

**Combined DAA NSW
Nutrition Support and Renal IG Meeting
26/8/2015**

Nutrition Support in Advanced Chronic Kidney Disease

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Scope



- **Target audience:**
 - **Clinical Dietitians managing patients with Chronic Kidney Disease (CKD)**
- **Presentation:**
 - **Overview of:**
 - **Nutrition management in End Stage Kidney Disease (ESKD)**
 - **Nutritional Support in ESKD**
 - **Focus on Nutritional Support in non-dialysis CKD stages 4-5 patients**
- **Learning outcome:**
 - **Improved knowledge in providing Nutritional Support to non-dialysis CKD patients**

Presentation overview



- **Overview of nutrition management in End stage Kidney Disease (ESKD)**
- Overview of Nutritional Support in ESKD
- Focus on Nutritional Support in non-dialysis CKD stages 4-5 patients
- Discussion and Question

Function of the kidney and consequence of kidney failure

Function of Kidney	Metabolic effect of Kidney Disease
<p><u>Excretion:</u> Waste, fluid, excess minerals, metabolites</p>	<p><u>Accumulation:</u> Waste products of protein metabolism (uraemic toxins) e.g. urea, creatinine, ammonia etc. Metabolites, electrolytes e.g. K⁺, Na, PO₄ etc. Fluid</p>
<p><u>Regulation:</u> Maintain homeostasis - fluid, acid-base & electrolytes balance</p>	<p><u>Uncontrolled:</u></p> <ul style="list-style-type: none">● Blood pH● Disturbed BP controlled● Lipid abnormality
<p><u>Endocrine:</u></p> <ul style="list-style-type: none">● Vitamin D/Ca²⁺ + Phosphate Metabolism, PTH● Hb Synthesis/Erythropoietin	<p><u>Hormonal imbalance:</u></p> <ul style="list-style-type: none">● Hyperphosphatemia● Low vitamin D● Low folate, B₁₂ and iron levels

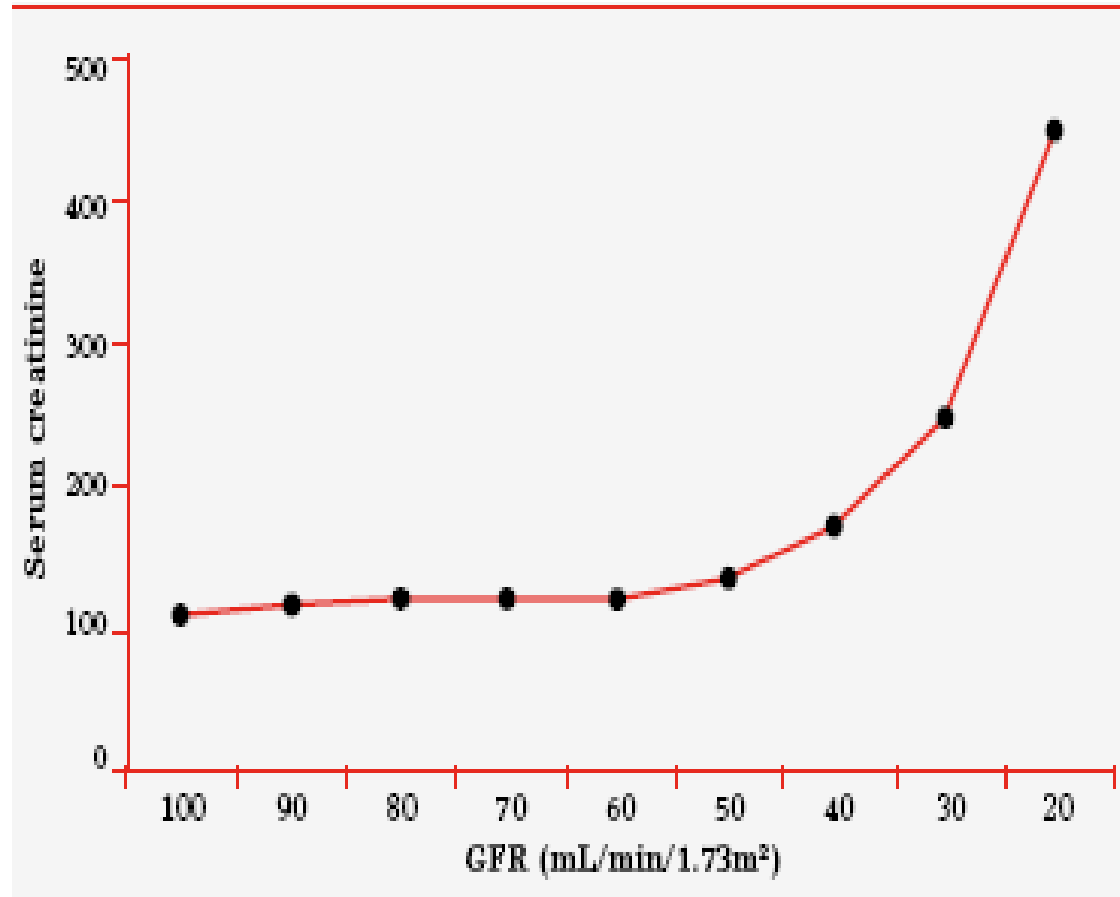
Consequence of kidney failure

Metabolic effect of Kidney Disease	Related signs and symptoms
<p><u>Accumulation:</u> Waste products of protein metabolism (uraemic toxins) e.g. urea, creatinine, ammonia etc Metabolites, electrolytes e.g. K^+, Na, PO_4 etc. Fluid</p>	<ul style="list-style-type: none">• 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
<p><u>Uncontrolled:</u></p> <ul style="list-style-type: none">● Blood pH● Disturbed BP controlled● Lipid abnormality	<ul style="list-style-type: none">• Hypertension• Acidosis• Dyslipidaemia• Glucose intolerance
<p><u>Hormonal imbalance:</u></p> <ul style="list-style-type: none">● Hyperphosphatemia● Low vitamin D● Low folate, B_{12} and iron levels	<ul style="list-style-type: none">• Osteodystrophy (Renal bone disease) • Anaemia

Back to the Basics:

Nutrition and Chronic Kidney Disease (CKD)

Serum creatinine does not increase beyond normal limits until more than 50% of GFR has been lost



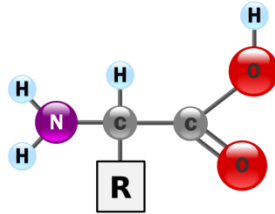
CKD stages and treatment goals

Stage	GFR (mL/min/1.73m ²)	Description	Treatment goal
1	≥90	Renal damage with normal or ↑ GFR	Diagnosis, treatment of co-morbid conditions, slowing progression, cardiovascular disease risk reduction
2	60–89	Renal damage with mild ↓ GFR	Estimate progression
3a	46–59	Moderate ↓ GFR	Evaluate and treat complications
3b	30-45	Moderate ↓ GFR	Evaluate and treat complications
4	15–29	Severe ↓ GFR	Pre-dialysis - preparation for renal replacement therapy <u>OR</u> for conservative pathway (no-dialysis)
5	<15 (+ dialysis ± transplantation)	Renal failure	If severe uraemia present, for renal replacement therapy (dialysis ± transplantation) <u>OR</u> for conservative pathway (no dialysis)

Protein Metabolism

Protein Food

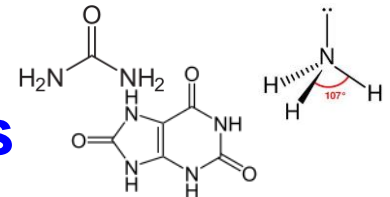
Amino acids



**Fuel
Building blocks
Metabolism**

nitrogenous wastes, e.g.

