What should be on the plate?
Foods for Advanced Chronic Kidney Disease
(non-dialysis dependent, stages 3b-5)
2/9/2017

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Scope of presentation

- Brief review of CKD stages 3b-5 diet management (back to the basics)
- Review of latest evidence
- Summary
- Recommendations
“Food synergy” - the coordinated effects of all biological constituents of food on health (including nutrients, food components, antioxidants, phytochemicals etc.).

Dietary modelling - an applied mathematical system that translates the science of energy and nutrient requirements into food-based knowledge.

This review argues that non-dialysis dependent CKD nutrition requirements to a large extent align with healthy eating guidelines for the general population, and should not be based on deprivation or be unusually restrictive.
## Metabolic effect of Kidney Disease

### Excretion:
Waste, fluid, excess minerals, metabolites

- **Accumulation:**
  - Waste products of protein metabolism (uraemic toxins) e.g. urea, creatinine, ammonia etc.
  - Metabolites, e.g. K⁺, Na, PO₄
  - Fluid

### Regulation:
Maintain homeostasis - fluid, acid-base & electrolytes balance

- Blood pH
- Disturbed BP
- Lipid abnormality
- Hypertension
- Acidosis
- Dyslipidaemia
- Glucose intolerance

### Endocrine:
- Vitamin D/Ca²⁺/PO₄ metabolism, PTH
- Hb Synthesis/Erythropoietin

- **Hormonal imbalance:**
  - Hyperphosphatemia, Low vitamin D
  - Low folate, B₁₂ and iron levels

### Consequences & related S & S
- Uraemic symptoms: nausea, taste aversion, dry retching, poor appetite, constipation, dry mouth, lethargy, itching
- Hyperkalaemia, Hyperphosphatemia
- Malnutrition, unintentional weight loss
- Protein-Energy Wasting (PEW)
- Volume overload
- High uric acid

- Hypertension
- Acidosis
- Dyslipidaemia
- Glucose intolerance

- Osteodystrophy (Renal bone disease)
- Anaemia

**Nutrition Interventions** prevent & manage these abnormalities
Renal Function

Trajectory of deteriorating kidney function and treatment

The diet requirements change as renal function changes

Stage (GFR ml/min)

1 (>90)
2 (90)
3 (60)
4 (30)
5 (15)

CKD – progressive deterioration  Dialysis  Transplant

Today’s focus
CKD Nutrition Management

Additional considerations:
- Co-morbidities
  - Cardio-renal syndrome
  - Diabetes
  - Obesity (including obese sarcopenia)
  - Protein-energy wasting (PEW) ……..
- Lifecycle specific requirements – aged, paediatric, adolescent, pregnancy ……..
- Psycho-social issues
Goals

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

Traditional clinical outcomes:
- Morbidity
- Mortality
- Hospitalisation

Economic cost of dialysis $$$
Nutrition intervention- cost saving !!!
- AUD$1000/HDx session
- Hospitalisation
- Medications used
Clinical Practice Guidelines for nutritional management of non-dialysis dependent CKD (currently available)
Common Nutritional Considerations
in Kidney Disease

- Energy
- Protein
- Sodium
- Potassium
- Phosphorous
- Fluid
- Vitamin & Minerals
- Lipids
- CHO (esp. Diabetic)

Very important:
- an adequate & balanced intake of all other essential nutrients and food components as well
Protein requirements:

**Healthy adults:**
- Physiological: 0.6g/kg/d
- RDI: ~0.75 (F) - 0.85 (M) g/kg/d

**CKD:**
- 0.6g/kg/d (traditional)
- ~0.8g/kg/d (current)
- Very low protein diet: 0.6g/kg/d = 0.3g/kg/d from diet + 0.3g/kg/d from Keto-analogue of amino acids

Plus adequate energy to maintain nitrogen balance
Protein content of foods
(example – g/serve)

