Healthy Nutrition

Juggling Kidney Disease and Diabetes

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8th February 2019

“There are few conditions in medicine that are more influenced by nutrition than diabetes and chronic kidney disease, both of which result in changes in macronutrient balance and processing.”

Handbook of Nutrition and the Kidney. Ikizler, TA, Mitch, ME. 7th Ed. 2018

Outline

Introduction

Brief overview of kidneys function

Risk factors

Prevalence and causes

Dietary requirements - stages of CKD

Nutrients and food

Chronic Kidney Disease (CKD) is a worldwide public health problem

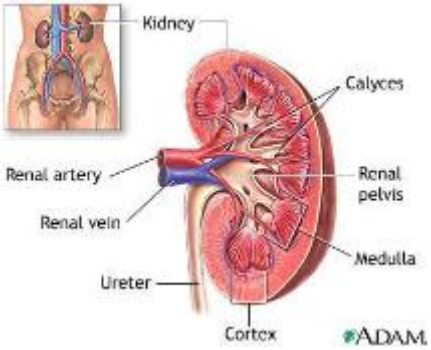
In Australia,

- 1:3 people are at risk
- Approximately 1.7 million Australians (1 in 10) aged 18 years and over have indicators of CKD such as reduced kidney function and/or the presence of albumin in the urine.
- People with CKD have a 2 to 3-fold greater risk of cardiac death than people without CKD.
- The risk of dying from cardiovascular events is 20 times greater than the risk of requiring dialysis or transplantation.
- If CKD is detected early and managed appropriately, the deterioration in kidney function can be reduced and may even be reversible.

Functions of the Normal Kidney

- Maintenance of extracellular fluid volume and composition

  - Water
  - Electrolytes and inorganic ions
  - Acid base
  - Blood pressure control



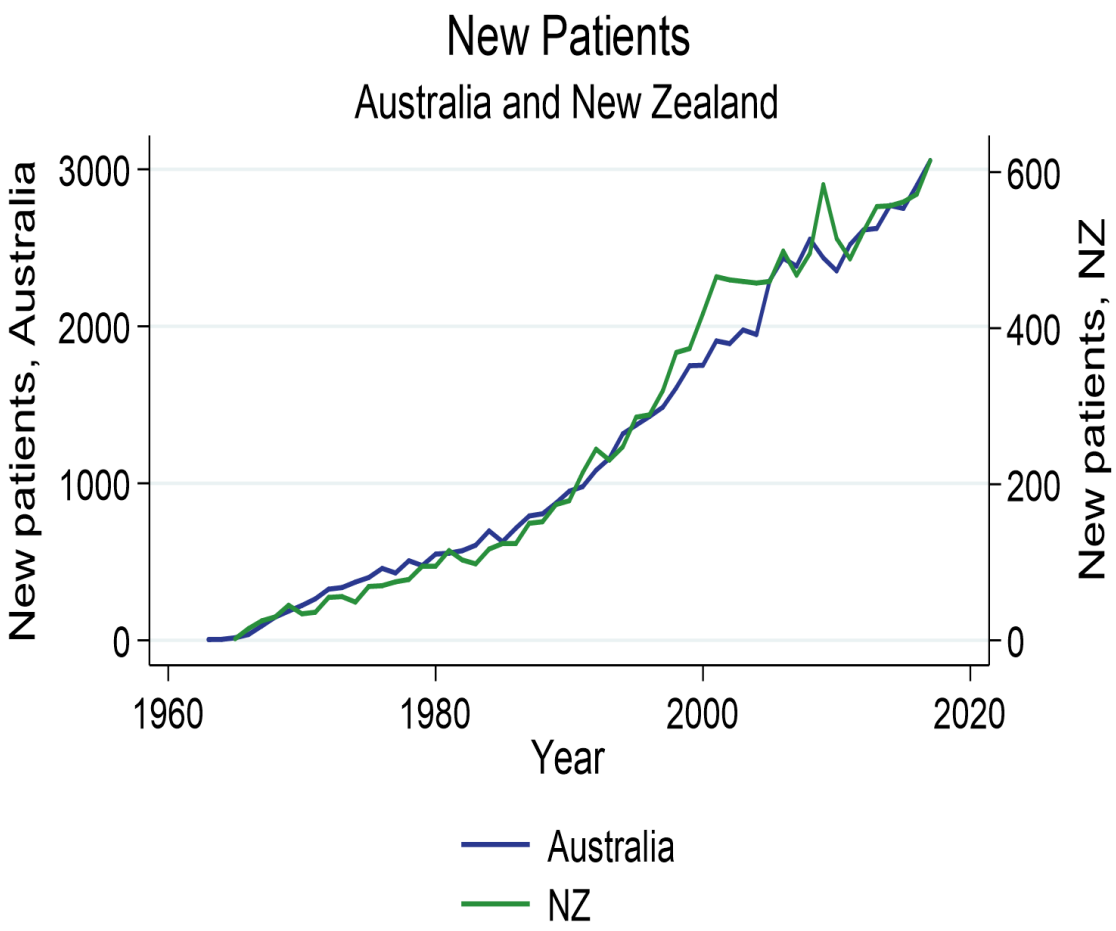
- Removal of metabolic wastes and foreign chemicals (e.g. drugs)

- Endocrine and other homeostatic functions

  - Erythropoiesis
  - Bone and mineral metabolism, including 1-25-OH-vitamin D

factors for CKD

- Diabetes
- High blood pressure
- Obesity (BMI 30)
- Heart disease and/or stroke
- Smoking
- Age over 60 years
- Family History of Kidney Disease
- Aboriginal or Torres Strait Islander heritage
- History of Acute Kidney Injury



2018 ANZDATA Annual Report, Figure 1.1

ANZ DATA
AUSTRALIA & NEW ZEALAND DIALYSIS & TRANSPLANT REGISTRY

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Causes of CKD

Table 1.11 Primary Renal Disease of New Patients 2014 - 2017

Country	Primary renal disease	2014	2015	2016	2017
Australia	Diabetic Nephropathy	1033 (37%)	1035 (38%)	1029 (35%)	1159 (38%)
	Glomerulonephritis	568 (21%)	494 (18%)	532 (18%)	523 (17%)
	Hypertension	373 (13%)	380 (14%)	402 (14%)	380 (12%)
	Polycystic Disease	182 (7%)	166 (6%)	172 (6%)	203 (7%)
	Reflux Nephropathy	62 (2%)	49 (2%)	64 (2%)	72 (2%)
	Other	361 (13%)	381 (14%)	403 (14%)	413 (14%)
	Uncertain	123 (4%)	126 (5%)	136 (5%)	192 (6%)
	Not reported	68 (2%)	120 (4%)	162 (6%)	114 (4%)
	Total	**2770**	**2751**	**2900**	**3056**
New Zealand	Diabetic Nephropathy	293 (53%)	270 (48%)	276 (48%)	318 (52%)
	Glomerulonephritis	95 (17%)	113 (20%)	112 (20%)	129 (21%)
	Hypertension	51 (9%)	51 (9%)	54 (9%)	51 (8%)
	Polycystic Disease	20 (4%)	25 (4%)	26 (5%)	29 (5%)
	Reflux Nephropathy	19 (3%)	16 (3%)	9 (2%)	6 (1%)
	Other	57 (10%)	65 (12%)	72 (13%)	59 (10%)
	Uncertain	15 (3%)	19 (3%)	17 (3%)	17 (3%)
	Not reported	7 (1%)	3 (1%)	6 (1%)	6 (1%)
	Total	**557**	**562**	**572**	**615**

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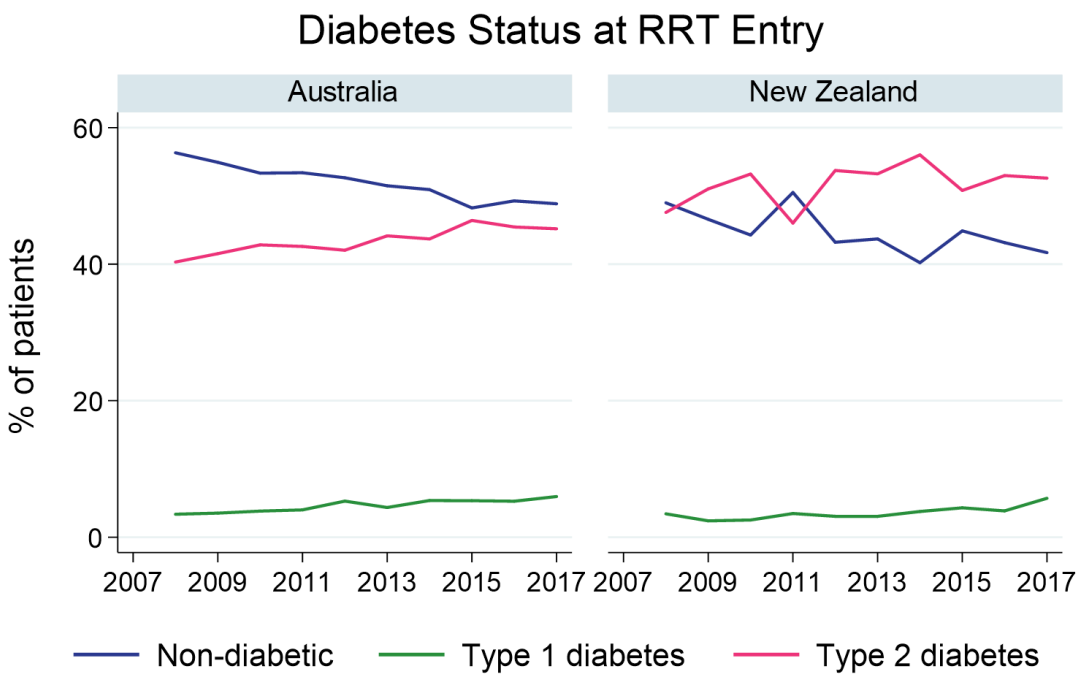