- **Ammonia**
- **Urea**
- **Uric acids**



Uraemia

- Build up of end products of protein metabolism / nitrogenous waste
- Uraemic Symptoms (see slide 5)

Other Symptoms:

Volume overload

(Na & fluids): SOB, pain & poor mobility

Medications: dry mouth, GI symptoms, bloating, nausea

Lack of energy: poor nutrition intake, starvation (not just anaemia !!!)

Nutritional Considerations



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

Also, very important:

- a balanced diet
- an adequate intake of intake of all other essential nutrients and food components

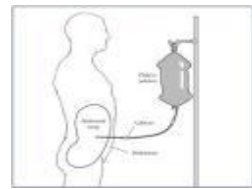
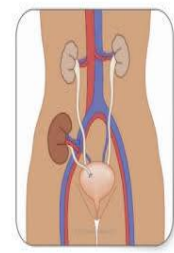
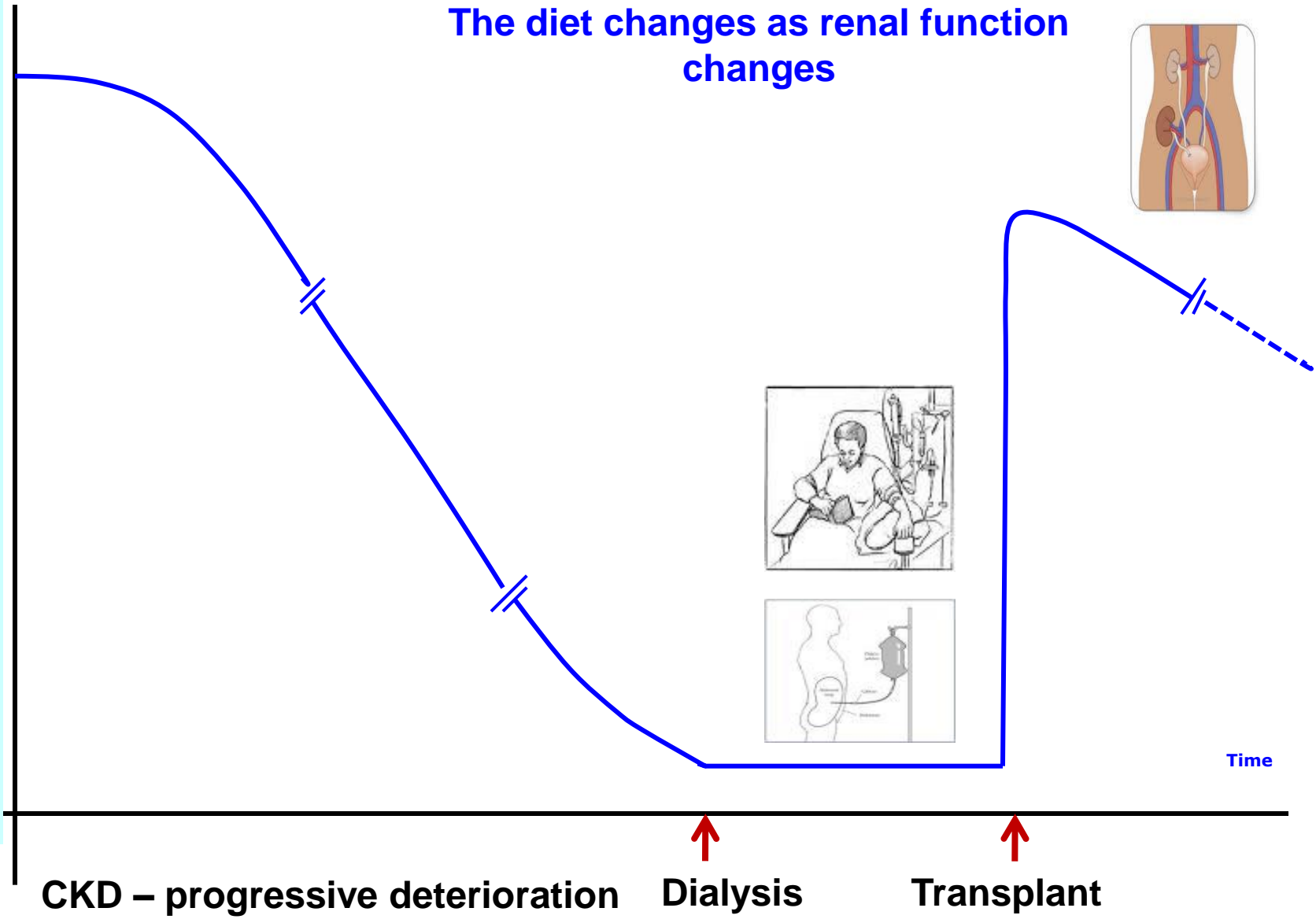
Stage
(GFR
ml/min)

