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Evidence based practice guidelines for the nutritional management of chronic kidney disease

INTRODUCTION

Scope and Purpose

The purpose of these guidelines is to provide dietitians in Australia and New Zealand with a summary of evidence based clinical guidelines related to the dietetic management of adult patients with chronic kidney disease. The patient target group is any adult patient fulfilling the definition and diagnostic criteria of Chronic Kidney Disease (CKD), excluding those with nephrotic syndrome. These guidelines by definition also exclude acute renal failure and transplantation.

The clinical questions were as follows:

- At what level of glomerular filtration rate (GFR) should patients be referred to the dietitian in order to maximise nutritional intervention opportunities?
- Which specific measures best reflect nutritional status or change in nutritional status in CKD?
- What are the goals of nutrition intervention for CKD?
- What is (are) the appropriate nutritional intervention(s) to optimise nutritional status in CKD and prevent malnutrition?
- What is the optimal method of implementation and follow up to ensure nutritional status is maintained or improved?

These guidelines are meant to serve as a general framework for handling patients with particular health problems. It may not always be appropriate to use these guidelines to manage clients because individual circumstances may vary. The independent skill and judgement of the health care provider must always dictate treatment decisions. These guidelines for practice are provided with the express understanding that they do not establish or specify particular standards of care, whether legal, medical or other.[1]

Methods

The Royal Brisbane and Women's Hospital (RBWH) Nutrition and Dietetics Department supported a project dietitian, Helen McLaughlin to undertake the search strategy of existing guidelines. An initial team led by Dr Susan Ash, from Princess Alexandra Hospital with Helen McLaughlin, Suzie Chesterfield and Helen McCoy from RBWH developed the framework and the initial draft, which was circulated to Queensland dietitians working in Nephrology Services. This draft was used for consultation and evaluation at a workshop of dietitians at the 21st National Dietitians Association Australia conference in May 2003. A national panel of experts was defined at the conference, the Australia and New Zealand Renal Guidelines Taskforce (ANZRGT), who have continued to refine the guidelines as discussed elsewhere (see 'Consultation Process').

Relevant guidelines and articles were identified by Medline database and Internet key word searches between April 2002 and October 2003. The evidence based practice guidelines for the dietetic management of chronic kidney disease were developed by summarising the nutrition components of the following published guidelines:

- Caring for Australians with Renal Impairment (CARI) Guidelines[2]
- Kidney Disease Outcomes Quality Initiative (K/DOQI) Clinical Practice Guidelines[3–8]
- American Dietetic Association (ADA) Medical Nutrition Therapy Evidence-Based Guides for Practice: Chronic Kidney Disease (non-dialysis) Medical Nutrition Therapy Protocol[9]
- ADA Guidelines for Nutritional Care of Renal Patients (3rd ed)[10]
- European Dialysis and Transplant Nurses Association and European Renal Care Association (EDTNA/ERCA) Guidelines for the Nutritional Care of Adult Renal Patients.[11]

Where conflicting guidelines answering the same clinical question existed, the guideline with the strongest level of evidence was included. When conflicting supporting evidence was equal in quality and depth, CARI guidelines were selected preferentially as more relevant to the local environment. If similar information was proposed from more than one set of guidelines, all sources were acknowledged. Aspects of nutritional management not included in any of the guidelines were omitted. Due to the difficulties associated with research into nutritional management of kidney disease, an evidence-based approach could not be adopted for all aspects. For published guidelines based on opinion or agreed best practice without supporting research, recommendations have still been included to complete the document but are acknowledged as being open for wider variance in practice. In particular, adherence to

process type guidelines may be strictly resource dependant.

The selected guidelines were reformatted into the following components: definition of disease, diagnostic criteria, clinical questions to be addressed, referral criteria, nutrition assessment, nutrition prescription and outcome measures, in line with established nutritional management process. Dietetic management of acute renal failure, transplantation, nephrotic syndrome or kidney disease in paediatrics is not included.

These guidelines include information taken from existing sets of guidelines based on scientific evidence, and where no evidence exists, published guidelines stating consensus opinion from experienced practitioners including dietitians have been included. These guidelines do not address many issues concerning the implementation of dietetic practice, such as using groups or individual consultations, educational strategies or counselling techniques. This is beyond the scope of these guidelines and neither the evidence nor consensus opinion currently exists to promote one form of practice over another.