2018 ANZDATA Annual Report, Figure 1.9

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MYTHS
FACTS

“My doctor said to control potassium avoid bananas and stone fruit. ”

Potassium in Fruit (mg)

Apple 1 small 		Banana 1 small 	291
Pear 1 small 		Nectarine 1 small 	201
Grapefruit ½ medium 		Apricot 2 small 	188
Kiwi Fruit 1 medium 		Mango 1small 	

Potassium in Fruit (mg)

Apple 1 small 	98	Banana 1 small 	291
Pear 1 small 	107	Nectarine 1 small 	201
Grapefruit ½ medium 	93	Apricot 2 small 	188
Kiwi Fruit 1 medium 	205	Mango 1small 	268

Other High Potassium Sources (mg)

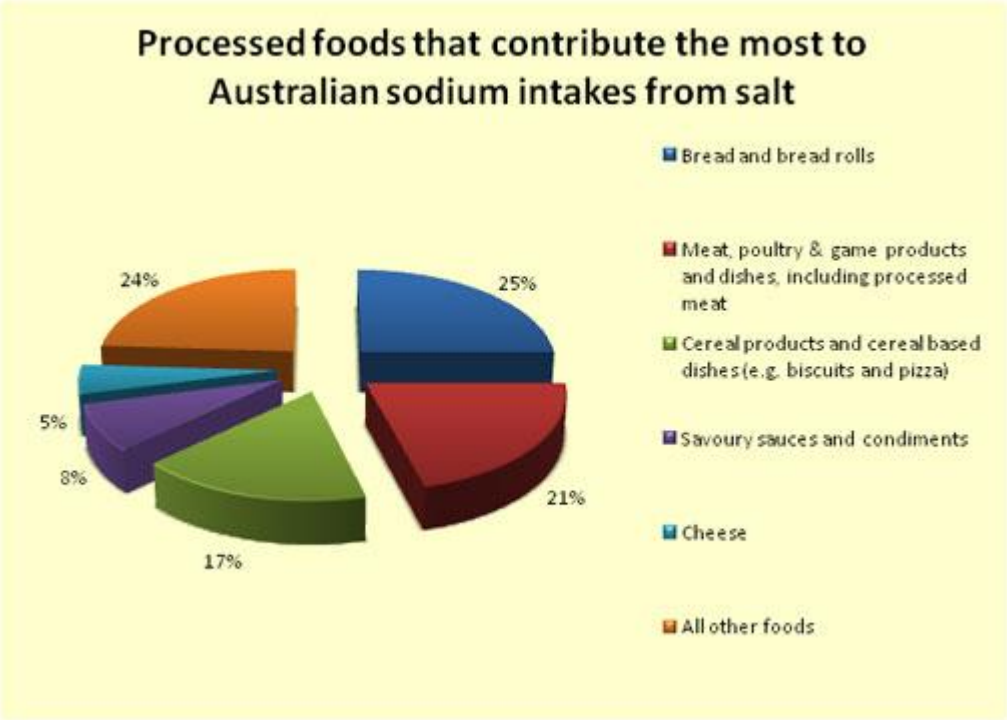
Milk 1 glass 	362	Mashed Potato ½ cup 	366
Avocado 1 small 	572	Oven Fried Potato Chips 100g 	770
Sundried Tomatoes 5-6 pieces -10g 	317	Potato Crisps 50g 	600
Chocolate 50g 	312	Licorice 50g twist 	530

“I don’t add salt to my foods so my diet must be low in salt”

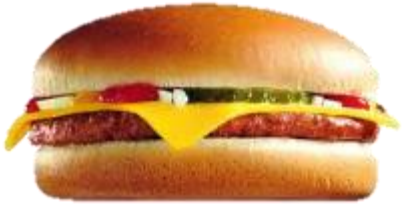
Where does it come from?

80% from processed foods, 20% from added salt or home cooking

foodstandards.gov.au/consumer/nutrition



Sodium content

1 cup Cornflakes + ½ cup milk = 275 mg 	2 Weet- Bix + ½ cup Milk = 145mg 	2 Poached eggs on toast = 440mg 	2 Eggs + 1 rasher bacon + toast = 840mg 
Chicken & salad sandwich = 430mg 	Ham & salad sandwich = 855mg 	Meat pie = 900mg 	2 minute noodles = 1200mg 
Home Roast chicken +vegetables = 150mg 	Fried Chicken & Chips = 1710mg 	Homemade Burger = 480mg 	Fast food Burger = 1000mg 

“I need to drink as much fluid as possible to flush out my kidneys”

CARI - Early Chronic Kidney Disease

- Suggest patients drink fluid in moderation (2C).
  For most with early CKD, a daily fluid intake of 2-2.5 L (including the fluid content of foods) is sufficient, although this might need to be varied according to individual circumstances (2C).

- No convincing evidence to date that pushing oral fluid intake beyond this amount, except in states of excessive fluid loss (e.g. sweating or diarrhoea), is beneficial for long-term kidney health.

Case Study - Mr K

Male

Age 58

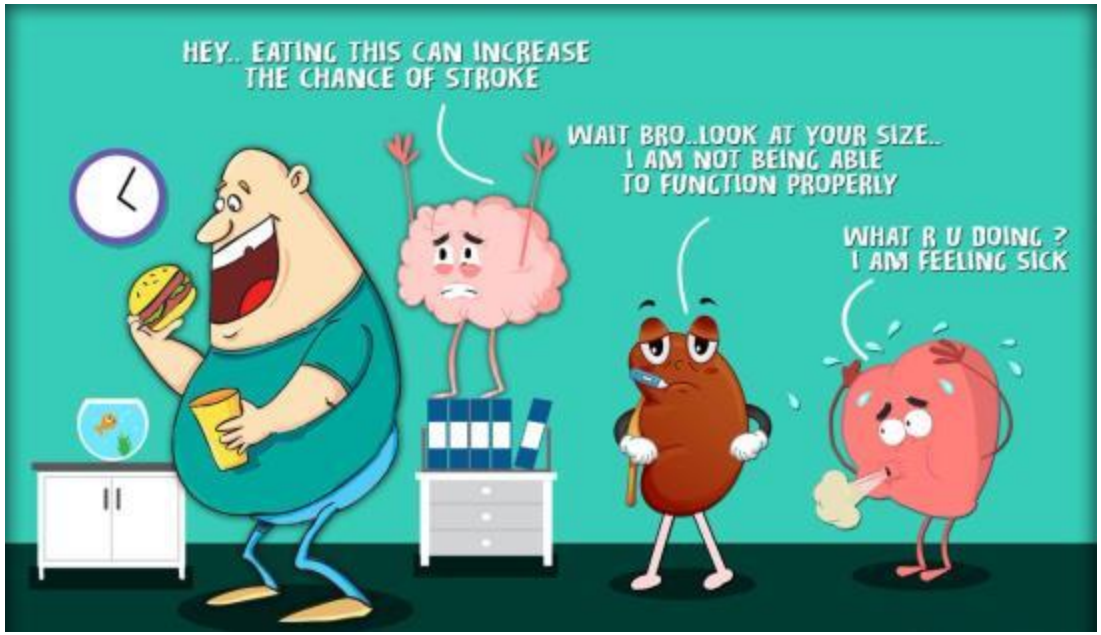
Weight 93.1kg

Height 174 cm

BMI 30.8

HWR 61-76kg

eGFR 48



Medical History:

Type 2 Diabetes (insulin requiring)

Diabetic nephropathy, retinopathy & peripheral neuropathy

Hypertension

Severe Obstructive Sleep Apnoea

	Units	Normal Range	Mr. K
Sodium	mmol/L	135 -145	134
Potassium	mmol/L	3.5 - 5.1	4.5
Bicarbonate	mmol/l	22-32	22
Urea	mmol/L	3-8	7.2
Creatinine	umol/L	40 - 80	134
Total Protein	g/L	60 - 80	77
Albumin	g/L	35-50	40
Phosphate	mmol/L	0.6 - 1.3	0.85
Cholesterol	mmol/L	<5mmol/L	5.6
Triglycerides	Mmol/L	<2.5	3.8
HbA1C		<7%	8.6

Chronic Kidney Disease

- Characterised by the kidney's inability to excrete waste products, maintain fluid and electrolyte balance, and produce hormones.

Staging of CKD

For people with CKD, the combination of low Glomerular Filtration Rate (GFR) and albuminuria places them at greater risk of CKD and CVD progression at all ages than those with just one of low GFR or albuminuria.