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

Renal Function

Trajectory of deteriorating kidney function and treatment

The diet changes as renal function changes

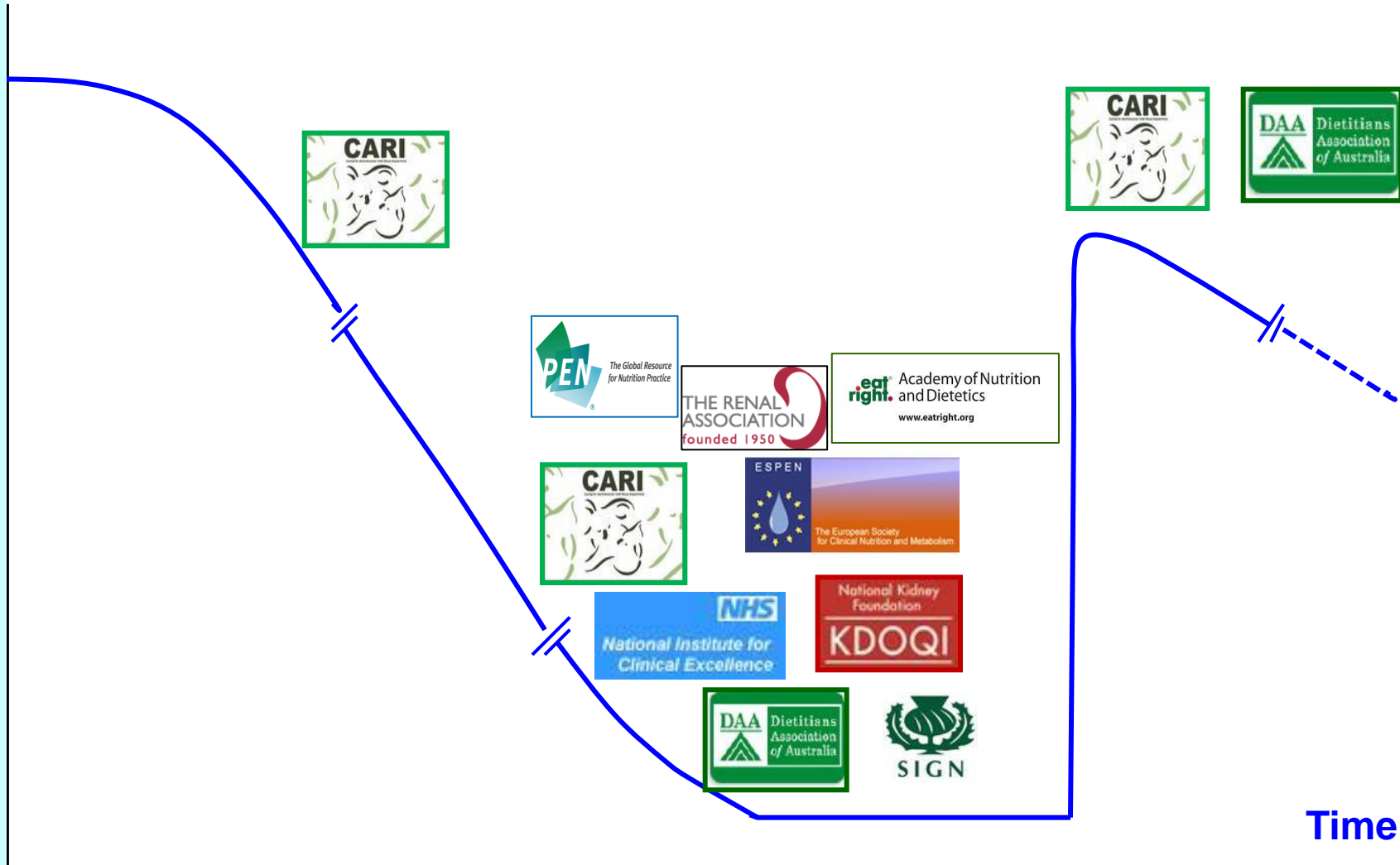


Stage

(GFR ml/min)

Clinical Practice Guidelines for nutritional management of kidney disease (currently available)

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



CKD – progressive deterioration

Dialysis

Transplant

Time

Nutrition & Dietetics 2006; 63 (Suppl. 2): S35–S45

DOI: 10.1111/j.1747-0080.2006.00100.x

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

INTRODUCTION

Scope and Purpose

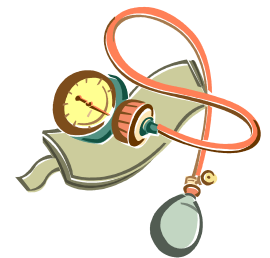
tians working in Nephrology Services. This draft was used for consultation and evaluation at a workshop of dietitians at the 21st National Dietitians Association



Common Goals of Diet Therapy in CKD

- To maintain optimal nutritional status:
 - (Prevent Malnutrition)
 - Reduce protein catabolism
 - Attain Ideal Body Weight (IBW) & Lean Body Mass (LBM)
- To correct abnormalities:
 - reduce uraemic symptoms
 - maintain homeostasis
 - fluid & e⁻ balance (excess K⁺ ⇒ cardiac arrhythmia)
- To prevent & minimise complications:
 - ↓ CV risk ←
 - control of HT
 - kidney bone disease (osteodystrophy) – Phosphate/Calcium/Vitamin D management
 - anaemia
- To improve QOL

Control of
Metabolism &
Catabolism

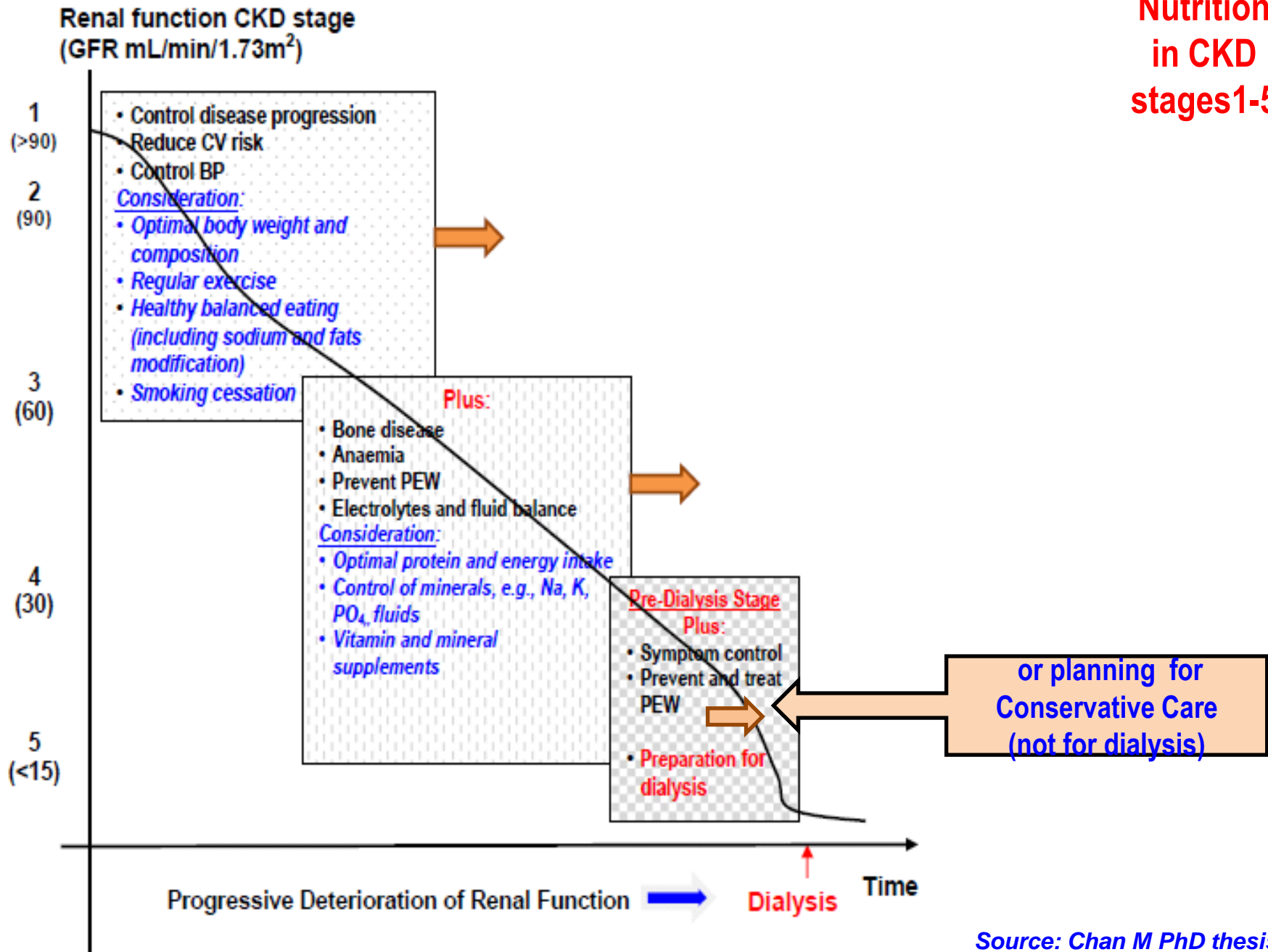


Common Goals of Diet Therapy in CKD (Cont'd)

In addition:

- Common to all Non-dialysis CKD:
 - Symptoms:
 - Delay onset of
 - Control of
 - Preserve renal function & retard the rate of progression
- Additional specific goals:
 - Pre-Dialysis (planning for dialysis) – healthy start of dialysis
 - Conservative care (not planning for dialysis): improve quality and quantity of life

Nutrition in CKD stages 1-5



Trajectory of
deteriorating renal
function +
conservative
management

Stage
(GFR
ml/min)

1

(>90)