The Appendix show the definitions and calculations required for the management of CKD.

Levels of evidence or opinion have been cited from the above documents and referenced in each guideline. Descriptions of the levels of evidence are listed in Table 1.

Consultation Process

These practice guidelines have undergone several stages of peer and expert review using the Appraisal of Guidelines for Research and Evaluation (AGREE) instrument (The AGREE Collaboration).[12] The rigour of scientific process varies between guidelines. The K/DOQI and CARI guidelines have documented systematic search and review processes in place, which meet the NH&MRC and AGREE criteria for quality. The ADA and EDTNA/ERCA guidelines are less rigorous, but the information extracted from these documents is based on expert opinion and is unable to be assessed using an evidence based practice tool.

The first draft of these guidelines was presented at the Dietitians Association of Australia (DAA) 21st National Conference in Cairns in May 2003 and achieved support in principle. A national panel of experts was defined at the conference, the Australia and New Zealand Renal Guidelines Taskforce (ANZRGT) to oversee further development and formulation of the final document. Consultation with nephrologists and renal nurses was undertaken when the guidelines were presented at the 31st Annual Renal Society of Australasia Conference in Brisbane, also in May 2003. The second draft was reviewed by the ANZRGT in August 2003 with comments incorporated into the final document. ANZRGT launched the guidelines in Queensland on October 30, 2003 with the assistance of the Queensland Health Allied Health Core Practice Group. Following the launch of the 2003 Guidelines, a workshop was conducted at the DAA 22nd National Conference in Melbourne in May 2004, on implementing the guidelines, and the taskforce gathered feedback from the 6 month pilot period since launching the guidelines. Currently, the guidelines are published on the Queensland Health Electronic Publishing Service (QHEPS) Internet site and have been endorsed by DAA.

As part of the DAA endorsement process, consumer input was sourced from Kidney Health Australia's regional Advocacy Committees, which are comprised of CKD patients. A standardised feedback form was developed based on recommendations from the Queensland Health Charter of Patient Rights (http://www.health.qld.gov.au/qhppc/default.asp). Feedback from consultation in two states has indicated that overall consumers felt the guidelines provided a standardised approach to care, however, were concerned that in their current format were too technical to be understood by consumers. Consumers would have liked to have been involved from the outset and were particularly interested that minority groups such as Indigenous people and those from non-English-speaking backgrounds be considered in any educational material and that those in rural and remote areas receive the same access to dietetic care as people in metropolitan areas. Discussion at both the National DAA workshops in 2003 and 2004 recognised the importance of involving consumers particularly from Indigenous backgrounds in the development of education materials.

Review Process

These guidelines are based on other published guidelines and should be reviewed annually to ensure they remain current. Responsibility for review lies with Royal Brisbane and Women's Hospital in conjunction with the Australia and New Zealand Renal Guidelines Taskforce.

Next Review Date: October 2007.

Applicability

The applicability was tested by dietitians at two national workshops and one state workshop. The cost of implementing the guidelines was a human resource issue and participants in the workshops felt having the guidelines would assist in lobbying for more staff for patient management.

Table 1 Levels of evidence from original sources

Reference	*Levels of evidence*					
NHMRC[13]	I Systematic review of all relevant clinical trials	II At least 1 properly designed randomised clinical trial (RCT)	III-1 Well-designed pseudo-RCT	III-2 Comparative studies with concurrent controls and allocation not randomised (Cohort studies), case control studies, or interrupted time-series with a control group	III-3 Comparative studies with historical control, 2 or more single-arm studies, or interrupted time-series without a parallel control group	IV Case series, either post-test or pretest and post-test
ADA/Splett, 2000[1]		1 Evidence obtained from 1 or more well-designed RCTs	II-1 Evidence obtained from well designed control trials without randomisation	II-2 Evidence obtained from well designed cohort or case-controlled analytic studies, preferably from more than 1 centre or research group	II-3 Evidence obtained from multiple time-series studies with or without intervention, or well designed studies with concurrent comparison groups, studies with dramatic results from uncontrolled experiments	III Descriptive observational studies (no control or comparison group), case series reports and reports from expert committees, opinions of respected authorities and documented clinical experience
ADA, 2002[9,10]		Grade 1 Studies of strong design for answering the questions addressed. The results are both clinically important and consistent with minor exceptions at most. The results are free of serious doubts about generalisability, bias, and flaws in research design. Studies with negative results have sufficiently large samples to adequate statistical power		Grade II Studies of strong design but uncertainty attached to the conclusion because of inconsistencies among the results for different studies or because of doubts about generalisability, bias, research design flaws or adequacy of sample size. OR the evidence is solely of studies from weaker designs but results have been confirmed in separate studies and are consistent.	Grade III Limited studies of weak design. Evidence from studies of strong design is either unavailable because no studies have been done or because the studies that have been done are inconclusive due to lack of generalisability, bias, design flaws or inadequate sample size	Grade IV The support of the conclusion consists solely of the statement of informed medical commentators based on their clinical experience, unsubstantiated by the results of any research studies