		Albuminuria Stage		
Kidney Function Stage	GFR (mL/min/1.73m²)	Normal (urine ACR mg/mmol) Male: < 2.5 Female: < 3.5	Microalbuminuria (urine ACR mg/mmol) Male: 2.5-25 Female: 3.5-35	Macroalbuminuria (urine ACR mg/mmol) Male: > 25 Female: > 35
1	<90	Not CKD unless haematuria, structural or pathalogical abnormalities present		
2	60-89			
3a	45-59			
3b	30-44			
4	15-29			
5	<15 or on dialysis			

↓

Investigations to determine underlying diagnosis

↓

Combine eGFR stage (1-5), albuminuria stage and underlying diagnosis to fully specify CKD (e.g., stage 2 CKD with microalbuminuria due to diabetic kidney disease).

Ref: KHA CKD Management in General Practice

Overview of Diabetic Nephropathy

- Diabetic nephropathy occurs in both type 1 and type 2 diabetes mellitus.

- Risk factors associated with diabetic nephropathy include:
  - Family history of diabetes
  - Black race, Mexican-American or Pima Indian ancestry
  - Higher systemic blood pressures
  - Evidence of hyperfiltration early in course of disease
  - Poor glycaemic control
  - Smoking
  - Possibly the use of oral contraceptives
  - Obesity and older age may also be risk factors

No one factor is predictive in the individual patient.

Overview of Diabetic Nephropathy continued

- The four major histologic changes in the glomeruli include mesangial expansion, glomerular basement membrane thickening, podocyte injury, and glomerular sclerosis. Different histologic patterns have similar prognostic significance.

- Pathogenetic processes that contribute to diabetic nephropathy in susceptible individuals include glomerular hyperfiltration; hyperglycaemia and the increased production of advanced glycation end products; hypoxia-inflammation and the activation of cytokines.

- Rates of progression of diabetic nephropathy have slowed markedly over the last several decades with optimal medical care for blood pressure, glycaemic control, lipid management, and the use of agents that block the renin-angiotensin system.

What are the aims for management of Diabetes Mellitus?

National Evidence Based Guideline for Diagnosis, Prevention and Management of Chronic Kidney Disease in Type 2 Diabetes

Prepared by:
CARI Guidelines
Centre for Kidney Research &
NHMRC Centre of Clinical Research Excellence
The Children's Hospital at Westmead

In collaboration with:
The Diabetes Unit
Menzies Centre for Health Policy
The University of Sydney

For the:
Diabetes Australia Guideline Development Consortium

Approved by NHMRC
on 12 June 2009

Summary of Recommendations

1. Kidney status in people with type 2 diabetes should be assessed by: (GRADE B)
    a. Annual screening for albuminuria
    b. Annual estimation of the eGFR.
    c. Continue annual screening for albuminuria and eGFR in the event of negative screening tests.

2. Blood glucose control should be optimised aiming for a general HbA1c target ≤ 7%. (GRADE A).

Summary of Recommendations continued

3. In people with type 2 diabetes and microalbuminuria or macroalbuminuria, ARB or ACEi antihypertensive should be used to protect against progression of kidney disease. (GRADE A)

4. The blood pressure of people with type 2 diabetes should be maintained within the target range. ARB or ACEi should be considered as antihypertensive agents of first choice. Multi-drug therapy should be implemented as required to achieve target blood pressure. (GRADE A)

5. People with type 2 diabetes should be informed that smoking increases the risk of CKD. (GRADE B)

KDOQI CLINICAL PRACTICE GUIDELINE FOR DIABETES AND CKD: 2012 UPDATE

Guideline 2: Management of Hyperglycemia and General Diabetes Care in CKD

2.1: Target HbA1c of 7.0% to prevent or delay progression of the microvascular complications of diabetes, including DKD. (*1A*)

2.2: Recommend not treating to an HbA1c target of <7.0% in patients at risk of hypoglycemia. (*1B*)

2.3: Suggest that target HbA1c be extended above 7.0% in individuals with co-morbidities or limited life expectancy and risk of hypoglycemia. (*2C*)

KIDNEY HEALTH AUSTRALIA | CARI GUIDELINES

Primary prevention of chronic kidney disease: managing diabetes mellitus to reduce the risk of progression to CKD

Date written: July 2012
Author: Kate Wiggins, Graeme Turner, David Johnson

GUIDELINES

We suggest that patients with diabetes mellitus aim to achieve an HbA1c <7.0% or <53 mmol/mol* (2B).

* SI units recommended as per The International HbA1c Consensus Committee [1, 2]

Glycaemic control[33] - Kidney Health Australia

Target:

BGL: 6-8mmol/L fasting; 8-10 mmol/L postprandial

HbA1c: Generally: ≤53 mmol/mol (range 48-58); ≤7% (range 6.5-7.5). Needs individualisation according to patient circumstances (e.g., disease duration, life expectancy, important comorbidities, and established vascular complications).

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HBA1C

Hyperglycemia	Goal is A1C <7% A goal of <6.5% may be appropriate in early-onset diabetes in younger patients Treatment consists of lifestyle modification, oral medications, and injectable medications, including insulin

General Recommendations

A1C <8% when GFR <60 mL/min/1.73 m^2 due to increased risks of hypoglycemia Imprecision of A1C with CKD strengthens reliance of SMBG in making treatment decisions Doses of insulin and other injectable and oral medications used to lower blood glucose often need to be reduced for eGFR <60 mL/min/1.73 m^2

Modifications for DKD

Diabetic Kidney Disease: A Report From an ADA Consensus Conference. Diabetes Care 2014;37:2864–2883 | DOI: 10.2337/dc14-1296

Cochrane Library

Cochrane Database of Systematic Reviews

Glucose targets for preventing diabetic kidney disease and its progression (Review)

Ruospo M, Saglimbene VM, Palmer SC, De Cosmo S, Pacilli A, Lamacchia O, Cignarelli M, Fioretto P, Vecchio M, Craig JC, Strippoli GFM

Ruospo M, Saglimbene VM, Palmer SC, De Cosmo S, Pacilli A, Lamacchia O, Cignarelli M, Fioretto P, Vecchio M, Craig JC, Strippoli GFM.
Glucose targets for preventing diabetic kidney disease and its progression.
Cochrane Database of Systematic Reviews 2017, Issue 6. Art. No.: CD010137.
DOI: 10.1002/14651858.CD010137.pub2.

www.cochranelibrary.com

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Cochrane Library
Cochrane Database of Systematic Reviews

Glucose targets for preventing diabetic kidney disease and its progression

What is the issue?

In many parts of the world, diabetes is the most common reason that people experience kidney failure and need treatment with a kidney transplant or dialysis. Disability (blindness, limb loss, kidney failure) due to diabetes is caused by high blood glucose (sugar) levels. An important question is whether extra treatment to control blood glucose levels to near normal can safely prevent the health consequences of diabetes including lower life expectancy and loss of kidney function, without causing problems such as low blood glucose leading to loss of awareness or seizures. Some medical care of diabetes includes careful blood glucose control to low levels (measured by a blood test called the HbA1C) through the use of extra medication and careful blood glucose monitoring with the help of health professionals.

What did we do?

We looked at the evidence for tighter blood glucose control (lower blood glucose in the long term, that is HbA1c < 7%) compared with less tight blood glucose control (HbA1c > 7%) in people who have either type 1 or type 2 diabetes. Blood glucose was achieved by any sort of treatment including pills or insulin.

What did we find?

Fourteen studies involving 29,319 people with at risk of diabetes complications were included and 11 studies involving 29,141 people were included in our analyses. Tighter blood glucose control generally didn't show any benefits for patients compared to less tight glucose control. There was no difference in the risks for patients on kidney failure, death, or heart disease complications. A very small number of patients (1 in every 1000 treated each year) might avoid a heart attack with more intense blood glucose management. Some patients would expect to have less protein leakage through kidney function although the clinical impact of this benefit is unclear in the long term. The potential problems with treatment, such as side effects and risks of very low blood glucose (hypoglycaemia) were not generally measured in the studies.

Our conclusions

The review concludes that people with diabetes receive uncertain benefits from tighter blood glucose control in the long-term and the immediate complications of this treatment approach are difficult to know accurately.

Mr K

HbA1c 8.6%

AJKD Official Journal of the National Kidney Foundation
AMERICAN JOURNAL OF KIDNEY DISEASES

Narrative Review

Dietary Modeling of Foods for Advanced CKD Based on General Healthy Eating Guidelines: What Should Be on the Plate?

