

Renal

Applicable to: Nurses, Physicians and other Health Professionals

Recommendations

- Obese individuals with protein losses in the urine (>1 gram/day) should be encouraged to achieve a healthy body mass index (BMI). Overweight and obese individuals with chronic kidney disease (CKD) should achieve a healthy weight (BMI 18.5-24.9 kg/m²; waist circumference < 102 cm for men and < 88 cm for women) to prevent or manage hypertension.
- A moderate protein intake (consistent with the recommended daily allowance of 0.8 g/kg/day) should only be implemented in individuals with CKD who are not undergoing dialysis. Severe protein restrictions are not required. Referral to a Registered Dietitian for nutrition counselling is recommended before changes to protein intake are made.
- An adequate energy intake to minimize malnutrition must accompany a protein modified diet.
- Serum potassium should be regularly monitored, and a potassium restricted diet commenced when serum potassium is greater than 5.0 mmol/L. Referral to a Registered Dietitian for nutrition counselling is recommended.
- The daily fluid intake for individuals with CKD should be unrestricted unless otherwise instructed by a physician.
- Individuals with CKD (with or without hypertension) should limit their sodium intake to less than 2300 milligrams (100 mmol) per day.
- General multivitamins are discouraged in individuals with CKD due to the vitamin A content. Supplementation of vitamin A is also discouraged.
- Patients at high risk of progressive deterioration in kidney function (e.g. patients with diabetes, hypertension) should be referred to a nephrology service for specialist management of renal failure.
- All patients with declining CKD should be referred to a Registered Dietitian for nutrition counselling to ensure nutritional adequacy of the diet.

Health Benefits

Following the recommendations above can help individuals:^{1,2,3,4,5,6,7}

- Decrease the progression of renal failure or delay the onset of renal replacement therapy.
- Achieve and maintain a healthy body weight.
- Decrease uremic symptoms and generation of nitrogenous wastes.
- Achieve a normal blood pressure.
- Decrease the incidence/severity of metabolic disturbances (metabolic acidosis, imbalances in phosphorus and/or potassium)

Key Questions

How is chronic kidney disease diagnosed?

The National Kidney Foundation's Kidney Disease Outcomes Quality Initiative (K/DOQI) clinical practice guidelines define stages of chronic kidney disease (CKD) based on estimated glomerular filtration rate (GFR) that is calculated from the serum creatinine level:¹

Stage	GFR (mL/min/1.73 m ²)
2	60-89
3	30-59
4	15-29
5	<15 or dialysis

A user-friendly GFR calculation is available online at:
http://www.kidney.org/professionals/kdoqi/qfr_calculator.cfm

How does body weight affect kidney function?

Obesity is a risk factor for kidney impairment and may influence the progression of renal damage due to other causes, including diabetic kidney disease.² Weight reduction can be an important adjunct to anti-hypertensive interventions, as well as insulin and lipid management.² Such improvements can have beneficial effects in slowing the progression of CKD. There is some evidence that obese patients (BMI > 30 kg/m²) have an increased rate of progressive CKD compared with non-obese individuals.²

Maintaining a healthy body weight to prevent hypertension or control blood pressure in hypertensive individuals originates with the Canadian Hypertension Education Program (CHEP), which has been generalized for the CKD population.³ Limited data from the CHEP suggests that a moderate weight reduction (< 10% body weight) in obese individuals with CKD and proteinuria (protein losses in the urine) is safe and can reduce proteinuria.³

The initial weight loss goals should be aimed at reduction of body weight by approximately 10% from baseline.² Further weight loss can be attempted, if indicated, through further assessment. The benefit of weight loss in obese patients without protein losses in the urine has not been formally tested.²

Refer to Guideline: Adult Weight Management

How does glycemic control affect kidney function?

The hyperglycemia induced by diabetes is a primary cause of organ complications, including kidney disease.⁴ Treatment of hyperglycemia can prevent diabetic nephropathy, the end result of kidney damage caused by high blood sugars. It may also slow the progression of pre-existing kidney damage caused by diabetes.

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The target hemoglobin A1c (HbA1c) for people with diabetes should be less than 7.0%, even in patients with advanced kidney disease.^{4,5} Micro- and macroalbuminuria, which are small and large losses of albumin in the urine, can both be seen in diabetic nephropathy, and improve with better blood glucose control.