Table 1 *Continued*

Reference	*Levels of evidence*			
CARI, 2003[2]	Level A Randomised controlled trials and meta-analyses		Level B Descriptive studies	Level C Consensus or opinion
K/DOQI, 2000[3]		Evidence Mainly convincing scientific evidence limited added opinion	Evidence and opinion Descriptive studies	Opinion Consensus or opinion
K/DOQI, 2002[4]	S Analysis of individual patient data from a single large, generalisable study of high methodological quality (for example NHANES III)	C Compilation of original articles into evidence tables	R Review of reviews and selected original articles	O Opinion
Guidelines for Nutritional Care of Renal Patients (3rd ed)[10]	No levels of evidence or opinion provided			
European Guidelines for the Nutritional Care of Adult Renal Patients[11]	'Examination of the scientific literature shows a paucity of evidence on dietary advice in renal failure. Therefore the guidelines are based on scientific evidence, where available, and on consensus of what constitutes "best practice" where not'			

Editorial Independence

These guidelines have been developed as a quality activity without external funding, therefore there is no external influence on the content of the guidelines. No member of the guideline taskforce has any conflict of interest to declare relating to the development of these guidelines.

EVIDENCE BASED PRACTICE GUIDELINE FRAMEWORK

The framework for evidence-based practice for the nutritional management of CKD is presented in Figure 1.