Maria Chan, MNutrDiet, GradDip, Ex&Sp, PhD, AdvAPD,[1,2,3,4]
John Kelly, MBBS, MD,[3,4] and Linda Tapsell, PhD, FDAA, AM[2,5]

March 2017 Volume 69, Issue 3, Pages 436–450

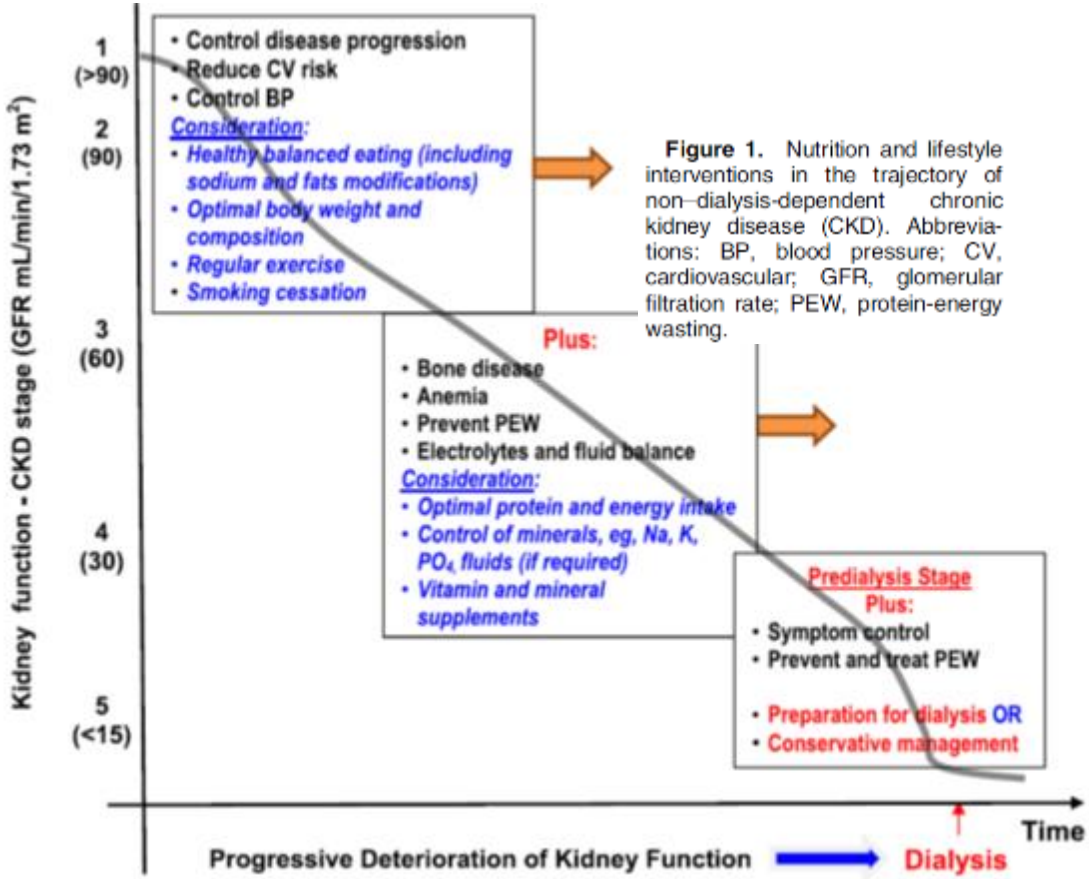

Figure 1. Nutrition and lifestyle interventions in the trajectory of non–dialysis-dependent chronic kidney disease (CKD). Abbreviations: BP, blood pressure; CV, cardiovascular; GFR, glomerular filtration rate; PEW, protein-energy wasting.

Box 1. Goals of Nutritional Management in Non–Dialysis-Dependent CKD Stages 3b to 5

General goal for all non–dialysis-dependent CKD

- To preserve kidney function
- To maintain optimal nutritional status
- To delay onset of and alleviate uremic symptoms
- To correct electrolyte, metabolic, and fluid imbalances
- To prevent complications
- To reduce cardiovascular risk
- To improve quality of life and patient-centered outcomes

Additional goals for predialysis care

- To postpone need for dialysis
- To aim for a healthy initiation of dialysis

Additional goals for conservative management

- To improve quantity of life

“It's just too hard to follow because I also have diabetes and I can't combine the 2 diets"

Dietary Requirements

CKD

ESKD

- **Renal Replacement Therapies**
  - **Haemodialysis**
  - **Peritoneal dialysis**
  - **Transplant**
- **Supportive Care (Conservative) management**

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Dietary Requirements CKD

	Stage 1-2 CKD	Stage 3 CKD	Stage 4 CKD	Stage 5 CKD Conservative
Energy	Ideal for age, gender, BMI and physical activity level		At least 146kJ/kg IBW (BMI 18.5-25), 125-146kJ/kg IBW >60 yr	125-146 kJ/kgIBW/day
Protein	Normal protein diet, consisting of 0.75 - 1.0 g/kg/day, with adequate energy.			
Sodium	100ml/day			
Potassium	Only restricted if persistent hyperkalaemia (1mmol/kg IBW)			
Phosphorus	Only restricted when serum phosphorus levels are elevated (>1.49 mmol/L) or plasma levels of intact PTH are elevated above target range of the CKD stage (800-1,000 mg/day and adjusted to dietary protein needs)			
Fluid	Restrictions not routinely recommended in non-dialysed adults with CKD, but may be necessary depending on the degree of reduced GFR; i.e. declining urine output and/or for the management of severe edema or hypertension.			

Pre Dialysis

Diabetes Australia recommend:

- People with diabetes follow the Australian Dietary Guidelines.
- Eat the recommended amount of food from the five food groups
- To help manage diabetes:
  - Eat regular meals and spread them evenly throughout the day
  - Eat a diet lower in fat, particularly saturated fat
  - If on insulin or diabetes tablets, between meal snacks may be needed
- It is important to recognise that everyone's needs are different. All people with diabetes should see an Accredited Practising Dietitian in conjunction with their diabetes team for individualised advice.

4. Lifestyle Management: *Standards of Medical Care in Diabetes—2018*

American Diabetes Association
Diabetes Care 2018 Jan; 41(Supplement 1): S38-S50.
https://doi.org/10.2337/dc18-S004

Table 4.1—MNT recommendations

Topic	Recommendations	Evidence rating
Effectiveness of nutrition therapy	• An individualized MNT program, preferably provided by a registered dietitian, is recommended for all people with type 1 or type 2 diabetes or gestational diabetes mellitus.	A
	• A simple and effective approach to glycemia and weight management emphasizing portion control and healthy food choices may be considered for those with type 2 diabetes who are not taking insulin, who have limited health literacy or numeracy, or who are older and prone to hypoglycemia.	B
	• Because diabetes nutrition therapy can result in cost savings B and improved outcomes (e.g., A1C reduction) A, MNT should be adequately reimbursed by insurance and other payers. E	B, A, E
Energy balance	• Weight loss (>5%) achievable by the combination of reduction of calorie intake and lifestyle modification benefits overweight or obese adults with type 2 diabetes and also those with prediabetes. Intervention programs to facilitate weight loss are recommended.	A
Eating patterns and macronutrient distribution	• There is no single ideal dietary distribution of calories among carbohydrates, fats, and proteins for people with diabetes; therefore, macronutrient distribution should be individualized while keeping total calorie and metabolic goals in mind.	E
	• A variety of eating patterns are acceptable for the management of type 2 diabetes and prediabetes.	B
Carbohydrates	• Carbohydrate intake from vegetables, fruits, legumes, whole grains, and dairy products, with an emphasis on foods higher in fiber and lower in glycemic load, is preferred over other sources, especially those containing added sugars.	B
	• For people with type 1 diabetes and those with type 2 diabetes who are prescribed a flexible insulin therapy program, education on how to use carbohydrate counting and in some cases fat and protein gram estimation to determine mealtime insulin dosing is recommended to improve glycemic control.	A
	• For individuals whose daily insulin dosing is fixed, a consistent pattern of carbohydrate intake with respect to time and amount may be recommended to improve glycemic control and reduce the risk of hypoglycemia.	B
	• People with diabetes and those at risk should avoid sugar-sweetened beverages in order to control weight and reduce their risk for CVD and fatty liver B and should minimize the consumption of foods with added sugar that have the capacity to displace healthier, more nutrient-dense food choices. A	B, A

4. Lifestyle Management: *Standards of Medical Care in Diabetes—2018*

Contd

Protein	• In individuals with type 2 diabetes, ingested protein appears to increase insulin response without increasing plasma glucose concentrations. Therefore, carbohydrate sources high in protein should be avoided when trying to treat or prevent hypoglycemia.	B
Dietary fat	• Data on the ideal total dietary fat content for people with diabetes are inconclusive, so an eating plan emphasizing elements of a Mediterranean-style diet rich in monounsaturated and polyunsaturated fats may be considered to improve glucose metabolism and lower CVD risk and can be an effective alternative to a diet low in total fat but relatively high in carbohydrates. • Eating foods rich in long-chain n-3 fatty acids, such as fatty fish (EPA and DHA) and nuts and seeds (ALA), is recommended to prevent or treat CVD B; however, evidence does not support a beneficial role for the routine use of n-3 dietary supplements. A	B B, A
Micronutrients and herbal supplements	• There is no clear evidence that dietary supplementation with vitamins, minerals, herbs, or spices can improve outcomes in people with diabetes who do not have underlying deficiencies, and are not generally recommended. There may be safety concerns regarding the long-term use of antioxidant supplements such as vitamins E and C and carotene.	C
Alcohol	• Adults with diabetes who drink alcohol should do so in moderation (no more than one drink per day for adult women and no more than two drinks per day for adult men). • Alcohol consumption may place people with diabetes at increased risk for hypoglycemia, especially if taking insulin or insulin secretagogues. Education and awareness regarding the recognition and management of delayed hypoglycemia are warranted.	C B
Sodium	• As for the general population, people with diabetes should limit sodium consumption to <2,300 mg/day, although further restriction may be indicated for those with both diabetes and hypertension.	B