2

(90)

3

(60)

4

Conservative care ≠ End of life

Poor prognosis if 2 or more of the following characteristics present:

- > 75 years
- high co-morbidity score
- marked functional impairment
- **chronic malnutrition**

<http://www.renalmd.org/catalogue-item.aspx?id=682>

food phobia

Decision re conservative
pathway (GFR: 18 ± 4
ml/min, age ~ 85 yo at SGH)

Death

CKD – progressive deterioration

Not for Dialysis

Time

End of Life care


Protein requirements

(energy adjusted according to activity levels)

- **Healthy adults (physiological):**
 - 0.6g/kg/d + adequate energy (~ 35kcal/kg/d)
- **RDI (NH & MRC):**
 - Females: 0.75g/kg/d + adequate energy (~ 35kcal/kg/d)
 - Male: 0.84g/kg/d + adequate energy (~ 35kcal/kg/d)
- **Others: elderly:**
 - 1.0g/kg/d +adequate energy (~ 30kcal/kg/d)

Diet prescription	Stage 3-5 CKD	HDx	PD
Energy (kcal/Kg IBW/d)	~ 35 (< 60 yo) ~ 30 (> 60 yo) or to attain/ maintain IBW	~ 35 (< 60 yo) ~ 30 (> 60 yo) or to attain/ maintain IBW	~ 35 (< 60 yo) ~ 30 (> 60 yo) Subtract ~500 (dialysate) or to attain/ maintain IBW
Protein (g/kg IBW/d)	0.75-1.0	1.2 (-1.4 High flux dialyser)	1.3
Na (mmol/d)	80 -100	80 -100	80 -100
K (mmol/d)	40-70 if restriction required	40-70 if restriction required	Usually no restriction
Ca (mg/d)	800-1,000	800-1,000	800-1,000
PO ₄ (mg/d)	<800	<1,000	1,000-1,200
Vitamin & mineral	RDI	RDI	RDI
Vitamin & mineral supplementation (MO prescription)	Bs & C – RDI, Vit D & Ca- according to Ca, PO ₄ & PTH levels, Fe, Folate & B ₁₂ – depending on anaemia mx No routine supplementation of Vitamin A, E & K		
Fluid (ml/d)	UO + 500	UO + 500	UO + 500

Malnutrition & Renal Disease

	Type I "True Malnutrition"	Type II Protein & Energy Wasting - PEW
Associated with	uremic syndrome <i>per se</i>	co-morbidity and MIA* 
Food/Nutrition intake	low NS	low to normal NS
Serum Albumin	low to normal	markedly decreased
Inflammatory Markers e.g. CRP	normal	increased
Resting Energy Expenditure (REE)	normal	increased
Malnutrition Reversal by adequate dialysis and Nutrition Support (NS)	Yes	probably not

MIA*:

Malnutrition, Inflammation and Atherosclerotic Syndrome

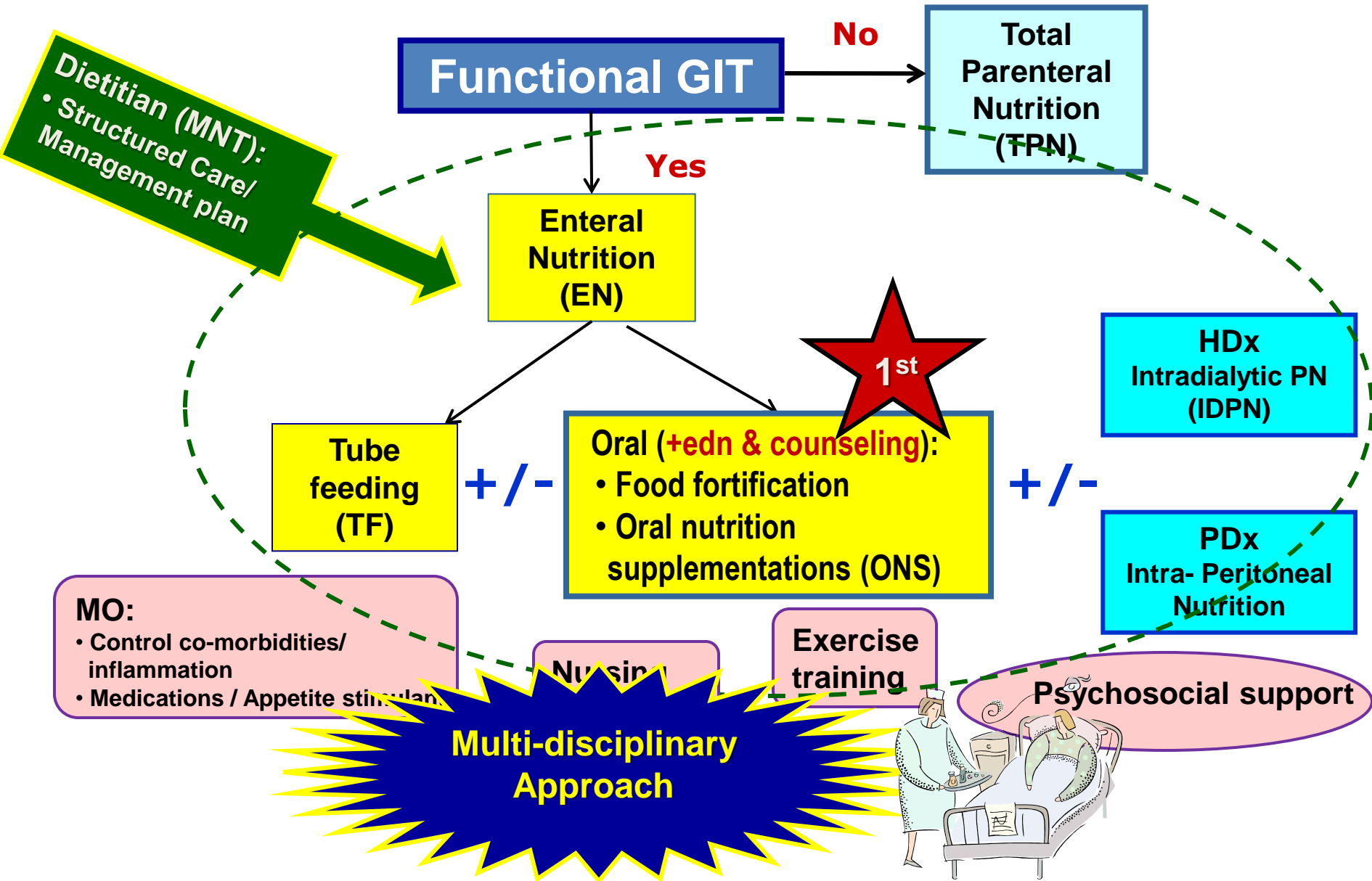
**Type I & II may
co-exist**

Presentation overview



- Overview of nutrition management in End stage Kidney Disease (ESKD)
- **Overview of Nutritional Support in ESKD**
- Focus on Nutritional Support in non-dialysis CKD stages 4-5 patients
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Nutrition Support in CKD



Nutrition Support	Stage 3-5 CKD	HDx	PD
Energy Higher if hyper-catabolic and excess protein loss	~ 35 (< 60 yo) ~ 30 (> 60 yo) or to attain/ maintain IBW	~ 35 (< 60 yo) ~ 30 (> 60 yo) or to attain/ maintain IBW	~ 35 (< 60 yo) ~ 30 (> 60 yo) Subtract ~500 (dialysate) or to attain/ maintain IBW
Protein (g/kg IBW/d)	for repletion 1.0 1.5 1.5		
Na (mmol/d)	80 -100	80 -100	80 -100
K (mmol/d)	40-70 if restriction required	40-70 if restriction required	Usually no restriction
Ca (mg/d)	800-1,000	800-1,000	800-1,000
PO ₄ (mg/d)	<800	<1,000	1,000-1,200
Vitamin & mineral	RDI	RDI	RDI
Vitamin & mineral supplementation (MO prescription)	Bs & C – RDI, Vit D & Ca- according to Ca, PO₄ & PTH levels, Fe, Folate & B₁₂– depending on anaemia mx No routine supplementation of Vitamin A, E & K		
Fluid (ml/d)	UO + 500	UO + 500	UO + 500

Adjusted body weight

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.