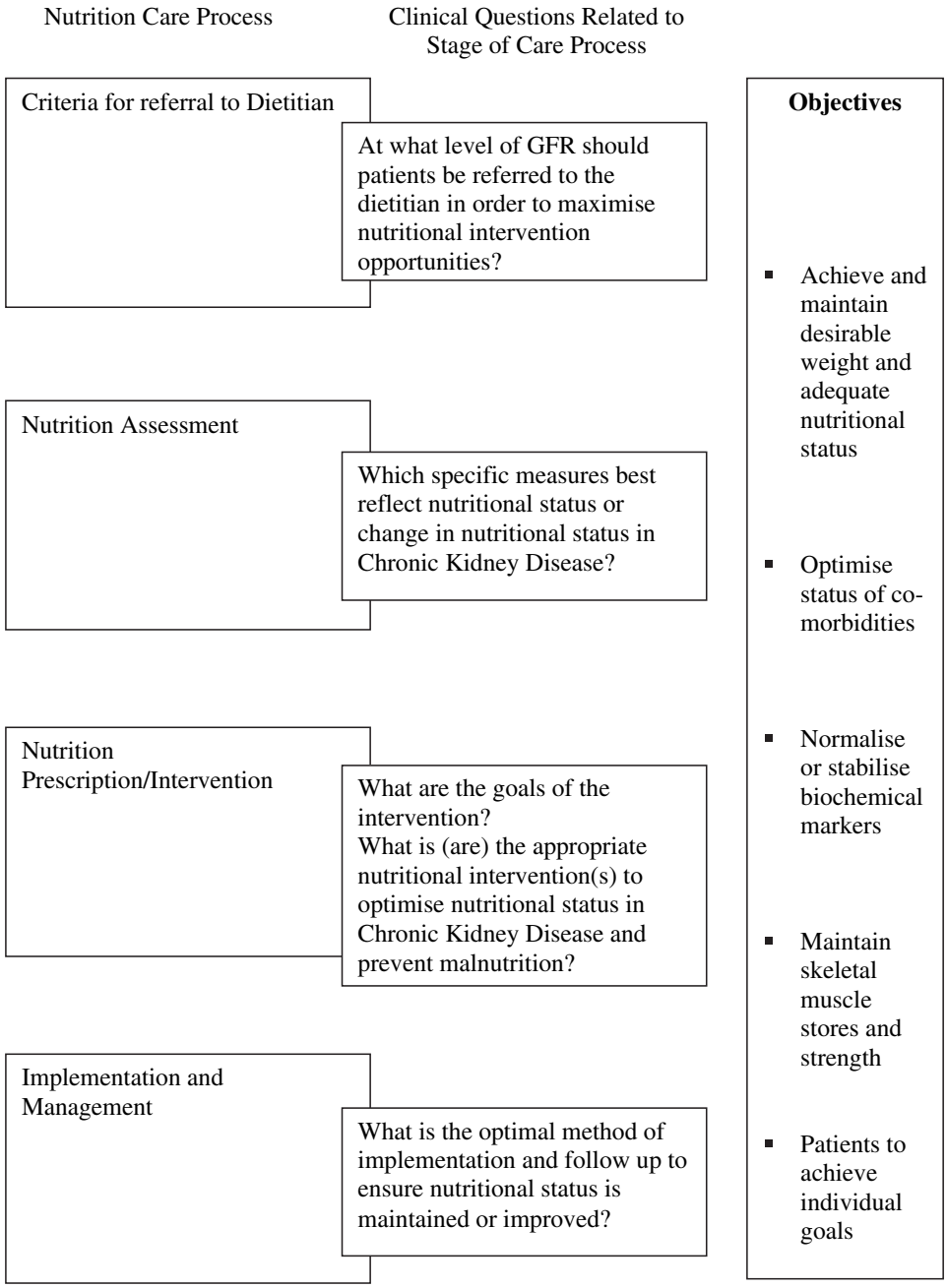

Figure 1 Framework for the development of evidence based practice guidelines for the nutritional management of chronic kidney disease (adapted from Splett[14] and Hakel-Smith[15]).

EVIDENCE BASED STATEMENTS

The evidence based statements are listed under the headings described in the Nutrition Care Process in Figure 1, based on the stages of CKD (Table 2). A summary of the recommendations are in Table 3.

Table 2 Stages of chronic kidney disease

Stage	*Description*	*GFR (mL/min/1.73 m²)*
1	Kidney damage with normal or ↑ GFR	≥90
2	Kidney damage with mild ↓ GFR	60–89
3	Moderate ↓ GFR	30–59
4	Severe ↓ GFR	15–29
5	Kidney failure	<15 (or dialysis)

Criteria for Referral to Dietitian

Clinical question

At what level of Glomerular Filtration Rate (GFR) should patients be referred to the dietitian in order to maximise nutritional intervention opportunities?

Evidence statement	*Level of evidence*
CKD Stages 3 and 4	
CKD Stage 3 (GFR 30–59 mL/min)	Level IV[2]
CKD Stage 4 (GFR 15–29 mL/min)	Level III[4]
Protein energy malnutrition increases with deteriorating kidney function and is associated with adverse outcomes	Level III-2[4]
Low protein and calorie intake is an important cause of poor nutritional status	Level III-3[4]
CKD Stage 5	
CKD Stage 5 (GFR <15 mL/min)	Level I[2]
For patients undergoing haemodialysis and peritoneal dialysis, nutritional status should be routinely assessed at commencement of dialysis and at regular intervals thereafter	Level III[3]

Nutrition Assessment

Clinical question

Which specific measures best reflect nutrition status or change in nutritional status in CKD?

Evidence statement	*Level of evidence*
CKD Stages 3 and 4	
Maintained percent (%) oedema-free (dry) actual body weight reflects optimal nutritional status.	Level II[2]
Body Mass Index (BMI) = 18.5–25, reflects optimal nutritional status.	Level IV[3]
Subjective global assessment (SGA) and percentage ideal body weight (BMI) reflect change in nutritional status.	Level IV[3]
Total body nitrogen, dual X-ray absorptiometry (DEXA) or bioelectrical impedance (BIA) reflect long-term nutritional adequacy.	Level IV[2]
CKD Stage 5	
Maintained percent (%) oedema-free (dry) actual body weight reflect optimal nutritional status.	Level II[2]
Body Mass Index (BMI) = 23–26, reflects optimal nutritional status.	Level II[2]
SGA maintained or improved reflects nutritional status.	Level III-3[2]
Nutritional status of patients on peritoneal dialysis should be monitored by methods appropriate to assess total body stores and detect early signs of malnutrition, such as normalised protein nitrogen appearance (nPNA) >0.9, total body nitrogen (TBN) and DEXA within the normal range.	Level IV[2,3]