It is important to note that the amount of glycogen degradation (a mechanism used by the body to protect against hypoglycemia) decreases with reduced kidney mass, as seen in more advanced kidney disease.⁴ This may impair ability to defend against hypoglycemia caused by excessive insulin/oral diabetic agent or lack of food.⁴ The effect, while difficult to quantify, leads to a prolonged half-life of insulin when kidney function is reduced.

Patients with type 1 diabetes and CKD on insulin are the most prone to severe hypoglycemia.⁴ Therefore, it is very important that patients being treated intensively monitor their blood glucose levels closely, and reduce medications (insulin and oral agents) to avoid low blood sugar levels.⁴ A person with advanced CKD may no longer need to achieve good glycemic control to prevent deterioration in kidney function.⁴ However, intensive treatment of hyperglycemia may still prevent or slow the progression of other diabetic complications, including retinopathy, neuropathy, and macrovascular disease.⁴

Refer to Guideline: Diabetes

What effect does blood pressure have on kidney function?

Hypertension is one of the major risk factors for the development of kidney disease and cardiovascular disease (CVD). The risk of CVD, beginning at 115/75 mmHg, doubles with each increment of 20/10 mmHg. Most hypertensive patients will require two or more antihypertensive medications to achieve goal blood pressure.⁶

The goals of antihypertensive therapy in CKD are to lower blood pressure to reduce the risk of CVD, and to slow the progression of CKD.⁶

Target blood pressures:

- for individuals with CKD and diabetes: <130/80 mmHg.^{6,7,8,9,10,11}
- for non-diabetic individuals with CKD: 140/90 mmHg.^{6,7,8,9,10,11}

Hypertension is both a cause and complication of CKD.⁶ Arterial hypertension is a key risk factor for kidney damage in people with Type 2 diabetes.¹² Several trials have shown that intensive treatment of elevated blood pressure (particularly systolic blood pressure) lowers the risk of microvascular disease, CVD and mortality.¹²

Refer to Guideline: Hypertension

Do individuals with kidney disease need a protein restriction?

Although some studies have shown a modest benefit of a protein-restricted diet (<0.7 g/kg/day) on delaying the progression of CKD and reducing the risk of death in renal patients, there is an overall lack of convincing evidence to demonstrate the efficacy of a low protein or protein restricted diet. A low protein diet may also have nutritional consequences such as malnutrition and certain nutrient deficiencies.¹³

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Adherence to a low protein diet is generally poor.¹⁴ Patients on a controlled protein diet have been able to maintain nutritional status provided that they are consuming higher energy (calorie) intakes.¹⁵ Such diets must be implemented by trained personnel with expertise and experience in dietary management of renal patients.¹⁵ Individuals prescribed these diets must be closely monitored and should be referred to a Registered Dietitian for further management.¹⁵

How much protein should be consumed on a protein restricted diet?

A moderate protein intake (consistent with the recommended daily allowance (RDA) of 0.8 g/kg/day) is generally recommended for adults with CKD.¹⁴ For example, for a 70 kg person, this translates into approximately 56 grams of protein per day.

Patients requiring a protein modified diet should be referred to a Registered Dietitian for nutrition counselling. Education of the patient should include foods containing higher protein quality, appropriate serving sizes, and adequate energy (calorie) provisions.

Do individuals with kidney disease need a potassium restriction?

In individuals with CKD, plasma potassium levels are affected by multiple factors including diet, metabolism, degree of renal failure, and medications that retain or lose potassium. Angiotensin-converting-enzyme (ACE) inhibitors and angiotensin-receptor blockers (ARBs) tend to cause potassium retention, whereas diuretics such as furosemide and spironolactone tend to cause potassium to be lost. Individuals with CKD stages 3-5 (GFR <60 mL/min) and/or with serum potassium >5.5 mmol/L may require a dietary potassium restriction to reduce their risk of hyperkalemia.

Patients requiring a potassium restricted diet should be referred to a Registered Dietitian for nutrition counselling. Patient education should include awareness of foods containing high amounts of potassium, low potassium alternatives, cooking methods, and appropriate serving sizes.

How much potassium is allowed on a potassium restricted diet?