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ORIGINAL RESEARCH

A High Prevalence of Abnormal Nutrition Parameters Found in Predialysis End-Stage Kidney Disease: Is It a Result of Uremia or Poor Eating Habits?

Maria Chan, BSc(Hons), MNutrDiet, GradDipExSp, PhD, AdvAPD,†‡ John Kelly, MBBS, MD,‡§
Marijka Batterham, MSc(Nutr&Diet), MMedStat, PhD, Gstat, AdvAPD,|| and
Linda Tapsell, PhD, FDAA†*

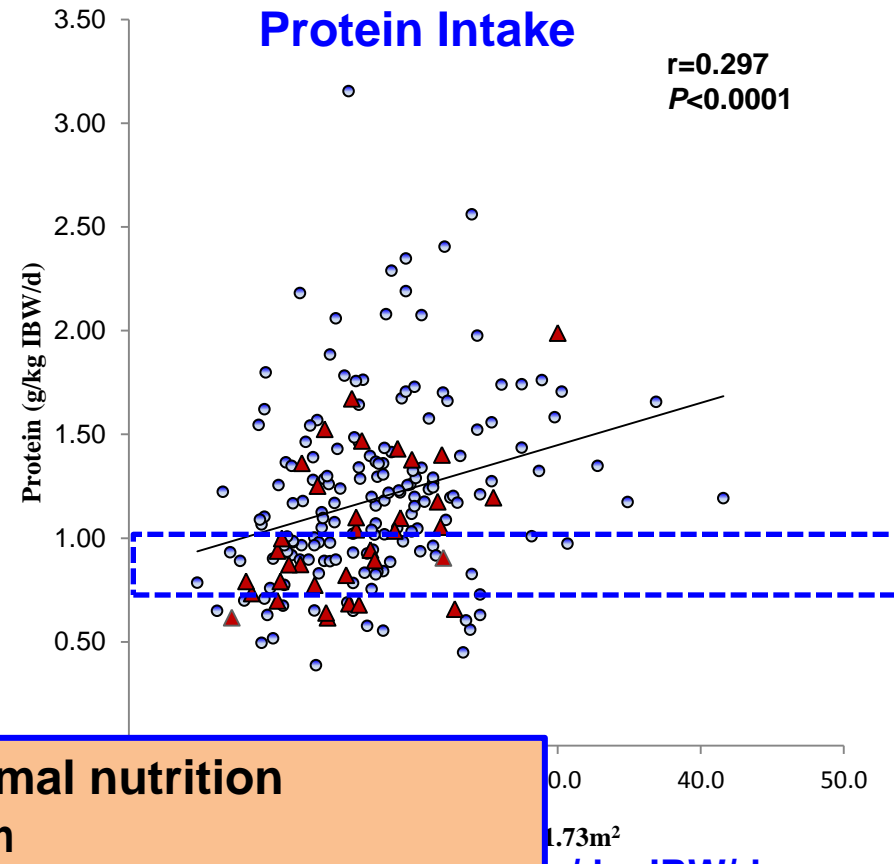
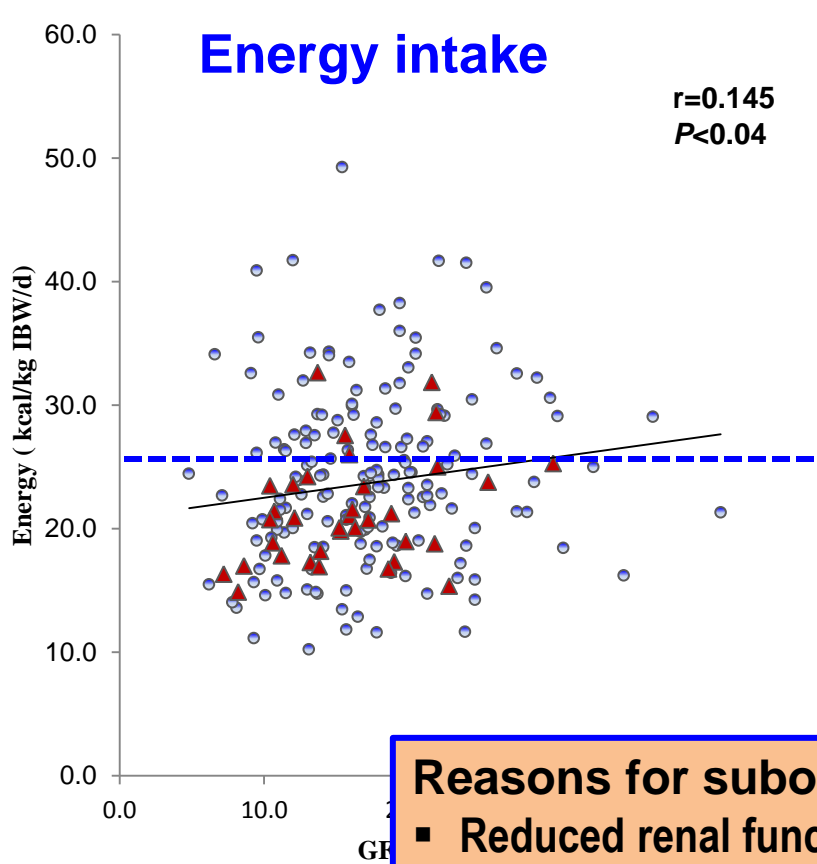
ChanM et.al, JREN 2014

Results: 65.7±13.6yr; 60.5% M;