<table>
<thead>
<tr>
<th>High biological value:</th>
<th>Low biological value:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Egg</td>
<td>• Bread</td>
</tr>
<tr>
<td>6g (1 large)</td>
<td>2g (slice)</td>
</tr>
<tr>
<td>• Cheese</td>
<td>• Cereal (CF)</td>
</tr>
<tr>
<td>4g (slice)</td>
<td>2g (bowl)</td>
</tr>
<tr>
<td>• Meat /fish/ chicken</td>
<td>• Special K</td>
</tr>
<tr>
<td>8g (30g)</td>
<td>6g (serve)</td>
</tr>
<tr>
<td>• Lamb cutlet</td>
<td>• Rice/pasta</td>
</tr>
<tr>
<td>8g (ave. cutlet)</td>
<td>2g (0.5 cup)</td>
</tr>
<tr>
<td>• Oysters</td>
<td>• Legumes</td>
</tr>
<tr>
<td>8g (12 small)</td>
<td>7g (0.5 cup)</td>
</tr>
<tr>
<td>• Milk</td>
<td>• Fruit</td>
</tr>
<tr>
<td>5g (150ml)</td>
<td>&lt;1g (serve)</td>
</tr>
<tr>
<td>• Milk (fat reduced)</td>
<td>• Potato</td>
</tr>
<tr>
<td>7.5g (150ml)</td>
<td>2g (1 med)</td>
</tr>
<tr>
<td>• Yoghurt</td>
<td>• Green leafy vegs min (0.5 cup)</td>
</tr>
<tr>
<td>9g (200g tub)</td>
<td>Other Foods:</td>
</tr>
<tr>
<td>• Soya beans</td>
<td>• Fat/oil &amp; sugars 0g</td>
</tr>
<tr>
<td>7g (0.5cup)</td>
<td></td>
</tr>
</tbody>
</table>

Other Foods:
• Fat/oil & sugars 0g
## Diet Assessment and Intervention

<table>
<thead>
<tr>
<th><strong>Quantity</strong></th>
<th><strong>Quality</strong></th>
<th><strong>Strategies / practice tips</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Diet prescription (&quot;dose&quot; of energy &amp; nutrients)</td>
<td>Food &amp; meal plan, Dietary pattern (&quot;dose&quot; of foods &amp; distribution)</td>
<td>‘How to implement prescription’</td>
</tr>
</tbody>
</table>
| Energy; xxKcal/d | Core food groups (number of serves):  
  - Bread/cereals  
  - Fruit & Vegetables  
  - Meat and meat alternatives  
  - Milk & Dairy  
  - Fats  
  Others: added sugar, added salt/sodium ETOH & frequency | Characteristics of foods, types that would influence health e.g.:  
  - High biological value proteins  
  - Lean vs. fatty meat  
  - Omega-3 rich fatty fish etc. |
| Protein: xxg/d | Energy distribution: P: F:CHO% (ETOH) & frequency | Ways to implement prescription and plan e.g.:  
  - Mouth wash to reduce uraemic taste  
  - small frequent meals  
  - Using herb and spicy to flavour foods  
  - Behavioural modifications  
  - Social interaction etc. |
| Other macro- & micro nutrients e.g.: Na: mmol or mg/d | | |
| K: mmol or mg/d | | |
| PO₄: mg/d | | |
| Fluids: xxmL/d | | |

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Example:  
- Core food groups:  
  - Bread/cereals  
  - Fruit & Vegetables  
  - Meat and meat alternatives  
  - Milk & Dairy  
  - Fats  
- Others: added sugar, added salt/sodium ETOH & frequency  
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- Characteristics of foods, types that would influence health e.g.:  
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  - Lean vs. fatty meat  
  - Omega-3 rich fatty fish etc.  
- Ways to implement prescription and plan e.g.:  
  - Mouth wash to reduce uraemic taste  
  - small frequent meals  
  - Using herb and spicy to flavour foods  
  - Behavioural modifications  
  - Social interaction etc.
Dietary Modeling of Foods for Advanced CKD Based on General Healthy Eating Guidelines: What Should Be on the Plate?