Diets with high potassium content can be potentially harmful to patients with CKD and these patients with hyperkalemia can often present as asymptomatic.⁷ However, over-restriction of potassium in the diet can lead to problems with hypokalemia, which can lead to cardiac arrhythmias (similar to the case in hyperkalemia).⁷

The recommended intake (DRI) for potassium for healthy adults is 4700 mg/day (120 mmol/day).¹⁶ The 24 hour intake for patients with CKD should be limited to between 2000 and 4000 mg/day (50 to 100 mmol/day). However, a daily potassium target should be assigned for each individual patient based on serum potassium levels and other factors, including potassium-elevating medications, current diet, and degree of kidney function.⁷ Regular monitoring of patients' potassium levels is recommended.⁷

Patients requiring a potassium restricted diet should be referred to a Registered Dietitian for nutrition counselling. Education of the patient should include foods containing high amounts of potassium, low potassium alternatives, cooking methods, and appropriate serving sizes.

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What is the effect of sodium intake on kidney disease?

Dietary sodium reduction is important in the general population for prevention and treatment of hypertension. Individuals with CKD have significant co-morbid conditions in addition to hypertension, including diabetes, CVD, obesity and hyperlipidemia. Sodium restrictions are commonly recommended for these co-morbid conditions.

In individuals with CKD, water retention is due to sodium retention, which further aggravates pre-existing hypertension.⁷ The hypertension increases cardiovascular risk and further renal damage. Reduction in sodium intake will reduce water retention, which will in turn reduce hypertension. Diuretics can reduce blood pressure by increasing water and sodium excretion.⁷

A sodium (salt) restriction is often not enough on its own to reduce/control hypertension in the CKD patient. Anti-hypertensive agents are often required to achieve desired blood pressure targets.⁷ In early renal impairment, however, a sodium restriction may control edema. Once the patient's renal impairment progresses to more advanced stages of renal failure, the use of diuretics is often needed to control edema.⁷

The Dietary Approaches to Stop Hypertension (DASH) Diet study is not recommended in CKD Stages 3-5 patients.⁸ The original study looked at variable sodium intakes and hypertension. Unfortunately, the study excluded any patients with renal impairment. Therefore, the results of the study cannot be applied directly to CKD patients.¹⁷ In addition, many of the foods recommended in the DASH diet are high in potassium, protein and/or phosphorus.

Refer to Guidelines: Hypertension; Sodium

How much sodium is allowed for people with kidney disease?

Dietary sodium should be restricted to <2300 mg/day (<100 mmol/day) in addition to a well balanced diet to prevent hypertension.^{6,7,13} Patients with hypertension may be encouraged to achieve lower sodium intake of between 1500-2300 mg/day.¹³

The Adequate Intake (AI) for sodium for the general population per day is:

- 1500 mg (19 to 50 years old)
- 1300 mg (51 to 70 years old)

The upper limit (UL) for sodium is 2300 mg per day or 5.8 grams of salt.

Low sodium diets may be poorly tolerated by patients when they are initially introduced. Dietary sodium strategies for reduction of blood pressure and CVD risk are recommended as part of a comprehensive patient management approach.⁸

It is important to remember that many salt substitutes contain potassium and therefore should not be recommended for patients with CKD.⁷ It is important to review low sodium products as they may contain potassium additives as well (e.g. low sodium soups may contain potassium in place of sodium).

Patients requiring a sodium restricted diet should be referred to a Registered Dietitian for nutrition counselling. The Registered Dietitian can take into account other dietary modifications that may be

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required, including diabetes, hyperlipidemia, and obesity. Education of the patient should include foods containing high amounts of sodium, low sodium alternatives (that do not contain potassium additives), cooking methods, and appropriate serving sizes.

Refer to Guidelines: Hypertension; Sodium

When should a sodium restriction be implemented?

It is recommended that all adults (with or without CKD) should reduce their dietary sodium intake to prevent hypertension. All individuals with CKD (no matter what stage) should be encouraged to reduce their sodium intake to < 2300 mg (<100 mmol) per day.¹⁶ Adults with CKD and hypertension should be instructed to reduce their dietary sodium intake further, to between 1500-2300 mg/day (65-100 mmol/day).¹⁶

Sodium reduction strategies should be addressed upon initial visit with the patient under the guidance of a Registered Dietitian.

Refer to Guidelines: Hypertension; Sodium

Do individuals with kidney disease need a phosphorus restriction and/or phosphate binders?