Main cause of ESKD: Diabetic nephropathy 24.3%

GFR 17.0 ± 6.0 ml/min/1.73m²; **Malnutrition: 40.5%**,

Overweight/obesity (BMI> 26kg/m²): 62.4 %; obesity ~32.4%

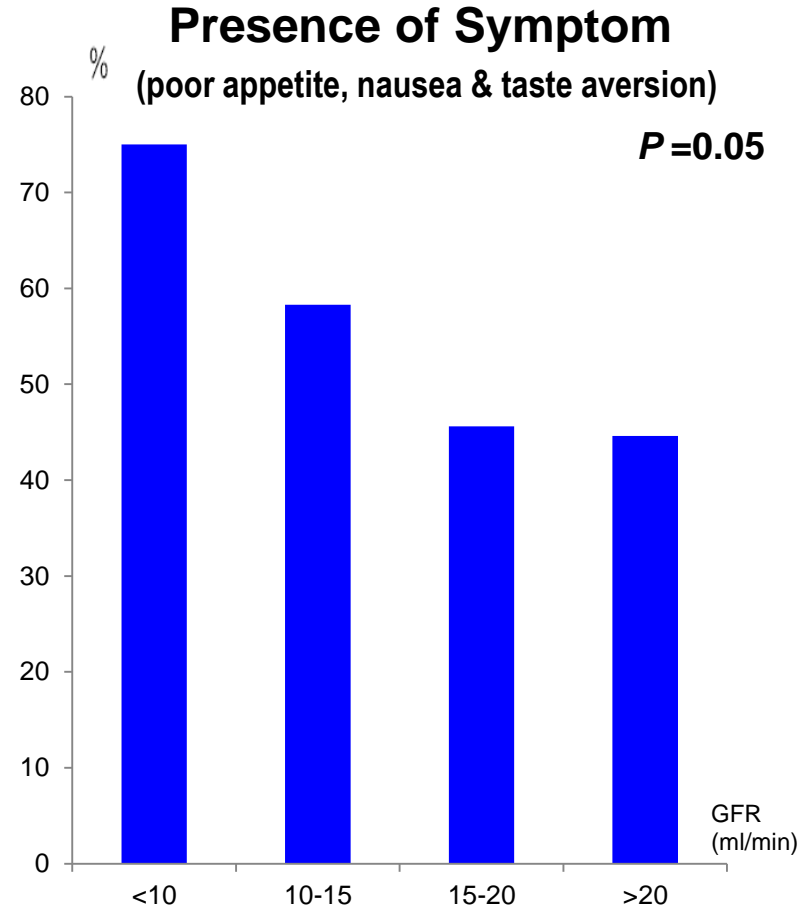
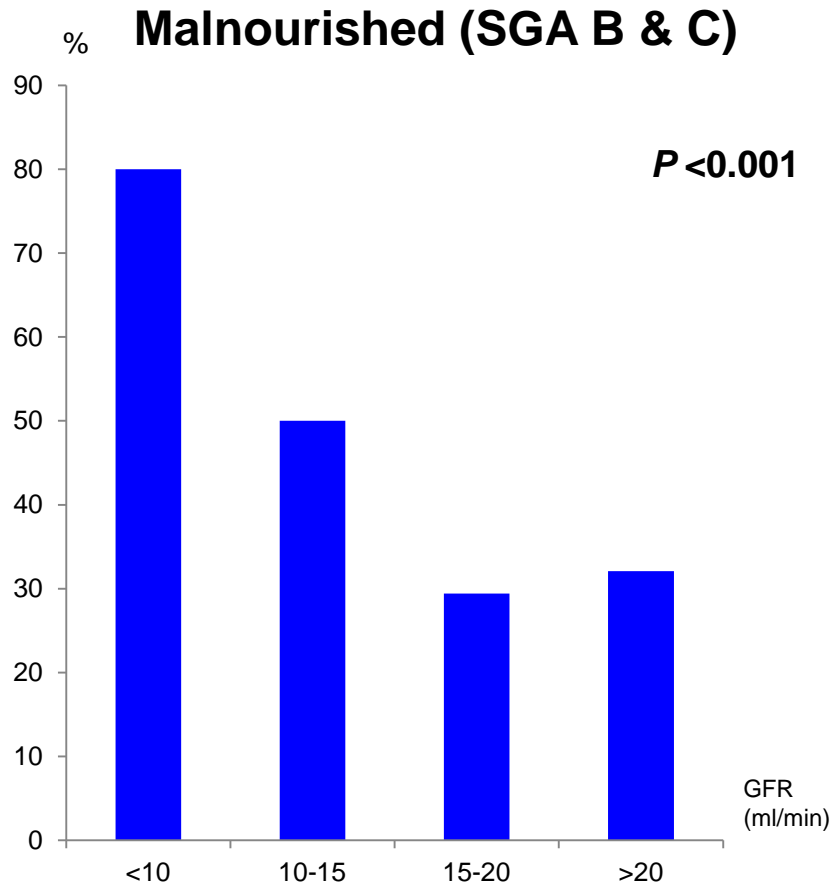


- Reasons for suboptimal nutrition**
- Reduced renal function
 - Symptoms (51%) - include excess protein intake
 - Self-imposed inappropriate diet (17.1 %) - ▲
 - Poor eating habits

1.73m²
g/ kg IBW/d;
and **61.2 % >**
dation

GFR and prevalence of nutrition abnormalities

n=225, ESKD assessment clinic:
plan for dialysis vs conservative care ~ 85:15%



As GFR↓, prevalence of nutritional abnormality ↑
ChanM, et.al JREN, 2014

Nutritional Assessment (**ideally**)

- **A-Anthropometry:**

- Weight, “ Dry weight”, Wt Hx, Ht, BMI, Skinfolds – triceps & arm muscle circumference, waist circumference (WC)



- **B-Biochemistry:**

- serum protein, albumin
- Creatinine, urea
- K⁺, Na⁺, Ca²⁺, PO₄⁻
- Bicarbonate
- lipids
- BSL & HbA1c
- Fe²⁺ Status
- CRP
- Dialysis adequacy (dialysis patients)



- **C-Clinical S & S:**

- Appetite/ nausea/vomiting/ taste change
- Gastroparesis
- muscle wasting
- Malnutrition
- Urine output
- Oedema /volume overload

- **D- Diet intake**

- History, intake etc
- Drug- nutrient interaction

- **E - Exercise/ Physical activity**

- **F- functional capacity**

- hand grip strength

Subjective Global Assessment (SGA) – 7 point scale

7 point scale SGA

SGA - (7 points) for Dialysis

Date:	Patient :
Admission status: inpatient/ outpatient	Ave. interdialytic weight gain(Kg):
	Nutrition support: none/ oral supplement / IDPN

Criteria - Medical History		A	B	C
WEIGHT		7-6	5-4-3	2-1
Weight change past 6 months	0 - < 5% loss			
Usual weight _____	5 - 10% loss			
Current weight _____	> 10% loss			
Amount weight loss _____				
% weight loss _____				
Weight change past 2 weeks				
Amount _____	no change; normal weight			
	no change, but below usual weight			
	increase to within 5% normal			
	increase (1 level above)			
	decrease			
DIETARY INTAKE (7 has it changed)				
No Change	no change; adequate			
OR	no change; inadequate			
Change	suboptimal solid diet			
Duration of change _____	full liquid diet			
7= usual/adequate	hypocaloric liquid			
6= recent, short term decrease	starvation			
5 = sustained dec., but usually adeq	intake borderline; increasing			
4 = sustained decrease, off and on adequate	intake borderline; decreasing			
3 = decreased from usual sustained, < adequate intake	intake poor; no change			
2 = sustained decrease, variable but mostly poor	intake poor; increasing			
1= sustained decrease, very poor intake	intake poor; decreasing			
GASTROINTESTINAL SYMPTOMS				
Freq (fever, <1/hr, every 2-3 day, daily)				
Duration(<2weeks, >2weeks)				
nausea _____	7-6 if few / no symp / uncommon			
vomiting _____	1 or more sym. 5= not daily 4=almost daily			
diarrhoea _____	3=most sym, almost daily			
anorexia _____	All symptoms 2=almost daily 1=daily			
FUNCTIONAL CAPACITY (related to malnutrition)				
Duration of change _____	no dysfunction (full capacity)			
7-6	difficulty with ambulation/ normal activities			
7-6 nothing more than the usual renal disease	bed/chair-ridden			
5-4-3= usual	improved			
2=mostly bed/chair ridden; 1=bed ridden, unable to perform ADL	no change			
Change past 2 weeks	regressed			