Maria Chan, MNutrDiet, GradDip, ExSpSc, PhD, AdvAPD,¹,²,³,⁴
John Kelly, MBBS, MD,³,⁴ and Linda Tapsell, PhD, FDAA, AM²,⁵

- Bread/cereals
- Fruit & Vegetables
- Meat and meat alternatives
- Milk & Dairy
- Fats

- Others:
  - Alcohol
  - Salt/sodium
  - Added Sugar
  - Dietary Pattern
<table>
<thead>
<tr>
<th>Food (General Advice for the Adult Population)</th>
<th>Nutrient Intake Could Be in Excess in CKD if Food Choice is Inappropriate</th>
<th>Important Food Components</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core food groups</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bread, cereals, and grain products (wholemeal/whole grain products)</td>
<td>Carbohydrates, PO₄, Vit B and E</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Fruit &amp; vegetables (choose a variety of colored vegetables in season; see plant-based protein foods below for other vegetables, eg, legumes)</td>
<td>Vit A, C, K, and Mg, folate, iron in green leafy vegetables</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Meat and meat alternatives</td>
<td>Protein, PO₄, iron, zinc, iodine, Vit B including B₁₂, omega-3 fatty acids and Vit D (in oily fish); Vit E (in nuts); n-6 fatty acids</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Milk and dairy, and/or alternatives (fat-reduced varieties if needing to lose weight)</td>
<td>Calcium, PO₄, Vit B₂, A, and D</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Fat (mono- or polyunsaturated fats; Fat-soluble Vit, limit saturated fats and trans fats)</td>
<td>ELL</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Other foods</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol (to be limited for general health in all populations)</td>
<td>Alcohol</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

**CV Health**
- Decreased CRP (E);
- Decreased MI risk (E);
- Low glycemic index;
- Increased insulin sensitivity (I);
- Decreased uric acid (I) and CRP (I)

**Kidney Health**
- Decreased inflammation and oxidative stress (E), acidosis (I), markers of kidney injury (I), and drop in eGFR (I)
- Controlled protein: see Table 4 for supporting use; plant-based protein, especially soya (E & I);
- Decreased S creatinine, S PO₄, CRP, and proteinuria

**Benefits**
- Decreased CRP (E);
- Decreased mortality (E)
Table 3 (Cont’d). Benefits of Food for General, CV, and Kidney Health

<table>
<thead>
<tr>
<th>Food (General Advice for the Adult Population)</th>
<th>Main Nutrient(s)</th>
<th>Nutrient Intake Could Be in Excess in CKD if Food Choice Is Inappropriate</th>
<th>Important Food Components</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salt/sodium (limit to &lt;100 mmol/d)</td>
<td>Sodium</td>
<td></td>
<td>CV Health</td>
<td>Decreased BP (I)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Kidney Health</td>
<td>Decreased BP (I), proteinuria (I), and EFV (I)</td>
</tr>
<tr>
<td>Sugars (optimal level for energy)</td>
<td>Carbohydrates</td>
<td></td>
<td>CV Health</td>
<td>Decreased BP (I)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Kidney Health</td>
<td>Decreased microalbuminuria (E); increased S albumin (I); decreased S lipids (I) and inflammation (I)</td>
</tr>
<tr>
<td>Healthy dietary patterns</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dietary patterns that emphasize</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>plant-based foods, good-quality animal protein food, low sugar</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: BP, blood pressure; CKD, chronic kidney disease; CRP, C-reactive protein; CV, cardiovascular; E, epidemiological data; EFV, extracellular fluid volume; eGFR, estimated glomerular filtration rate; I, intervention study; IHD, ischemic heart disease; Mg, magnesium; MI, myocardial infarction; O, observational study; PO₄, phosphate; S, serum; Vit, vitamin.

Next:
To highlight some useful concepts and studies under individual food groups (please refer to all references in paper).
Bread and Cereals (Grain foods)

- **CHO** for energy, **B vitamins** - metabolic promoters
- **Dietary fibre**
  - Soluble (lipid lowering) and insoluble (regulation of bowel motions)
  - Fermentable fibre – resistant starch is synbiotic – a combination of prebiotics and probiotics - reducing gut dysbiotic microbiota and hence uraemic toxin production.
  - Probiotics in supplement forms have shown to benefit kidney health (RCT) ⇒ ↓uraemic toxin levels, serum homocysteine and triglyceride levels. Effect from wholefood alone is unknown
  - CKD observational study - high dietary fibre intake was inversely associated with inflammation markers (CRP) and all-cause mortality with a dose-response benefit
High dietary fiber intake is associated with decreased inflammation and all-cause mortality in patients with chronic kidney disease.

