



February 2010 (updated May 2015)

ELDER CARE

A Resource for Interprofessional Providers



A program of the Hartford
Geriatric Nursing Initiative

Medication-Induced Hypokalemia: A Common Problem

Barry D. Weiss, MD, College of Medicine, University of Arizona

Hypokalemia is one of the most common electrolyte disorders seen in both outpatient practice and inpatient care. It is common in older adults, and increasing age is associated with a marked increase in the incidence of hypokalemia. In fact, in comparison to younger adults, an 80-year old has more than triple the risk of having a potassium level <3.0 mm/L. Gender also confers risk, with women more likely than men to have a low potassium level.

A variety of medical illnesses, some serious, can cause hypokalemia (Table 1). Providers should be alert for those illnesses when evaluating patients who have hypokalemia.

Table 1. Medical Conditions Causing Hypokalemia

Barter's Syndrome and Gitelman's Syndrome
(inherited disorders of renal tubule function)
Cancer chemotherapy
Cushing syndrome
Delirium tremens
Diabetes mellitus, uncontrolled
Familial hypokalemic periodic paralysis
Gastrointestinal infections
Gastrointestinal tumors
Gastrointestinal malabsorption
Hyperaldosteronism
Hyperthyroidism
Leukemia
Magnesium deficiency
Malnutrition (severe)
Metabolic alkalosis
Pernicious anemia
Radiation enteropathy
Renal tubular acidosis

More common than hypokalemia induced by medical conditions, however, especially in the geriatric population, is medication-induced hypokalemia. There are many

medications that cause hypokalemia, even in therapeutic doses. This issue of Elder Care will review the most common hypokalemia-causing drugs. These and other medications are listed in Table 2. In addition to medication, hypokalemia can also be caused by the ingestion of large quantities of caffeine or licorice.

Although older adults have been reported to experience profound weakness from hypokalemia, more commonly there are no symptoms. Instead, low potassium levels are often discovered incidentally during routine blood testing. In the absence of blood testing, low potassium levels may go undetected and drop to the point that cardiac rhythm disturbances occur. Thus, when patients are taking medications known to cause hypokalemia, interval monitoring of potassium levels should be considered.

Diuretics

Diuretic therapy causes renal loss of potassium and is the most common cause of hypokalemia. It can occur with both thiazide-type diuretics and with loop diuretics such as furosemide. With loop diuretics, hypokalemia can occur even when potassium supplementation is given.

Laxatives and Enemas

Large doses of laxatives and enemas – particularly phenolphthalein laxatives and/or sodium polystyrene sulfonate – can cause loss of potassium in the stool. It is important to question patients about laxative use because they may not report it unless asked.

Medications for COPD

Sympathomimetic drugs, such as beta-adrenergic bronchodilators used to treat COPD, cause a shift of potassium from the serum into cells, thereby lowering serum potassium levels. The effect is potent, with a single nebulized albuterol treatment lowering potassium levels by 0.2-0.4 mmol/L, and a repeat dose within an hour dropping levels of by nearly 1 mmol/L.

TIPS ABOUT MEDICATION-INDUCED HYPOKALEMIA IN OLDER ADULTS

- Keep in mind that older adults are at higher risk for medication-induced hypokalemia.
- Be alert for hypokalemia when patients are taking common offending drugs - diuretics, laxatives, COPD medications, fludrocortisone, high dose antibiotics, high-dose insulin

ELDER CARE

Continued from front page

Theophylline, also sometimes used for treatment of COPD, stimulates release of sympathetic amines. Thus, similar to beta adrenergics, they cause a shift of potassium into cells and can lower serum potassium levels.

Oral or IV steroids with glucocorticoid properties, such as prednisone and hydrocortisone sometimes used to treat COPD, increase renal potassium excretion. When used chronically, potassium levels can fall by up to 0.4 mmol/L.

Mineralocorticoids

The mineralocorticoid fludrocortisone is used to treat orthostatic hypotension due to autonomic dysfunction in Parkinson's disease or other conditions by causing renal sodium and fluid retention. A byproduct of sodium retention is renal potassium loss, which can cause hypokalemia.

Antimicrobials

Most providers do not think of antibiotics as a cause of hypokalemia. In large doses, however, penicillin, ampicillin, nafcillin, or carbenicillin can induce renal potassium excretion. The same effect can occur with aminoglycoside therapy and amphotericin B.

Insulin

Routine outpatient insulin treatment does not cause significant hypokalemia. When administered in large doses, however, such as for treatment of the non-ketotic hyperosmolar state that sometimes occurs in older diabetics, insulin shifts potassium into cells and can result in marked serum hypokalemia. Intravenous potassium supplementation is often needed.

Table 2. Medications that Cause Hypokalemia

Medication Class	Example of Specific Drugs	Mechanism
Diuretics	Thiazides	Renal potassium loss
	Furosemide	Renal potassium loss
Laxatives	Phenolphthalein	Gastrointestinal potassium loss
	Sodium polystyrene sulfonate	Gastrointestinal potassium loss
COPD Medications	Beta adrenergics	Shift of potassium from serum to cells
	Theophylline	Shift of potassium from serum to cells
	Steroids	Renal potassium loss
Mineralocorticoids	Fludrocortisone	Renal potassium loss
Antimicrobials	Penicillins (penicillin G, nafcillin, ampicillin, carbenicillin)	Renal potassium loss
	Aminoglycosides	Renal potassium loss
	Amphotericin B	Renal potassium loss
Insulin	High dose	Shift of potassium from serum to cells
Other Medications	Pseudoephedrine	Shift of potassium from serum to cells
	Verapamil (in overdose)	Shift of potassium from serum to cells

References and Resources

Gennari FJ. Hypokalemia. *N Eng J Med.* 1998; 339:451-458.

Hawkins RC. Gender and age as risk factors for hypokalemia and hyperkalemia in a multiethnic Asian population. *Clinica Chimica Acta.* 2003; 331:171-172.

Interprofessional care improves the outcomes of older adults with complex health problems

Editors: Mindy Fain, MD; Jane Mohler, NP-c, MPH, PhD; and Barry D. Weiss, MD

Interprofessional Associate Editors: Tracy Carroll, PT, CHT, MPH; David Coon, PhD; Jeannie Lee, PharmD, BCPS;

Lisa O'Neill, MPH; Floribella Redondo; Laura Vitkus, BA

The University of Arizona, PO Box 245069, Tucson, AZ 85724-5069 | (520) 626-5800 | <http://aging.medicine.arizona.edu>

Supported by: Donald W. Reynolds Foundation, Arizona Geriatric Education Center and Arizona Center on Aging

This project was supported by the Health Resources and Services Administration (HRSA) of the U.S. Department of Health and Human Services (HHS) under grant number UB4HP19047, Arizona Geriatric Education Center. This information or content and conclusions are those of the author and should not be construed as the official position or policy of, nor should any endorsements be inferred by HRSA, HHS or the U.S. Government.