Criteria - Physical Examination	A	B	C
SUBCUTANEOUS FAT			
under the eyes	slightly bulging area		hollowed look,
triceps	large space between fingers		very little space between fingers, or fingers touch
biceps	large space between fingers		very little space between fingers, or fingers touch
OVERALL FAT LOSS RATING	A 7-6	B 5-4-3	C 2-1
MUSCLE WASTING			
temple	well-defined muscle/fat	slight depression	hollowing, depression
clavicle	ribs: not visible. Females: may be visible but not prominent	some protrusion; may not be all the way along	protruding/prominent bone
shoulder	rounded	no square look; Acromion process may protrude slightly	square look; bones prominent
scapula/ribs	bones not prominent; no significant depressions	mild depressions or bone may show slightly; not all areas	bones prominent; significant depressions
quadriceps	well rounded; no depressions	mild depression on inner thigh; thin	depression; obviously thin
calf	well developed		thin; no muscle definition
knee	bones not prominent; muscle protrudes		bones prominent
interosseous muscle between thumb and forefinger	muscle protrudes; could be flat in females	slightly depressed or flat	flat or depressed area
OVERALL MUSCLE WASTING RATING	A 7-6	B 5-4-3	C 2-1
OEDEMA (related to malnutrition)	no sign	mild to moderate	severe
ASCITES (related to malnutrition)	no sign	mild to moderate	severe
OVERALL SGA RATING	A 7-6	B 5-4-3	C 2-1
Intake: calculate the % deficit. If intake is > 10-15% below the levels recommended for more than 1-2 weeks, decrease the overall rating by 1 point. If intake is > 16-20%, drop the overall rating by at least two points.			
General Health: V Good/ Good/ Fair/ Poor/ V Poor Appetite: V Good/ Good/ Fair/ Poor/ V Poor Use of PO4 binders with meals at HDx: Y / N Blinder prescription: Blood results & other comments:			
Need for further Mx: 1= no, 2= brief advice & no further mx, 3= need detail Ax & Mx (high priority) 4= details Ax & Mx (intermediate to low priority), 5 = had previous intervention & to continue Mx from before		Action/Plan:	

Managing Uraemia (non Dialysis- CKD)

(to follow clinical practice guideline for non-dialysis CKD)

- Protein prescription, (mainly elderly patients; ideal level is still not established yet), suggestion as the severity of symptom increases:

– 0.75 to 1.0g/kg IBW/d



– 0.6 g/kg IBW/d (very symptomatic)



– Keto-amino acid + 0.3 g/kg IBW/d (very low protein diet if available) ⇒ 0.6 g/kg IBW/d

*****PLUS adequate energy**

- Others as per guidelines:
 - Na, K, PO₄, Fluids, Vitamin and Minerals

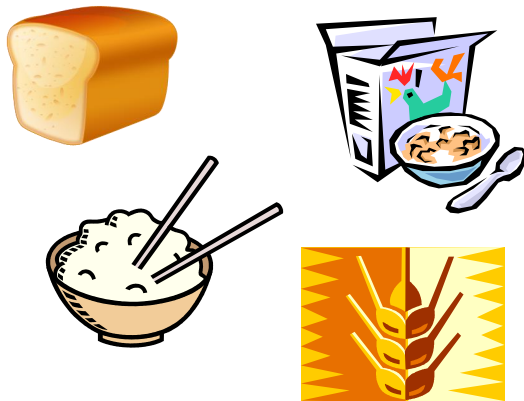
Diet is prescriptive, not restrictive

CKD	Stage 4 (GFR 15–29) ⁹
Point of referral	GFR <30 mL/min ²
Time for consultation	45–60 mins ⁹
Biochemistry and clinical	Alb ² , K ⁹ , PO ₄ ⁹ , Cr ⁹ bld glucose & HbA _{1c} (for persons with diabetes) ⁹ , PTH ⁹ , BP ⁹ , lipids, ² GFR, ⁹ Hb, ⁹ medications inc supplements ²
Nutrition assessment	Dry wt, ^{2,3} BMI, ² %IBW/SGA, ³ diet assessment/nPNA, ^{2,3} activity level and limitations ⁹
Nutrition intervention	
Energy	At least 146 kJ/kg IBW (BMI 18.5–25), ² 125–146 kJ/kg IBW >60 years ³
Protein	0.75–1.0 g/kg IBW ² with adequate kJ intake ² >50% HBV ⁹
Sodium	<100 mmol if hypertensive and CKD is progressive ¹
Potassium	If K ⁺ >6.0 limit intake ² to 1 mmol/kg IBW/day
Phosphate	If >1.49 mmol/L (or >target PTH) restrict to 800–1000 mg/day (adj for protein) &/or binders ⁹
Fluid	Individualised based on CKD, oedema and hypertension ²
Nutrition counselling	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
Review & frequency of follow up	Dry wt & BMI monthly, ² 20–30 min ⁹ r/every 1–3 months, ² more frequently if inadequate intake, concomitant illness, GFR <15 or malnourished, ³ SGA every 6–12 months ²

Diet Plan

set realistic goals for quality

Bread & Cereals

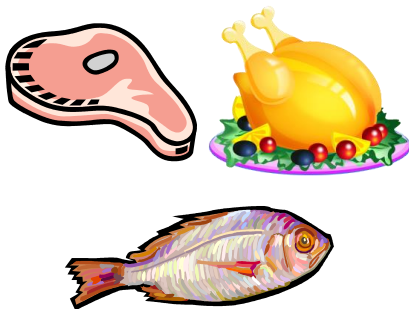


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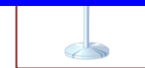
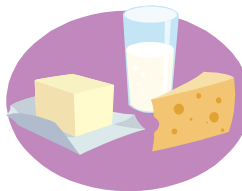
Implementation:

- Diet counseling/ prescription
- Food fortifications
- Oral Nutrition Supplement
- Must consider other age related factors:
 - Dentition
 - Dysphasia
 - Food preparation/ provision
 - Mental status etc

Meat & Meat alternatives



Dairy







In addition to CKD Stages 4-5 dietary guidelines & medications

Issues	Nutritional management / practice tips
Poor mobility	Nutritional support, exercise training Check fluid management
Weakness	Nutritional support
Poor appetite	Nutritional support, small frequent meals, try cold blend foods, try vegetarian protein foods
Pain	
Pruritus/itching	Remove medical causes, Ca & PO ₄ control Fish oil?
Drowsiness	
Shortness of breath	If related to volume overload – Na and fluid control
Constipation	Increase fiber intake, check overall intake of food and fluids
Feeling anxious	


In addition to CKD Stages 4-5 dietary guidelines & medications

Issues	Nutritional management / practice tips
Difficulty sleeping	
Nausea	Nutritional support, small frequent meals, try cold blend foods, try vegetarian protein foods* (reflux?)
Changes in Skin	
Feeling depressed	
Vomiting/ dry retching	Nutritional support, small frequent meals, try cold blend foods, try vegetarian protein foods (reflux?)
Restless legs	Medications
Mouth problems	e.g. dry mouth: rinse mouth, suck on lollies or chewing gum
Diarrhoea	Fluid replacement, specialised nutritional supplements
Taste aversion	Nutritional support, small frequent meals, try cold blend foods, try vegetarian protein foods

Oral Nutrition Support (4 components)