Vidya M. Raj Krishnamurthy¹,², Guo Wei², Bradley C. Baird², Maureen Murtaugh², Michel B. Chonchol³, Kalani L. Raphael¹,², Tom Greene¹,² and Srinivasan Beddhu¹,²

Kidney International 2012

Figure 1 | Associations of dietary fiber with elevated serum C-reactive protein (>3 mg/l) in the non-chronic kidney disease (CKD) and CKD sub-populations. Odds ratio for every 10-g/day increase in each type of fiber intake in CKD and non-CKD sub-populations. Models adjusted for age, gender, race.

Figure 2 | Associations of dietary fiber with all-cause mortality in the chronic kidney disease (CKD) and non-CKD sub-populations.
Phosphorus absorption:
- in plants (~20-40%) - is mostly in the form of phytate and absorption in the gut is low
- in animal (40-60%)
- from food additive (~90%)
⇒ feasible to include wholegrain products in the diet of CKD patients
• Average adults need ≥ 5 serves/d
Fruit and Vegetables

• Main source of CHO, vitamin A(β-carotene), C, E, folate, potassium, magnesium and dietary fibre.
• Known BP lowering effects from wholefood (F & V). However, – K & Mg in isolated supplement forms showed no significant effects.

A Comparison of Treating Metabolic Acidosis in CKD Stage 4 Hypertensive Kidney Disease with Fruits and Vegetables or Sodium Bicarbonate

Nimrit Goraya,*† Jan Simoni,*‡ Chan-Hee Jo,*§ and Donald E. Wesson*†

(2012-4) 3 papers

• In hypertensive nephropathic CKD patients (stage 3-4), controlled feeding studies have shown comparable alkali-inducing effects to sodium bicarbonate in ▼ markers of kidney injury and preserving renal function without causing hyperkalaemia
Fruit and Vegetables - cont’d

- F&V are rich in nitrate - substrate for nitric oxide (NO) which initiates and maintains endothelial vasodilatation. Renal patients are NO deficient.
- U-shaped relationship exists between serum potassium levels and mortality. Must balance between diet & medications – ACE-I and diuretics or other drugs affecting K handlings.
Meat and meat alternatives

- CKD patients are in the chronic state of “protein intolerance” or protein waste “intoxication”
- Controlled intake (including other protein food containing foods) + adequate energy
- “free” or “high protein” diets ↑ increased proteinuria and faster progression rate.
- Plant based vs. animal protein foods:
  - Plant based (including nuts): may have advantages, fibre, alkaline inducing effects, low in saturated fats etc.
  - However, excess intake of either protein foods has been associated with detrimental effects on CKD progression
  - Therefore, plant-based protein should substitute, or partly substitute animal protein within the total protein allowance rather than as an add-on
<table>
<thead>
<tr>
<th>Rationale for optimal level of protein intake</th>
<th>For</th>
<th>Against</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adequate energy should be maintained; RDI level = 0.8 (0.75-1.0) g/kg/d, very low-protein diet = 0.3 g/kg/d combined with keto-analogue of amino acids (physiologic requirement is approximately 0.6 g/kg/d)</td>
<td></td>
<td>Optimal level and duration of intake have not been well defined</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rationale for efficacy of low-protein diet</th>
<th>For</th>
<th>Against</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve signs and symptoms (and reduce onset) of peripheral neuropathy, insulin resistance, red blood cell lipid peroxidation, osteodystrophy, albuminuria, proteinuria</td>
<td></td>
<td>Benefits demonstrated in experimental models but lacking in clinical evidence</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rationale for low-protein diet slowing CKD progression rate</th>
<th>For</th>
<th>Against</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inconsistent findings due to short study duration, inclusion of early and nonprogressing CKD patients, inclusion of nonadherent patients, unregulated use of ACE inhibitors, undefined treatment targets and mechanism (eg, BP, phosphorus), when optimal adherence is achieved, the diet can slow progression rate</td>
<td></td>
<td>Benefits demonstrated in experimental models but lacking in clinical evidence; no significant slowing of progression</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rationale for renoprotective effects of low-protein diet</th>
<th>For</th>
<th>Against</th>
</tr>
</thead>
<tbody>
<tr>
<td>May help decrease albuminuria, proteinuria, and total sodium, uric acid, and phosphate intake</td>
<td></td>
<td>No additional benefit above the renin-angiotensin-aldosterone system blockade, BP reduction</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rationale for safety and lack of adverse effects for low-protein diet</th>
<th>For</th>
<th>Against</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervised diet management preserves nutrition status, increases albumin, maintains body weight and protein stores, does not jeopardize survival after initiation of dialysis therapy, improves symptom score and quality-of-life measures</td>
<td></td>
<td>May induce or further exacerbate malnutrition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Evidence from meta-analyses for low-protein diet</th>
<th>For</th>
<th>Against</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meta-analysis supports efficacy of a protein-restricted diet in slowing progression</td>
<td></td>
<td>Publication bias favoring studies with positive results</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Likelihood of adherence to low-protein diet</th>
<th>For</th>
<th>Against</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good adherence noted in a number of intervention studies, adherence can be measured by urinary nitrogen appearance and dietary assessment</td>
<td></td>
<td>Adherence is generally poor</td>
</tr>
</tbody>
</table>