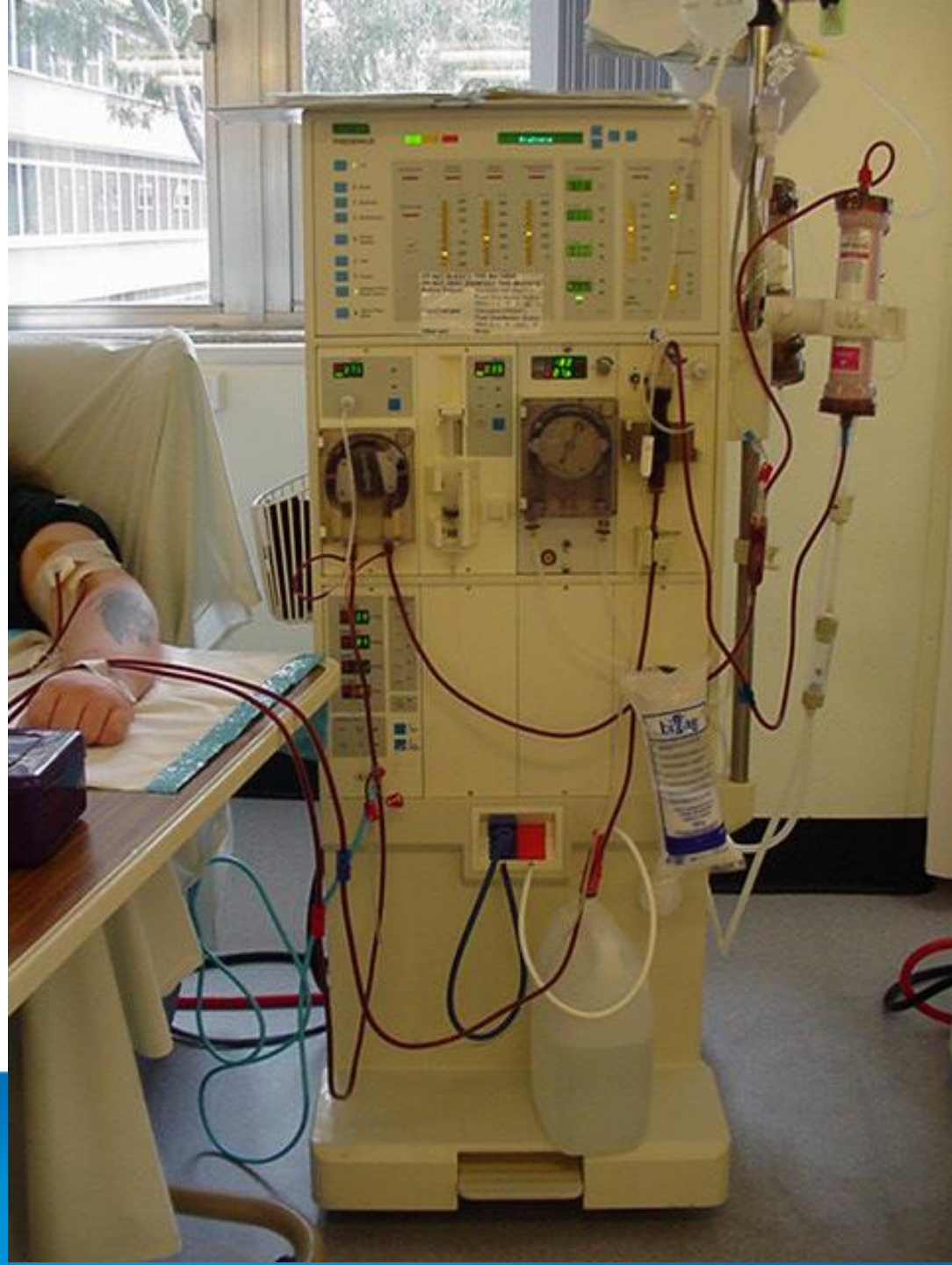
Mr K's usual eating pattern:

Breakfast:	1 glass (200ml) orange juice 1 serve cornflakes + full cream milk (100ml) 1 slice white toast + 1tsp margarine with vegemite Cup tea + full cream milk (30ml) + artificial sweetener
Morning Tea:	300ml Iced coffee 50g Mars bar
Lunch:	Takeaway-hamburger with extra cheese & bacon Hot chips 1 banana (large) 375ml can diet coke
Afternoon Tea:	1 stubby beer 60g potato crisps
Tea:	Large fried steak + Gravy + salt 1 cup mashed potato 1 cup green peas 1 large serve apple pie with 2 large scoops icecream 1 glass red wine

Mr K's nutrient intake

Nutrient	Intake	Recommend	% kJ	Ideal %kJ
Energy (kJ)	14657	Reduce for weight reduction		
Protein (g)	135	60-80	16	10-35
Fat (g)	147	Reduce intake	37	20-35
Carbohydrate (g)	355	Reduce intake	40	45-65
Sugars (g)	138	Reduce intake		
Potassium (mmol)	141			
Phosphorus (mg)	1940			
Sodium (mmol)	143	100		

Haemodialysis



Dietary Requirements

	Haemodialysis
Energy	125-146kJ/kg IBW/day
Protein	1.1-1.2/kg IBW/day
Sodium	80 – 110 mmol Na
Potassium	1mmol/kg IBW/day
Phosphorus	800-1000mg/day adjusted for protein
Fluid	PDUO + 500mls

PDUO = past days urine output

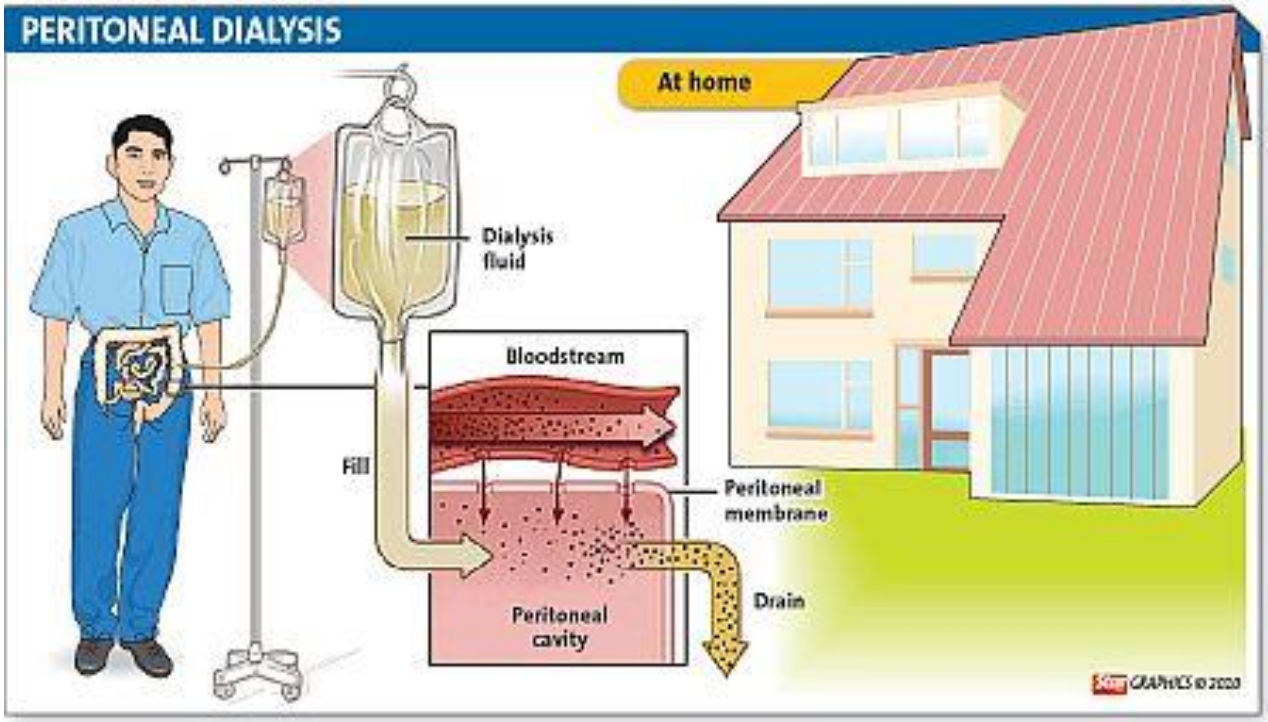
Protein: Requirements

EBP: lower than previously recommended (Naylor et al, Hum Nutr Diet 2013)

EBP: 1.1-1.2g/kg due to increased requirements:

- amino acid losses on dialysis
- inflammation/catabolism
- Other comorbidities
- proteinuria

Peritoneal Dialysis



Dietary Requirements

	Peritoneal Dialysis
Energy	125-146kJ/kg IBW/day

Must take into account energy from absorption of dialysate

- 120-320g/d glucose supplied during PD
- % absorption
  - 40% in APD (shorter dwell times)
  - 60% in CAPD (longer dwell times)
  - 25-40% with icodextrin
- Average 100-200g glucose; 1600-3200kJ absorbed in CAPD