Table 3 Summary of recommendations for the nutritional management of chronic kidney disease

CKD	*Stage 3 (GFR 30–59)*[4]	*Stage 4 (GFR 15–29)*[4]	*Stage 5*[4] *Haemodialysis*	*Stage 5*[4] *Peritoneal dialysis*
Point of referral	GFR <60 mL/min[2,4]	GFR <30 mL/min[3]	Upon commencement	Upon commencement
Time for consultation	45–60 mins[9]	45–60 mins[9]	45–60 mins[10]	45–60 mins[10]
Biochemistry and clinical	Alb[4], K[9], PO_4,[9] Cr,[9] bld glucose & HbA_{1c} (for persons with diabetes),[9] PTH,[8] BP,[9] lipids,[2] GFR,[9] Hb,[9] medications inc supplements[9]	Alb[3], K[9], PO_4[9], Cr,[9] bld glucose & HbA_{1c} (for persons with diabetes),[9] PTH,[8] BP,[9] lipids,[2] GFR,[9] Hb,[9] medications inc supplements[9]	Pre dial: Alb[2,3] urea,[2,16] K[10], PO_4[2], $CaxPO_4$[2], lipids,[7] PTH,[8] Post dial: urea[10] HbA_{1c} (if diab),[10] HD freq & fluid gains,[10] BP,[10] medications,[10] Kt/V[3]	Alb[2,3] K[10], PO_4[10], lipids,[7] PTH,[8] $CaxPO_4$[2], urea &/or Cr,[2] HbA_{1c} (if diab),[10] PD prescription & fluid gains,[10] BP,[10] medications,[10] Kt/V[3]
Nutrition assessment	Dry wt,[2,4] BMI,[2] %IBW/SGA,[4] diet assessment/nPNA,[2,4] activity level and limitations[9]	Dry wt,[2,3] BMI,[2] %IBW/SGA,[3] diet assessment/nPNA,[2,3] activity level and limitations[9]	Dry wt,[2] BMI,[2] %IBW,[3] SGA,[2,3] diet assessment[2,3] or nPNA[2,3]	Dry wt,[2] BMI,[2] %IBW,[3] SGA,[2,3] diet assessment[2,3] or nPNA[2,3]
Nutrition intervention				
Energy	Ideal for age, gender, BMI and phys activity level[2]	At least 146 kJ/kg IBW (BMI 18.5–25),[2] 125–146 kJ/kg IBW >60 years[3]	125–146 kJ/kg IBW (BMI 22–25)[2] Acute illness: >146 kJ/kg IBW if <60 years,[3] >125 kJ/kg IBW if >60 years[3]	146 kJ (35 kcal)/kg IBW (BMI 22–25)[2] inc glucose from dialysate[9] Acute illness: >146 kJ/kg IBW/day[3]
Protein	0.75–1.0 g/kg IBW/day[2]	0.75–1.0 g/kg IBW[2] with adequate kJ intake[2] >50% HBV[2]	1.2–1.4 g/kg IBW[2] >50% HBV[3] acute illness: >1.2 g/kg IBW[3]	Min 1.2 g/kg IBW;[2] >50% HBV[3] acute illness: >1.3 g/kgIBW;[3] peritonitis: 1.5 g/kg IBW[11]
Sodium	<100 mmol if hypertensive and CKD is progressive[2]	<100 mmol if hypertensive and CKD is progressive[2]	80–110 mmol/day[11]	Indiv treatment recommended, if restricted 80–110 mmol/day[11]
Potassium	Not usually restricted, If K^+ >6.0 limit intake[6] to 1 mmol/kg IBW/day	If K^+ >6.0 limit intake[2] to 1 mmol/kg IBW/day	1 mmol/kg IBW/day[10]	Indiv treatment recommended, if restricted 1 mmol/kg IBW/day[10]
Phosphate	If >1.49 mmol/L (or >target PTH) restrict to 800–1000 mg/day (adj for protein) &/or binders[8]	If >1.49 mmol/L (or >target PTH) restrict to 800–1000 mg/day (adj for protein) &/or binders[8]	If >1.78 mmol/L (or >target PTH) restrict to 800–1000 mg/day (adj protein) &/or binders[8]	If >1.78 mmol/L (or >target PTH) restrict to 800–1000 mg/day (adj for protein) &/or binders[8]
Fluid	Individualised based on CKD, oedema and hypertension[2]	Individualised based on CKD, oedema and hypertension[2]	500 mL + PDUO[11]	Indiv treatment recommended, if fluid overloaded or hypertensive: 800 mL + PDUO[11]
Nutrition counselling	Adequate protein and energy,[2,4] bld glucose control in DM,[4] fluid and Na control in HT,[4] lipid[2] & weight[4] control, meal plan,[9] self monitoring,[9] physical activity[17]	Protein and energy intake,[2,3] Na, K & fluid intake,[2] wt control[2,9], meal plan,[9] recipe modification, self monitoring,[9] physical activity[9]	Individual care plan,[3] adequate protein and energy intake,[2] fluid & electrolyte management,[10] self monitoring,[10] meal plan,[10] physical activity[10]	Individual care plan,[3] adequate protein intake,[2] appropriate energy intake,[2] self monitoring,[10] meal plan,[10] physical activity[10]
Review & frequency of follow up	Dry wt & BMI monthly,[2] 20–30 min[9] r/v every 6–12 months if no evidence of malnutrition, more frequently if malnourished[4]	Dry wt & BMI monthly,[2] 20–30 min[9] r/v every 1–3 months,[2] more frequently if inadequate intake, concomitant illness, GFR <15 or malnourished;[3] SGA every 6–12 months[2]	Dry wt, BMI & alb monthly,[2] 45–60 min[10] r/v every 3–6 months inc nPNA, Kt/V, diet assessment & SGA,[2] more frequently if clinically indicated[2]	Dry wt, BMI & alb monthly,[2] 45–60 min[10] r/v every 6 months inc nPNA, Kt/V, diet assessment & SGA,[2] more frequently if clinically indicated[2]