Phosphate retention begins early in the progression of CKD due to the inability of the kidneys to remove phosphorus.¹⁸ Phosphorus retention leads to secondary hyperparathyroidism (elevated parathyroid hormone in the blood) and increases the risk for vascular and soft tissue calcification (calcium phosphate deposition) in CKD patients.¹⁸ Elevated serum phosphorus has been associated with increased mortality in CKD (non-dialyzed) patients.¹⁹

During the progression of CKD, many patients will need to take phosphate binders in addition to a dietary phosphorus restriction to control serum phosphate levels. Serum phosphate levels can remain within the normal range until the GFR falls below 30 ml/min, at which point high phosphate levels are often observed.¹⁸

Patients requiring a phosphorus restricted diet should be referred to a Registered Dietitian for nutrition counselling. Specific nutrition education by a Registered Dietitian is essential when balancing the phosphorus restriction along with other renal dietary restrictions including potassium and protein. Without careful dietary education and specific strategies, the CKD patient can be at risk for protein-energy malnutrition. Dietary phosphate restrictions are often implemented before oral phosphate binders are initiated.¹³

Should individuals with kidney disease take a general multivitamin?

General multivitamins should not be used in CKD patients. General multivitamin supplements contain vitamins A, E and K; supplemental intake of these vitamins is not recommended for CKD patients:

- CKD leads to a rise in serum vitamin A levels by up to 20% above normal range.² However, regular monitoring of vitamin A levels is not required as the levels generally do not reach toxicity because the vitamin A is bound up by the retinol binding protein, which is also elevated in CKD.⁷

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- Supplementation of vitamin E (at doses of 400 IU/day) has not shown any cardiovascular benefit in CKD patients. In fact, one study showed vitamin E supplements (≥ 400 IU/day) have been associated with increased mortality in CKD patients. Therefore, **vitamin E supplements should be avoided.**²⁰
- There is no evidence to show benefit or risk of vitamin K supplementation in CKD patients, therefore no recommendations regarding safe amounts is available.

General multivitamins are commonly too low in many B vitamins and vitamin C for patients that are on protein and/or potassium restricted diets. Patients on a protein restricted diet will require supplementation of the B vitamins (thiamin, riboflavin and vitamin B₆ in particular) to meet the Recommended Daily Allowance (RDA).⁷

Patients following a potassium restricted diet could develop deficiencies in thiamin and vitamin C. Unfortunately, the exact amounts of the B vitamins and vitamin C recommended for the CKD population is not known. To avoid the risk of hyper-oxalosis and the associated kidney stones patients should not take excess vitamin C.

High doses of B vitamins (vitamin B₆, B₁₂ and folic acid) can increase the progression of kidney disease and incidence of vascular events (MI, stroke) in patients with diabetic nephropathy.²¹ In this patient population, high dose B vitamin supplementation should be discouraged.²¹

Refer to Guideline: Vitamins and Minerals

Which vitamin or mineral supplement should an individual with kidney disease take?

In the absence of a well balanced diet, a renal multivitamin (e.g. Replavite®) should be prescribed for patients with a GFR less than 30 ml/min. The renal multivitamin provides a complex of B vitamins plus a small but appropriate amount of vitamin C (approx. 100 mg/tablet). All individuals with Stage 4-5 CKD should receive a renal multivitamin.⁷

Refer to Guideline: Vitamins and Minerals

Do individuals with kidney disease need a low cholesterol diet?
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Individuals with CKD are at higher risk for CVD and frequently have high blood cholesterol levels due to their renal failure and/or treatments that alter lipid metabolism.⁷ There is, however, limited evidence to show that CVD risk decreases with the correction of these levels.⁷

Individuals with low serum total cholesterol may be at risk for malnutrition and should be assessed by a Registered Dietitian for nutritional deficiencies.²² In some cases, a higher fat diet may be required to meeting energy needs and prevent malnutrition.²²

It is important to assess for malnutrition in patients with CKD and dyslipidemia.²² Fat recommendations (in the absence of dyslipidemia) should be similar to recommendations for healthy individuals.²³

Refer to Guideline: Heart Healthy

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Are there any foods that should be consumed in higher amounts for individuals with low hemoglobin and/or low iron?

Many patients with kidney disease will need to take an oral iron supplement to increase their iron levels to the target range. This may be difficult to do with food due to other dietary restrictions that the patient may be on. For example, patients on a potassium restricted diet are often told to avoid high iron foods for potassium reasons. Therefore, it is not advisable for patients to eat high iron foods to increase their hemoglobin.

Eating high iron foods may still not be enough to increase hemoglobin levels in some patients. As kidney disease progresses, and if the patient is put on erythropoietin (e.g. Aranesp®) to increase their hemoglobin levels, they may require higher oral iron supplement doses and/or intravenous iron to meet their iron needs.