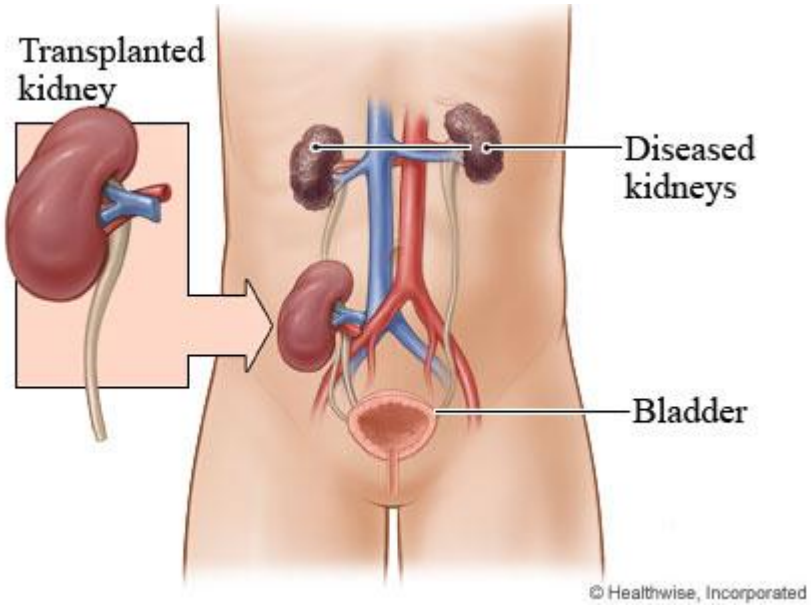
Dietary Requirements

	Peritoneal Dialysis
Energy	125-146kJ/kg IBW/day
Protein	Minimum 1.2g/kg IBW; >50% HBV Acute illness: >1.3g/kg IBW; Peritonitis: 1.5g/kg IBW
Sodium	80 – 110 mmol Na
Potassium	Individualised based on biochemistry; if need to restrict - 1mmol/kg/d
Phosphorus	800-1000mg/day adjusted for protein (ADA - 10-12mg per gram of protein **or** <17mg/kg IBW/day may be more practical for PD patients)
Fluid	Individualise taking into account Residual Renal Function • Urine output, weight changes, blood pressure and clinical symptoms • Fluid removed by PD + urine output

Management of hyperglycaemia in patients with diabetes on peritoneal dialysis

- Patients already on an oral agent with good glycaemic control prior to starting dialysis typically continue the oral agent.
- Patients who develop diabetes after starting dialysis generally treated first with an oral agent.
- Over time most peritoneal dialysis patients require insulin to maintain good glycaemic control.
- The principles underlying subcutaneous insulin therapy are the same for nondialysis CKD patients as for the general diabetic.

Kidney Transplant



Dietary Requirements

	Transplant
Energy	126-147 kcal/kg Ideal or ABW
Protein	1.3-1.5g /kg IBW/ day early post-transplant (~4 weeks) Normal Protein (0.8 g/kg IBW/day) –long term
Sodium	80 – 100 mmol Na
Potassium	Individualised based on biochemistry
Phosphorus	Encourage if hypophosphataemia
Fluid	As per fluid balance status

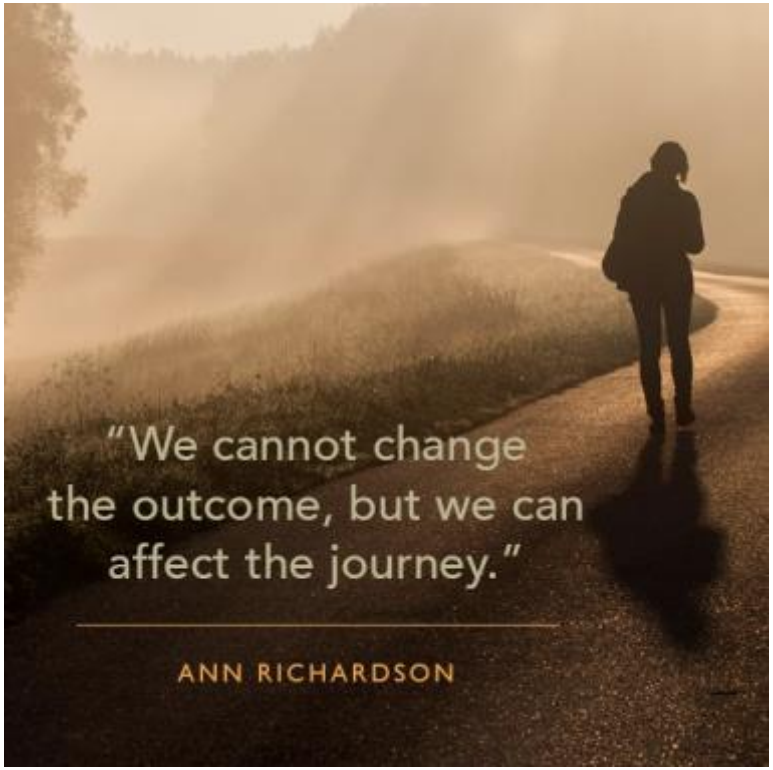
Need to consider food safety

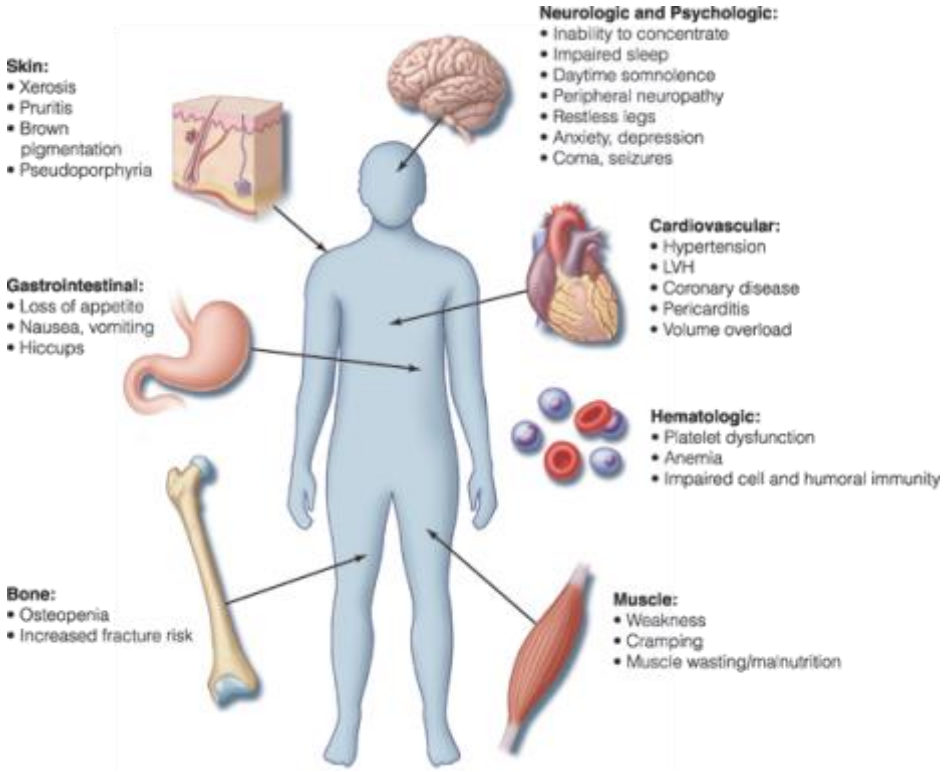
www.foodstandards.gov.au - Listeria and Food

New-onset diabetes after transplantation (NODAT)

- Most frequently diagnosed in first 3-6 months post transplant
- Can revert to normoglycaemia
- Incidence – 2-54%. Large range because:
  - Varying diagnostic criteria
  - Time at which diagnosed post transplant
- Results in a higher risk of:
  - Cardiovascular disease
  - Death
  - Graft failure
- Combination of insulin resistance and insulin deficiency

Supportive Care





Clinical Manifestations of Uremia

Supportive Care Pathway

- Dialysis treatment is not used
- The disease runs its natural course
- Focuses on treating the symptoms
- Relies on medications and in some instances diet
- Uses a multi disciplinary approach to caring for the clinical, emotional and social issues that are associated with kidney disease.
- Quality of life is of utmost concern
- Dietary restrictions may need moderation / relaxation but also may be useful to help symptom management
- Consider likely benefit of any intervention

Nutrients & Food

Protein

Potassium

Phosphorus

Sodium

Fluid

Joondalup Health Campus
Part of Ramsay Health Care

Protein

The benefits of RDI for protein for CKD:

- nitrogenous waste
- phosphate intake/levels
- acidosis –potential to affect progression and LBM
- avoid malnutrition- by not going too low or help↓ calorie intake
- slow progression

Dialysis:

Increased requirements due to

- amino acid losses on dialysis
- Inflammation/catabolism
- Other comorbidities

Kidney disease - getting the right amount of protein

Why is protein important?

Protein is an important building block of our immune system, helping us to heal and fight off infection. It also helps us to maintain or build lean muscle mass.

What foods contain protein?

The best sources of protein are animal foods such as red and white meat, fish, eggs, milk and milk products like custard, yoghurt and cheese. Other good sources of protein include meat alternatives like legumes, lentils, nuts and tofu.

How much protein do I need?

Everyone has different protein needs. Your protein needs depend on a number of factors such as your stage of kidney disease, whether you are on dialysis, and if you are losing weight or muscle mass. Eating the right amount of protein is important. Your Dietitian can advise you how much protein you need each day.