%IBW, percent ideal body weight; Alb, albumin; BMI, body mass index; BP, blood pressure; $CaxPO_4$, calcium phosphate ratio; Cr, creatinine; DEXA, dual xray absorptiometry; DM, diabetes mellitus; g, gram; Hb, haemoglobin; HbA_{1c}, glycosylated haemoglobin; HD, haemodialysis; HT, hypertension; K, potassium; kg, kilogram; kJ, kilojoules; Kt/V, dialysis adequacy; L, litre; mg, milligram; mL, millilitre; mmol, millimole; Na, sodium; NPNA, normalised protein nitrogen appearance; PD, peritoneal dialysis; PDUO, previous day's urine output; PO_4, phosphate; PTH, parathyroid hormone; SGA, subjective global assessment; TBN, total body nitrogen.

Nutrition Prescription/Intervention

Clinical question

What are the goals of nutrition intervention for CKD?

Evidence statement	*Level of evidence*
Achieve and maintain desirable weight and adequate nutritional status.	Level III-2[11]
Optimise status of comorbidities, blood glucose control in diabetes and fluid and sodium control in hypertension, phosphate control in hyperparathyroidism, lipid control and weight management.	Level III-2[4]
Normalise or stabilise biochemical markers, such as a normalised protein appearance (nPNA) ≥0.8 g/day in haemodialysis.	Level III-2[4]
Normalise or stabilise biochemical markers, such as a nPNA >0.9 g/day in peritoneal dialysis.	Opinion[4]
Maintain skeletal muscle stores and strength, using subjective global assessment (SGA), TBN and DEXA.	Opinion[4]

Clinical question

What are the prescriptions for appropriate nutritional intervention(s) to optimise nutritional status in CKD and prevent malnutrition?