Patients with kidney disease should not be encouraged to take extra vitamin C (ascorbic acid) to improve absorption of iron in the GI tract, due to the risk of oxalosis.²⁴

Refer to Guideline: Iron

Should individuals with kidney disease follow a fluid restriction?

As kidney disease progresses, the kidneys will clear less water. Excess fluid intake can lead to problems with fluid overload, including hypertension, shortness of breath, pulmonary edema, and other cardiac problems.⁷ Fluid intake should be adjusted to the clinical state of the individual, taking into account the degree of reduced GFR, edema, and hypertension management.⁷

Once the patient requires the use of diuretics for fluid management and to prevent symptoms of fluid overload, a liberal fluid intake should be curbed.⁷ This is usually directed by the patient's physician or nephrologist. Through education, the patient should be instructed on the appropriate amount of fluid for their stage of kidney disease, as well as a sodium restricted diet.⁷ Employing sodium reduction strategies can assist with thirst, hypertension and edema management.⁷

Patients requiring a fluid restricted diet should be referred to a Registered Dietitian for nutrition counselling. Specific nutrition education by a Registered Dietitian is essential when balancing the fluid requirements along with other renal dietary restrictions including sodium.

It is important to note that high fluid intake *may* be part of the management strategy for certain conditions such as nephrolithiasis (kidney stones), post renal transplant, and urinary tract infections.⁷

How much fibre should an individual with kidney disease eat each day?

Constipation is a common problem for people with kidney disease. Constipation can be caused by a diet low in fibre, too little exercise, fluid restrictions, some medications, or stress. Fibre will help to prevent constipation. Adequate fibre intake provides many health benefits for patients with kidney disease, including gastrointestinal health, easier bowel movements, and the cholesterol lowering/blood sugar controlling benefits of certain types of fibre.

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It is often difficult for patients on a renal diet to get enough fibre, usually because of other diet restrictions, specifically potassium and phosphorus.

Increasing fibre to deal with constipation in patients with kidney disease must be done carefully to avoid problems with high potassium and/or phosphorus levels in the blood.

Patients that are struggling with constipation and need education on appropriate high fibre, low potassium/phosphorus choices should be referred to a Registered Dietitian for nutrition counselling. A Registered Dietitian will help the patient to choose appropriate servings sizes and fibre supplements that do not contain too much potassium or phosphorus, or require too much fluid for administration (if on a fluid restriction).

Refer to Guideline: Fibre

Which nutrition supplements could be recommended for someone with kidney disease?
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People with kidney disease can often struggle with poor appetite and eating enough to get adequate nutrition. This is often due to uremia, but can also be due to medications, co-morbid conditions and social factors that prevent adequate nutrition.

There are a variety of nutrition supplements that are available for renal patients. If a patient is not consuming enough protein and/or calories, a nutrition supplement may be indicated. These supplements are available for purchase through a pharmacy or grocery store through special order.

Liquid renal nutrition supplements are made specifically for patients that need to watch their sodium, potassium and/or phosphorus intake but need more protein and calories. These may be given as a meal replacement or in addition to regular meals to add extra nutrition. Novosource Renal® and Nepro Carb Steady® are examples of liquid renal supplements. Both are available in vanilla flavour.

Patients that specifically have difficulty meeting protein requirements may benefit from use of a protein powder. Not all protein powders are created equal, so it is important that the protein powder be reviewed by a Registered Dietitian for potassium, phosphorus and sodium content to determine if it is appropriate for the patient's stage of kidney disease.

Liquid nutrition supplements, like Boost® and Ensure® that are not specifically for renal patients, may still be considered in certain circumstances, under the guidance of a Registered Dietitian.

It is important that patients identified as having poor nutrition or poor intake/appetite be referred to a Registered Dietitian for nutrition counselling. The Registered Dietitian can assist with prevention of malnutrition as a result of poor intake and provide suggestions that will assist the patient with meeting their specific nutritional needs, based on the stage of their kidney disease.

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Where can I get more information about the renal diet?

Kidney Foundation of Canada – Has a website dedicated to nutrition information for patients with kidney disease. Available at: www.kidneycommunitykitchen.ca

Davita – Has general information about kidney disease, treatment options, the renal diet and renal recipes. Available at: www.davita.com

Handouts

Refer to approved provincial Alberta Health Services renal nutrition handouts to support patient education. For more information, contact Nutrition.Resources@albertahealthservices.ca

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Nutrition Guideline

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