You need a total of _____ grams (g) of protein each day

Meat Aim for _____ g from this group	
Food	Grams (g)
Beef 100g (lean/cooked)	30
Chicken 100g (lean/cooked)	30
Lamb 100g (lean/cooked)	30
Pork 100g (lean/cooked)	30
Fish 100g (cooked)	30
1 Egg (medium)	7
Ham, chicken or turkey 25g (sliced)	4
Tuna/ salmon 100g (canned)	20

Milk & milk products Aim for _____ g from this group	
Food/drink	Grams (g)
Milk, cows or goats or soy 250ml (1 cup)	8
Custard 250ml (1 cup)	9
Yoghurt* 200g (1 tub)	10
Cottage or Ricotta cheese 60g (3 Tablespoons)	10
Hard cheese 40g (2 slices)	10
Ice cream 85mls (3 level scoops)	3
Creamed rice 150g	5

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Non animal products Aim for _____ g from this group	
Food/ drink	Grams (g)
Tofu 100g	12
Peanut Butter* Tablespoon 25g	7
Raw Nuts* 30g (¼ cup)	8
Baked Beans or other Legumes* 150g (½ cup)	5
Tahini Seed Paste 25g	5
Falafel Patties* 50g	5
Coconut Milk* 250ml (1 cup)	4
Chia Seeds* 15g	3
Rice Milk, Almond Milk* (1 cup)	1

Fruit, vegetables and grains	
Food	Grams (g)
Breads, pasta and rice (1 slice or ½ cup cooked)	3
Nutri-Grain™ (1 cup), *Special K*™ (1 cup)	8
Semolina (50g), *All Bran*™+ (1/2 cup)	6
Plus Protein™ (1 cup)	5
Weetbix™ (2 biscuits) *Sustain*™ (3/4 cup) *Just Right*™+ (2/3 cup)	4
Vegetables/ Fruit* 1 piece or ½ cup	1

Note: Be mindful of foods marked with * if you have been advised to limit high potassium foods by your dietitian or doctor.

What about nutrition supplements?

Your Dietitian may recommend a nutrition supplement to help you meet your protein needs.

The supplement you have been recommended is:

_____

This provides _____ grams of protein each day.

Remember:

If you have been prescribed phosphate binders, remember to take these when you eat protein rich foods or have a nutrition supplement.

If you have any questions about your protein intake or if you are losing weight unintentionally contact your Dietitian.

Your Dietitian is:

_____

This is a consensus document from Dietitian/ Nutritionists from the Nutrition Education Materials Online, 'NEMO', team.
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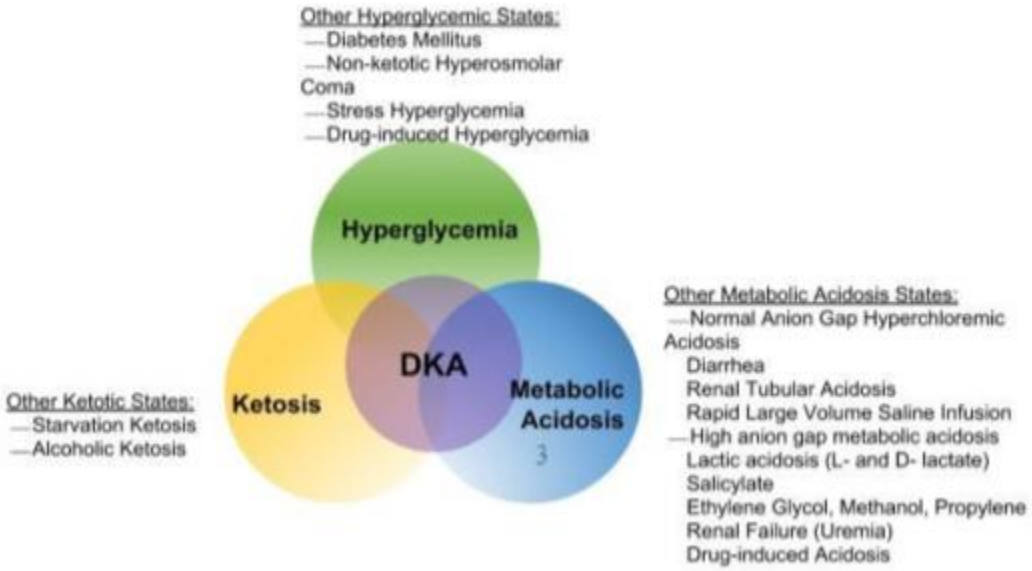
Potassium

Causes of Hyperkalaemia

- Drugs
- Hypovolemia
- Endocrine abnormalities & hyperglycaemia
- Blood transfusions
- G.I. Bleed
- Haemolysed blood sample
- Acidosis
- Constipation
- Increased catabolism
- Decreasing urine output
- Potassium sparing diuretics eg spironolactone

Figure 2. The triad of DKA (hyperglycemia, acidemia, and ketonemia) and other conditions with which the individual components are associated. From Kitabchi and Wall (12).



Gosmanov AR, Gosmanova EO, Kitabchi AE. Hyperglycemic Crises: Diabetic Ketoacidosis (DKA), And Hyperglycemic Hyperosmolar State (HHS) [Updated 2018 May 17]. In: De Groot LJ, Chrousos G, Dungan K, et al., editors. Endotext [Internet]. South Dartmouth (MA): MDText.com, Inc.; 2000-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK279052/

Potassium in foods

.....it's not just fruits & vegetables

Other foods to consider:

Meat, chicken, fish

Milk, milk products

Cappuccino, flat white, latte

Thick and homemade vegetable soup

Lentils, legumes

Potato crisps

Nuts, peanut paste, seeds

Tomato paste

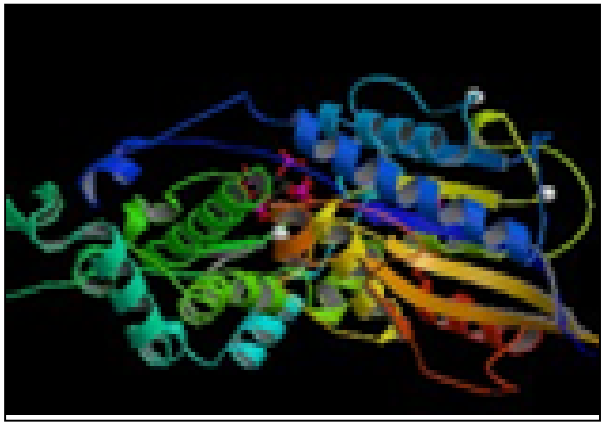
Vegemite

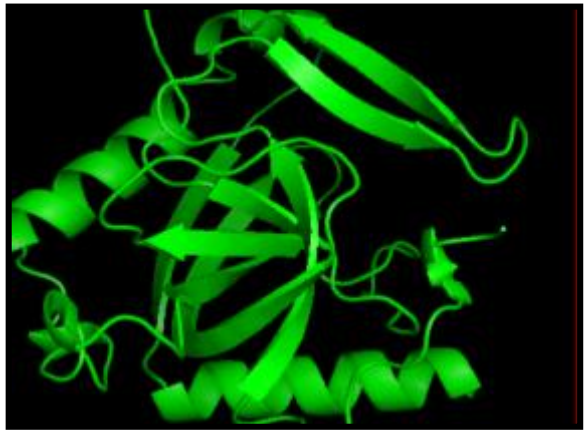
Cocoa, chocolate

Cider, wine

Licorice

Sources of Dietary Phosphorus





Organic Phosphorus

- Absorbed at slow rate
- 40-60% animal source absorbed
- 10-30% veg source absorbed
- Generally low bioavailability

Inorganic Phosphate Salts

- Food Additives
- High digestibility (> 90%)
- Absorbed rapidly

Noori N, et al. Organic and Inorganic Dietary Phosphorus and Its Management in CKD. Iranian Journal of Kidney Diseases, 2010; 4(2):89-100.
Kalantar-Zedeh K, et al. Understanding sources of dietary phosphorus in the treatment of patients with chronic kidney disease. CJASN, 2010; 5(3):519-30.

What does it all mean?

- Usually only 60% of phosphorus from a typical mixed diet is absorbed
- Higher reliance on processed foods will increase the amount of phosphorus absorbed compared to a diet rich in fresh, unprocessed foods.
- Diets containing phosphorus with low availability effectively limit phosphorus absorption in CKD

Therefore,

- legumes and nuts may be important protein sources (unless potassium is an issue)
- Seeds and grains can be utilised as important fibre and low GI