Evidence statement	*Level of evidence*
CKD Stage 3	
Energy. Ideal kilojoule/calorie energy intake determined for age, gender and BMI and level of physical activity needs to be determined.	Opinion[2]
A nutritionally balanced diet with adequate energy intake to maintain a healthy weight needs to be prescribed.	
Protein. A level of protein of 0.75–1.0 g/ideal body weight (IBW)/day is recommended.	Level I[2]
CKD Stage 4	
Energy intake of at least 146 kJ/kg IBW/day (35 kcal/kg IBW/day) with a moderate protein restriction to prevent protein energy malnutrition.	Level II[2]
For patients >60 years, an energy intake of 125 kJ/kg IBW/day is recommended.	Level III-2[3]
Protein intake for patients with GFR <25 mL/min, should not be less than 0.75 g/kg IBW/day. At least 50% should be of high biological value.	Level II[2]
Phosphate intake restricted to 800–1000 mg/day and/or use of phosphate binders is serum phosphate >1.49 mmol/L and/or serum parathyroid hormone >7.7 pmol/L on more than 2 consecutive occasions.	Opinion[8] Level II[2]
Supplementation. Patients on a restricted protein diet (<0.75 g/kg IBW/day) should receive thiamine (>1 mg/day), riboflavin (1–2 mg/day) and vitamin B6 (1.5–2 mg/day).	Level IV[2]
CKD Stages 3 and 4	
Fat/Carbohydrate. Priority should be given to a diet aimed at preventing protein-energy malnutrition and reducing fat to <30% of daily energy intake with saturated fat limited to <10% energy. Carbohydrate should be utilised to make up the balance of required energy intake.	Opinion[2]
Sodium intake of <100 mmol/day is recommended if the patient is hypertensive and CKD is progressive.	Opinion[2]
Potassium intake should be reduced if serum K >6 mmol/L	Opinion[2]
Phosphate intake restricted to 800–1000 mg/day and/or use of phosphate binders is serum phosphate >1.49 mmol/L and/or serum parathyroid hormone >12.1 pmol/L on more than 2 consecutive occasions.	Opinion[8] Level III-2/3[3]
Fluid intake needs to be adjusted to the degree of CKD and prevention of renal disease, oedema management and hypertension management.	Opinion[2]

Once fluid intake requires diuretics a liberal intake should be curbed.	
Management of hypertension includes limiting fluid intake.	
Vitamin D supplementation is required for patients with GFR <50 mL/min and PTH level 3–6 times the normal range or histological evidence of osteodystrophy.	Level II[2]
CKD Stage 5	
Energy levels of 125–146 kJ (30–35 kcal)/kg IBW/day are recommended to prevent malnutrition.	Level IV[2]
Energy levels of at least 146 kJ (35 kcals)/kg IBW/day is recommended for those acutely ill <60 years and 125–146 kJ (30–35 kcals)/kg IBW/day for those acutely ill >60 years.	Level IV[3]
Protein intake is recommended at 1.2–1.4 g/kg IBW/day, >50% high biological value protein.	Level IV[2]
In haemodialysis, protein intake at least 1.2 g/kg IBW/day when acutely ill.	Opinion[4]
In peritoneal dialysis, protein intake at least 1.3 g/kg IBW when acutely ill.	Opinion[4]
In peritoneal dialysis, protein intake at least 1.5 g/kg IBW/day with peritonitis.	Opinion[4]
Fat and Carbohydrate <7% energy from saturated fat, polyunsaturated fat, monounsaturated fat <20% energy, carbohydrate 50–60% energy.	Level III-2[7]
Sodium. Individualised treatment is recommended based on oedema and hypertension. 80–110 mmol/day if restricted.	Level IV[11]
Potassium. Individualised treatment recommended based on biochemistry	Opinion[10]
Phosphate. Restrict intake to 800–1000 mg/day if serum phosphate >1.8 mmol/L, and/or PTH >33.3 pmol/L	Opinion[4] Level III-2[8]
Fluid. For haemodialysis, restrict fluid to 500 mL + previous day's output.	Level III-2[11]
For peritoneal dialysis, individualised treatment recommended based on oedema and hypertension. If fluid overloaded, 800 mL + previous day's output recommended.	Opinion[11]

Implementation and Management

Clinical question

What are effective methods of implementation to achieve positive outcomes in CKD?