Abbreviations: ACE, angiotensin-converting enzyme; BP, blood pressure; CKD, chronic kidney disease; RDI, recommended daily intake.
Dairy foods

• an essential part of the Dietary Approaches to Stop Hypertension (DASH) diet - the antihypertensive properties of vitamin D, bioactive dairy peptides and minerals such as Ca, Mg and K, supported by the stratified effects of dairy alone.

• To date, effect of dairy alone in kidney health is limited

• High in phosphorous – need careful diet planning & to consider supplementation (Ca and Vit D), exercise and sun exposure for bone health
Fats and oils

- Evidence on the effects of dietary fat in the CKD population is limited (studies mainly in RRT)
- Recommendations:
  - monounsaturated fats
  - polyunsaturated fats
  for their CV protective effects from vitamin E, an antioxidant and polyphenols etc.
- Important non-protein calories
High sodium intake:
• ↑BP, ↑proteinuria
• ↓BP lowering effects of antihypertensive medications
• CKD and CVD progression (observational studies)
RCT- CKDLowsalt study

A Randomized Trial of Dietary Sodium Restriction in CKD

Emma J. McMahon,*† Judith D. Bauer,† Carmel M. Hawley,*† Nicole M. Isbel,*† Michael Stowasser,*† David W. Johnson,*† and Katrina L. Campbell*†

Dietary sodium restriction: 60-80 mmol/d

\[ \downarrow \text{ambulatory BP by 10/4 mmHg} \]
RCT- CKDLowsalt study (cont’d)

Summary:
- ↓ BP
- ↓ proteinuria
- ↓ extracellular fluid volume
- ↓ medications

Figure 4. Median urinary protein/creatinine ratio (PCR) and albumin/creatinine ratio (ACR) during the high salt and low salt periods. Error bars indicate interquartile range.*P<0.01; **P<0.001 for difference from high salt period. PCR and ACR were significantly reduced on a low-sodium diet compared with a high-sodium diet.
From these studies and Cochrane systemic review, implications of dietary sodium restriction in CKD:

- Effective, Feasible, Achievable
- Recommended: 80-100mmol/d (no added salt)
Dietary Pattern

• in CKD: Epidemiological evidence: Western diets (high in saturated fat, high protein, processed and fried foods) are associated with microalbuminuria and rapid eGFR decline.

• in non-CKD: DASH, Mediterranean and Nordic diets & intervention studies etc. – evidence in improving BP, CV health and ↓ mortality etc.

