to local ED for IV potassium repletion and monitoring
 - II. If patient is unable or refuses to present to local ED
 - 1. Prescribe KCl supplementation to patient's preferred pharmacy
 - a. 40-80 mEq/day for 5-7 days in patients with normal renal function
 - 2. Recheck BMP in 1 day
 - III. Alert patient's primary care provider for further management and possible need for chronic potassium supplementation if chronic medication is responsible for hypokalemia
- f. If repeat potassium remains in the severe hypokalemia range, the patient should be re-accessed utilizing the above pathway

Appendix:
A. Dot phrases
a. .OPATHYPOKALEMIA

Noted decrease in potassium (K < 3.5), spoke with {tclopatpt:46979} to assess status

	<u>Status</u>	<u>Additional Notes</u>
Vomiting?	{YES:40174}	
Diarrhea?	{YES:40174}	
Fatigue or weakness?	{YES:40174}	
Diuretics (furosemide, torsemide, bumetanide, metolazone)?	{YES:40174}	

b. .OPATDIARRHEA

Patient reported diarrhea, spoke with {tclopatpt:46979} to assess:

	<u>Status</u>	<u>Additional Notes</u>
Stool frequency?	{STOOL Frequency:65641}	
Symptom onset?	{Symptom onset:65642}	
Stool consistency?	{Stool consistency:65643}	
Laxative use?	{YES:40174}	
Nausea/vomiting?	{YES:40174}	
Blood in stool?	{YES:40174}	
Abdominal pain/cramping?	{YES:40174}	
Fevers/Chills?	{YES:40174}	
Vital Signs	{DESC; AN POST VITALS:19483}	

c. .OPATPOTASSIUMDIET

Patient counseled to increase dietary intake of foods high in potassium including:

- Fruits: bananas, oranges, cantaloupe, honeydew, apricots, grapefruit
- Vegetables: spinach, broccoli, tomatoes
- Other: potatoes, sweet potatoes, legumes

d. .OPATDIARRHEACOUNSELING

Patient's symptoms are consistent with antibiotic-associated diarrhea. Patient counseled on the following:

- Antibiotics can change the bacteria in your gut which can lead to loose, watery stools and mild belly cramping. Be sure to drink plenty of water and other liquids to replace fluids lost because of diarrhea
- Maintain adequate nutrition. Eat bland foods and avoid spicy or greasy foods that can worsen diarrhea. Try to increase your intake of foods that are high in potassium, including bananas, vegetables, fruits, and legumes.
- Probiotics may be of some benefit, but data on their usefulness improving symptoms of antibiotic-associated diarrhea is mixed.
- Limit use of anti-diarrheals like Immodium (loperamide)
- Please contact the UNC OPAT program if your current symptoms worsen or if you start to experience fever, chills, or abdominal pain

B. Medications associated with hypokalemia

Medication Class	Examples	Mechanism
Antimicrobials	Oxacillin/nafcillin Ampicillin Amoxicillin-clavulanic acid Piperacillin-tazobactam Penicillin Aminoglycosides* Amphotericin* Foscarnet*	Renal potassium loss
Diuretics	Furosemide Torsemide Bumetanide Metolazone Chlorthalidone Hydrochlorothiazide	Renal potassium loss
Mineralocorticoids and glucocorticoids	Hydrocortisone Fludrocortisone Prednisone	Renal potassium loss
Laxatives or enemas; if overused to the point of diarrhea	Sorbitol Bisacodyl Senna	Stool (gastrointestinal) loss
Beta ₂ -receptor agonists	Albuterol Formoterol Pseudoephedrine Salmeterol	Shift of potassium from extracellular fluid to intracellular fluid compartment

Insulin	High dose	Shift of potassium from extracellular fluid to intracellular fluid compartment
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* also associated with magnesium wasting

C. Magnesium Repletion

a. Dietary recommendations

i. Magnesium is found naturally in many foods and is added to some fortified foods.

Several foods high in magnesium are:

1. Legumes, nuts, whole grains, and green leafy vegetables (e.g. spinach)
2. Fortified breakfast cereals
3. Milk, yogurt, and other dairy products

b. Magnesium Oxide Supplementation

Product	Serum Magnesium	Replace with	Monitoring
Magnesium Oxide 400 mg (240 mg elemental Mg)	1.5 – 1.9 mg/dL	400 mg BID x 2 days	No additional monitoring needed
	1.2 – 1.4 mg/dL	400 mg BID x 3 days	Recheck at next planned lab draw (1-3 days)
	< 1.2 mg/dL	IV replacement strongly recommended. If patient unable to present to local ED or refuses → 400-800 mg TID x 3 days	Recheck of labs dependent on patient receiving IV vs. oral repletion. Recheck in 1-2 days if orally repleted.