Evidence statement	*Level of evidence*
EDUCATION	
CKD Stage 3	
Patients with decreased dietary intake or malnutrition need dietary modification, counselling and specialised nutrition therapy.	Level IV[4]
For patients with poorly controlled comorbidities, refer to medical specialist.	Opinion ANZRGT
CKD Stage 4	
Pre end stage kidney disease education forms an important part of management strategy to slow the progression of renal disease and may have a beneficial effect.	Level II[2]
Nutrition counselling should encompass appropriate protein and energy intake.	Level III-2[4]
Nutrition counselling should include fluid, sodium and potassium intake and weight management	Level IV[2] Opinion[4]
CKD Stage 5	
Every patient should receive intensive nutrition counselling based on an individualised care plan.	Opinion[4]
The care plan should focus on adequate protein and energy intake.	Level IV[2]
MONITORING AND EVALUATION	
Recommended times for initial consultation are 45–60 mins and review 20–30 mins, for all patients.	Opinion[9]

CKD Stage 5	
Nutrition reviews for dialysis patients need to occur every 6 months.	Opinion[9]
Timing for outcomes to be monitored include:	
• Monthly	
oedema free body weight and BMI	Level II[2]
serum albumin	Opinion[2]
• 3–6 monthly, dialysis adequacy (Kt/V)	Level IV[2]
nPNA	Level IV[2]
Dietary interview	Opinion[2]
SGA	Level IV[2,4]
• 6–12 monthly, assessment of body stores using TBN/DEXA	Opinion[4]

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APPENDIX I: BACKGROUND TO EVIDENCE STATEMENTS

Diagnosis and Referral

Chronic Kidney Disease (CKD) is defined as the presence of kidney damage for 3 months or more, as defined by structural or functional abnormalities, with or without decreased glomerular filtration rate (GFR), OR, GFR less than 60 mL/min for more than 3 months with or without kidney damage.[2] Kidney damage is defined as pathologic abnormalities or markers of damage, including abnormalities in blood or urine tests or imaging studies.[4]

Calculations

Estimated Glomerular Filtration Rate (eGFR)

Modification of Diet in Renal Disease (MDRD) formula[18]

$$eGFR = 186 \times ([SCR/88.4]^{-1.154}) \times (age)^{-0.203} \times (0.742 \text{ if female}) \times (1.210 \text{ if African-American})$$

- Where eGFR = estimated glomerular filtration rate (mL/min/1.73 m^2), SCR = serum creatinine concentration (μmol/L), and age is expressed in years. An automated calculator for MDRD-based eGFR can be found at <http://www.kidney.org.au>.
- Please note that the African-American factor is not used in Australia and as the MDRD formula has not been validated in children, its use should be restricted to people over 18 years of age.
- eGFR values over 60 mL/min/1.73 m^2 should be reported as '>60 mL/min/1.73 m^2', rather than as a precise figure.
- Specific clinical settings in which eGFR is not appropriate for use and GFR should be measured directly include:
  - populations in which the MDRD equation is not validated (e.g. Asian people) or in which validation studies have not been performed (e.g. Aboriginal and Torres Strait Islander populations);
  - severe malnutrition or obesity;
  - extremes of body size and age;
  - exceptional dietary intake (e.g. vegetarian diet or creatine supplements);
  - disease of skeletal muscle, paraplegia, etc. and
  - rapidly changing kidney function.

Normalised Protein Nitrogen Appearance (nPNA)[2]

Chronic renal failure

nPNA may be approximated by the Randerson formula

$$nPNA\ (g/kg/day) = [[\text{urea excretion (mmol/day)} \times 0.209] + 15.71] \div \text{weight (kg)}$$

Calculation of Ideal Body Weight (IBW)[19]

Aim for weight to be within BMI of 20–25 if GFR 15–59 and a BMI of 23–26 on a dialysis modality. A patient's ideal body weight can be adjusted (as per the equation below), particularly if a patient is obese BMI >30.

$$\text{Adjusted Body Weight} = [(\text{Actual Weight} - \text{Ideal Weight}) \times 0.25] + \text{Ideal Body Weight (IBW)}.$$

When to use actual or adjusted body weight

1 Use actual body weight (dry weight for dialysis patients) when:
- Weight is within reasonable range of ideal or standard body weight (recommended BMI range).
- Recent weight change has not occurred.
- The patient is not malnourished.
- The patient has been slightly overweight or underweight almost all of their lives.

2 Use adjusted body weight when patients are overweight/obese, using clinical judgement.