• in CKD: RCT (12 months) in Mediterranean + NKF K/DOQI ⇒ significant improvement in serum albumin and lipid profiles, and reduced markers of inflammation (CRP, fibrinogen) and lipid peroxidation (thiobarbituric acid reactive substances), (Mekki et.al. 2010)

• DASH diet in CKD: “prevents” CKD (epidemiology studies), intervention study: improved BP…. However, DASH diet is high protein (~1.4g/kg/d) – await to see more studies in CKD.
General population:
• Balanced
• Adequate
• Chronic disease prevention (obesity, diabetes and some types of cancer)
### Education

Consume what is needed

Careful diet planning (high \( \text{PO}_4 \))

Specific nutrient requirements e.g., K, Na, \( \text{PO}_4 \) etc. ⇒ Smart choice within the food groups for CKD

---

**SERVE SIZES**

#### Vegetables and legumes/beans

<table>
<thead>
<tr>
<th>Serves per day</th>
<th>10–50</th>
<th>51–70</th>
<th>70+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>6</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Women</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

#### Fruit

<table>
<thead>
<tr>
<th>Serves per day</th>
<th>10–50</th>
<th>51–70</th>
<th>70+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Women</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

#### Grain (cereal) foods, mostly wholegrain and/or high cereal fibre varieties

<table>
<thead>
<tr>
<th>Serves per day</th>
<th>10–50</th>
<th>51–70</th>
<th>70+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>6</td>
<td>6</td>
<td>4½</td>
</tr>
<tr>
<td>Women</td>
<td>6</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Lean meat and poultry, fish, eggs, tofu, nuts and seeds, and legumes/beans

<table>
<thead>
<tr>
<th>Serves per day</th>
<th>10–50</th>
<th>51–70</th>
<th>70+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>3</td>
<td>2½</td>
<td>2½</td>
</tr>
<tr>
<td>Women</td>
<td>2½</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

#### Milk, yoghurt, cheese and/or alternatives, mostly reduced fat

<table>
<thead>
<tr>
<th>Serves per day</th>
<th>10–50</th>
<th>51–70</th>
<th>70+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>2½</td>
<td>2½</td>
<td>3</td>
</tr>
<tr>
<td>Women</td>
<td>2½</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

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To meet additional energy needs, extra serves from the Five Food Groups or unsaturated spreads and oils, or discretionary choices may be needed only by those adults who are taller or more active, but not overweight.

An allowance for unsaturated spreads and oils for cooking, or nuts and seeds can be included in the following quantities: 28–40g per day for men less than 70 years of age, and 14–20g per day for women and older men.

For meal ideas and advice on how to apply the serve sizes go to: [www.eatforhealth.gov.au](http://www.eatforhealth.gov.au)
Healthy quality and quantity

Guidance for protein serving size according to body size

Similar to recommendations for:
- Diabetes
- CV disease
- Cancer prevention etc.
Figure 2. Symphony of foods in managing nondialysis chronic kidney disease. Abbreviations: GFR, glomerular filtration rate; GI, gastrointestinal.
Baseline nutritional assessment:
⇒ High prevalence of malnutrition (42%) and undesirable intake:
- Reduced eGFR
- Symptoms: ~ 50% experienced taste changes and nausea etc.
- Poor habitual eating
- Self-induced dietary restriction – asking Dr. Google
⇒ Carry on effects after dialysis initiation
⇒ Needs structured nutrition interventions
Summary

The best currently available evidence for the CKD diet is likely to be:

- CKD energy & nutrient prescriptions (renal guidelines) +
- evidence underpinning national dietary guidelines +
- Mediterranean and Dietary Approaches to Stop Hypertension (DASH) style eating (dietary pattern).

- Positive messages from these dietary patterns should improve acceptance of CKD dietary interventions among patients (& the renal community)

- CKD diets is:
  - prescriptive BUT NOT restrictive
  - similar to the diet for the healthy population with a few rules to observe
Renal Function

Stage (GFR ml/min)

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</table>

Renal Function

Summary Cont’d

Must consider changing requirements during the course of ↓ GFR, ⇒

- there will be no single diet to suit the lifelong disease trajectory of CKD.
- A framework for modelling, adapting and monitoring the diet to meet the individual needs of each CKD patient is essential.
- Refer to your dietitian

CKD – progressive deterioration

Dialysis

Transplant
XIX International Congress on Nutrition and Metabolism in Renal Disease
Genova, Italy, 26-30, June 2018