Queensland Government

4. Try to avoid higher phosphate foods

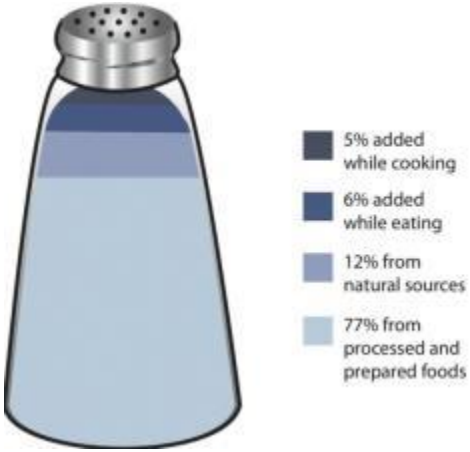
	Lower Phosphate Foods	Higher Phosphate Foods
Dairy products Limit to 2 serves per day	• Milk • Yoghurt/custard • Cottage/ ricotta/ cream cheese • Dairy desserts as occasional foods: ice cream, creamed rice	• Processed cheeses: spreads, slices • Hard cheeses: cheddar, parmesan • Malted drinks, hot chocolate • Milk powder • Condensed milk
Meat	• Lean meats: chicken, pork, beef, lamb, mince	• Processed/packaged meats: ham, spam, tinned meats, sausages, bacon • Offal: liver, kidney, pate
Fish	• Tinned tuna or salmon • Fresh white fleshed fish: flake, perch, cod	• Darker fleshed fish or fish with edible bones: sardines, herrings, snapper, fresh tuna, trout • Shellfish • Prawns • Oysters • Mussels • Fish paste
Meat alternatives	• Eggs • Legumes/lentils/beans • Tofu	• Seeds • Almonds and other nuts • Nut products: peanut butter
Cereals	• Weet-Bix • Rice Bubbles • Special K	• All Bran • Muesli
Treat food & drinks	• Water crackers • Plain sweet biscuits/cake • Shortbread • Lollies • Jam/marmalade • Non-cola soft drink • Weak instant coffee, Tea • Cordial • Wine • Spirits	• Chocolate • Scones • Crumpets • Pancakes • Potato chips • Pies/sausage rolls/pastry items • Takeaway foods • Cola • Sarsaparilla • Flavoured milk • Milk coffee: cappuccino, latte, flat white, iced coffee, flavoured milk • Instant sachets: coffee/ mocha/ chai latte • Beer

Reviewed: June 2016
Next Review: June 2018

Sodium

Reduced sodium diet will help:

- Reduce BP
- Prevent excess fluid intake and retention
- Decrease albuminuria



- Salt is an acquired taste
- Limit processed foods
- Limit takeaway foods
- Avoid adding salt in cooking and at the table
- Do not use Salt Substitutes

Fluid

- Individualise based on symptoms such as fluid overload, oedema, decreased urine output
- If restrict too early may reduce urine output and therefore renal residual function

Fluid definition:

- liquid at room or body temperature

- All drinks (eg. tea, coffee, milk, soft drinks, water)
- Thick fluids (eg. soup, yoghurt, sauces, custard, jelly)
- Frozen fluids (eg. icecream, ice)
- Foods that absorb water (rice, pasta)

Current recommendations

Heart healthy eating principles

Healthy eating patterns do not rely on one type of food or one type of nutrient to promote heart health. Heart healthy eating patterns are based on a combination of foods, chosen regularly, over time. This optimal combination can be categorised into **five healthy eating principles**.

This style of eating is naturally low in saturated and trans fats, salt and added sugar and rich in wholegrains, fibre, antioxidants and unsaturated fats (omega-3 and omega-6). Eating this way will improve the heart health of all Australians by reducing cardiovascular disease (CVD) risk factors such as high blood pressure and blood lipids and decreasing the risk of CVD events and mortality. In addition to the quality of foods consumed, their quantity is also an important determinant of a heart healthy eating pattern, as it can lead to weight gain and in turn, heart disease.

1

Plenty of fruit, vegetables and wholegrain cereals

2

Variety of healthy protein sources including fish and seafood, lean meat and poultry, legumes, nuts and seeds

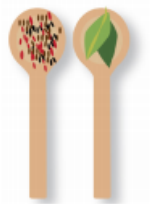
3

Reduced fat dairy such as unflavoured milk and yoghurt, and cheese

4

Healthy fat choices with nuts, seeds, avocados, olives and their oils for cooking

5



Herbs and spices to flavour foods, instead of adding salt

Heart Foundation

Mr K's modified eating pattern:

Breakfast:	2 weetbix + Hilo milk (100ml) 1 slice multigrain toast + 1tsp margarine (SR) Cup tea + Hilo milk (30ml) + artificial sweetener
Morning Tea:	Cup coffee + Hilo milk (30ml) + artificial sweetener 1 slice toast fruit loaf + 1tsp margarine (SR)
Lunch:	1 Multigrain Roll with chicken and salad 1 apple (medium) 375ml can diet lemonade
Afternoon Tea:	Cup tea + Hilo milk (30ml) + artificial sweetener Unsalted popcorn
Tea:	Medium Grilled steak + Gravy (SR) ½ cup mashed sweet potato ½ cup boiled broccoli 1 small serve boiled carrot 1 serve fresh strawberries + 2tbsp reduced fat yoghurt 1 glass diet cordial

Mr K's Modified Nutrient Intake

Nutrient	Intake	Previous intake
Energy (kJ)	5811	14657
Protein (g)	90	135
Fat (g)	40	147
Carbohydrate (g)	155	355
Sugars (g)	60	138
Potassium (mmol)	70	141
Phosphorus (mg)	1230	1940
Sodium (mmol)	85	143

Mr K's Modified Nutrient Intake

Nutrient	Intake	Recommended	% kJ	Ideal %kJ
Energy (kJ)	5811	Monitor weight		
Protein (g)	90	90	26	10-35
Fat (g)	40		25	20-35
Carbohydrate (g)	155		45	45-65
Sugars (g)	60			
Potassium (mmol)	70	70-80		
Phosphorus (mg)	1230	800-1000mg/day adjusted for protein		
Sodium (mmol)	85	80-110		

Recommended based on haemodialysis diet
*Fluid intake 1550ml

Major Nutritional Problems

Malnutrition

Dietary non-compliance

Prevalence

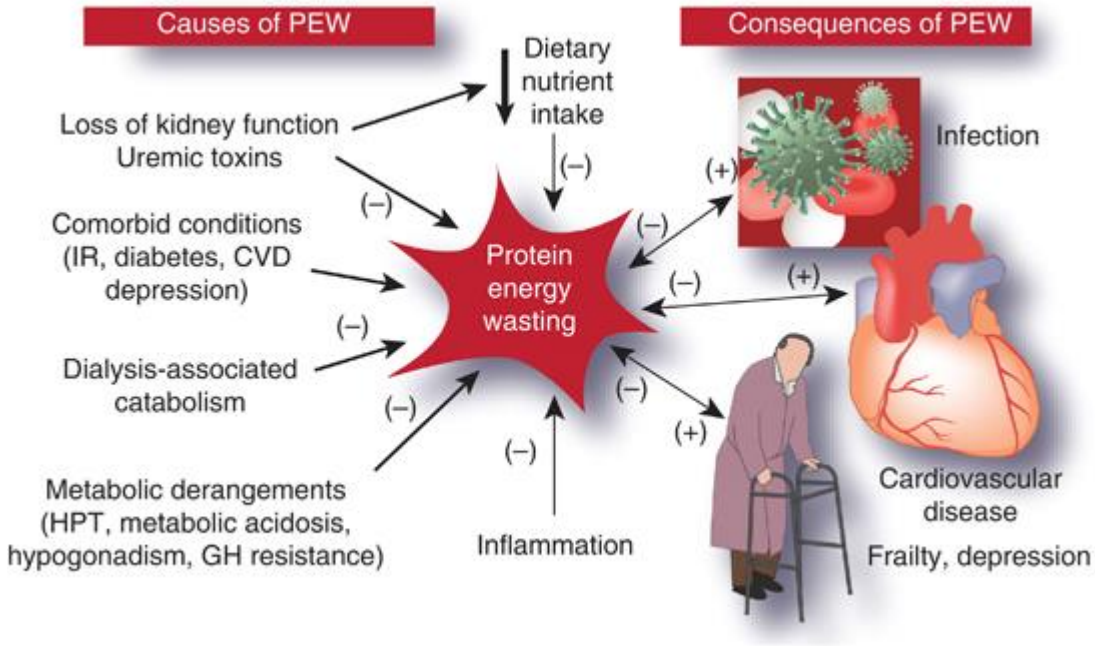
- Depends on definition and method of assessment.
- Surveys using classic measures of nutrition status indicate that approximately 18-75% of patients with CKD undergoing maintenance dialysis therapy show evidence of wasting.
- Approximately 40% of patients come to dialysis with signs and symptoms of Protein-energy wasting (PEW)
- Protein-energy wasting, a term proposed by the International Society of Renal Nutrition and Metabolism (ISRNM), refers to the multiple nutritional and catabolic alterations that occur in CKD and their association with morbidity and mortality.
- Evidence for Nutrition Support is Weak... However:
    - Prevention and treatment of PEW should be comprehensive
    - Supplementation may lead to considerable improvements in mortality, hospitalization, and treatment costs.

Protein Energy Wasting

http://www.kidney-international.org review

Prevention and treatment of protein energy wasting in chronic kidney disease patients: a consensus statement by the International Society of Renal Nutrition and Metabolism

T. Alp Ikizler[1], Noel J. Cano[2], Harold Franch[3], Denis Fouque[4], Jonathan Himmelfarb[5], Kamyar Kalantar-Zadeh[6], Martin K. Kuhlmann[7], Peter Stenvinkel[8], Pieter TerWee[9], Daniel Teta[10], Angela Yee-Moon Wang[11] and Christoph Wanner[12]



The conceptual model for etiology and consequences of PEW in CKD.
CVD, cardiovascular disease; GH, growth hormone; HPT, hyperparathyroidism; IR, insulin resistance

Conclusion

- Patients with type 1 and type 2 diabetes are living longer and therefore their lifetime risk of developing kidney disease is significant.
- Health professionals need to work together to improve the growing condition that is expensive for patients and the economy.
- Healthy eating plays an important role in reducing the risk of developing CKD.
- Dietary interventions can be very effective and involve few risks.
- Multifactorial risk reduction including dietary intervention is essential.

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