(1) Diet counseling (+ prescription & meal plan)	  (2) Food	 (3) Food enriching/ fortifications	 (4) Oral Nutrition Supplements
Characteristic/ strategy	<ul style="list-style-type: none"> • Use energy & nutrient dense foods & drinks 	<ul style="list-style-type: none"> • adding <u>non- protein calorie</u> foods: fat & CHO to foods and drinks, sugars, fats • commercial modules e.g. sugar polymers & fats 	<ul style="list-style-type: none"> • Ready –made formula
Advantage	<ul style="list-style-type: none"> • economical • familiar items: <ul style="list-style-type: none"> • taste • texture • cultural specific 	<ul style="list-style-type: none"> • economical • familiar items: <ul style="list-style-type: none"> • taste • texture • cultural specific 	<ul style="list-style-type: none"> • easy to use • convenient • easy handling (in institutions) staff and hygiene
Limitation	“larger” volume	“larger” volume	<ul style="list-style-type: none"> • cost • acceptance • taste • possible intolerance

Oral Nutrition Support – some useful practice tips

(2) Food	(3) Food enriching/ fortifications	(4) Oral Nutrition Supplements
<ul style="list-style-type: none">• Small frequent meals ± snacks• Often patient has <u>taste aversions</u> with animal proteins – try vegetarian proteins e.g. soya and soya products (HBV), nuts, and other vegetable proteins – observe rules of protein complementation (check Na⁺, K⁺ and PO₄ content)• Try cold foods/snacks	<p>±</p> <ul style="list-style-type: none">• Special Modules:<ul style="list-style-type: none">• Glucose polymer• Fats	<p>±</p> <ul style="list-style-type: none">• decanted & serve in a glass• use medicine cups• “Medpass” program (in hospital) – delivered as part of medication round (ensure compliance, small volume, better acceptance) • mixed with flavouring e.g. a drop of Tia Maria• as salad dressing

Nutritional Characteristics of Renal specific ONS formula

- **Energy dense:**
 - 1.8-2.0 Kcal/ml
- **Protein levels (optimal) :**
 - Low Protein formula e.g. 40g/L or 5g/125ml bottle Renilon 4.0
 - Dialysis: ~ 80g/litre or 18g/220 ml bottle Nepro HP
- **Low electrolytes levels:**
 - e.g. Na & K ; average ~ 30mmol/litre
- **Optimal vitamin and mineral levels:**
 - e.g. PO₄, vitamins
- **Low fluid volume:**
 - Fluid count ~ 70%



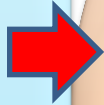
Which one to use for non-dialysis CKD patients?

Putting everything together



Gather all data & formulate the diet:

- Medical Hx
- Nutrition Ax:
 - a) Anthropometry
 - b) Bichemistry
 - c) Clinical S & S
 - d) Diet Hx
 - e) Exercise / Energy Expenditure
 - f) Functional capacity
- Subjective Global assessment (SGA)



Energy and all Essential Nutrients

Renal considerations

- Energy
- Protein
- Sodium
- Potassium
- Phosphorous
- Fluid
- Vitamin & Minerals
- Lipids

Process of nutritional care

Diet Prescription:

- Energy: xx kcal/d
- Protein: xx g/d
- Na: xx mmol/d
- K: xx mmol/d
- PO₄: xx mg/d
- Fluid: xx mL/d
- plus all other essential nutrients



Translate to foods type, quality & quantity

- Bread/cereals :yy
- Fruit/vegetable: yy
- Protein foods: yy
- Dairy: yy
- Oil/ Fat: yy
- Other foods: ETOH sugars etc

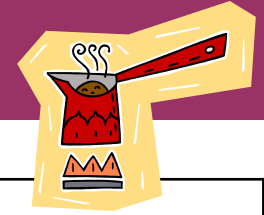


Complex & intrigue processes

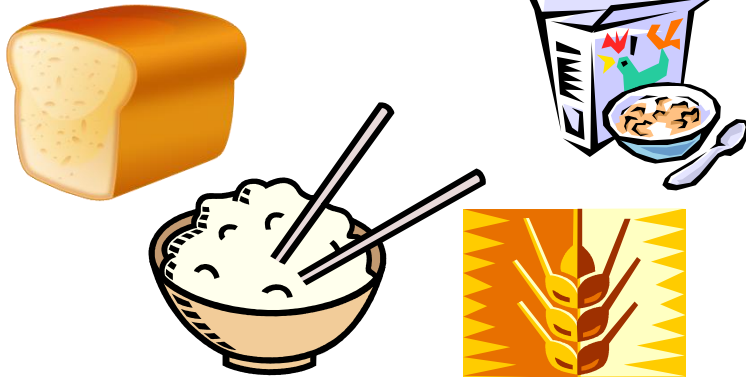
Translating evidence to practice



Planning renal diets (no of serves)



Bread & Cereals



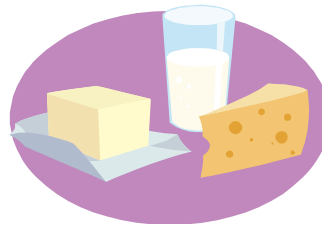
Fruit & Vegetable



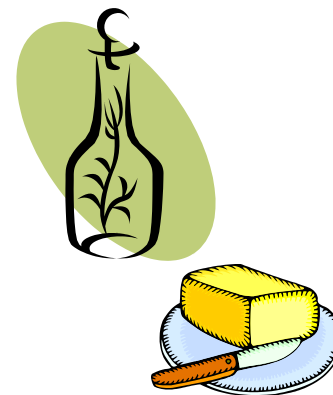
Meat & Meat alternatives



Dairy



Fats / oil



Miscellaneous

e.g. sugars

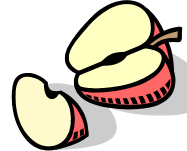
PLUS : Meal pattern & timing of phosphate binders



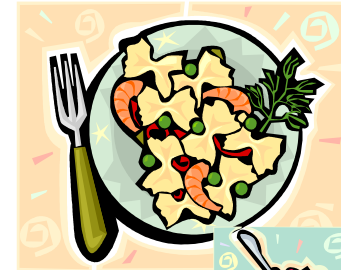
Breakfast:



Lunch:



Dinner:



Morning Tea:



Afternoon Tea:



Supper:

Fruit or other low PO₄ foods – NO binders required



**65 yo Female, weight ~ 60kg, normal BMI, light activity, CKD stage 5
mild symptoms, able to consume diet**

Energy ~ 1800kcal/d

Protein ~ 45g/d

No added salt diet

Food Group		no.	E (kcal)	E (kJ)	Protein	Fat	CHO	Na (mmol)	K+ (mmol)	Ca (mg)	PO4 (mg)	Fluid Count (mL)
5 food groups	Bread/cereal 30g/1 sl	5	350	1470	10		75	35	7.5	100	175	
	Fruit 1 piece (LK)	2	120	504			30		10	16	30	300
	Vegetable- starchy veg (LK)	1	75	315	2		17		6	5	30	
	Vegetable - non starchy (LK)	4	120	504			32		20	120	120	
	Meat/Fish/Chicken 30g cooked (Lean)	3	240	1008	24	15		3	9	12	180	
	Milk 150mL - regular	2	180	756	10	12	14	8	12	360	280	300
	Milk 150mL - fat reduced (1-2%)	0	0	0	0	0	0	0	0	0	0	0
	Milk 150mL - skim	0	0	0	0	0	0	0	0	0	0	0
Fat 20g/1T/ 4tsp	3	420	1764		48		9					
Sugars	sugars 1tsp/5g	15	300	1260			75					
Others												
TOTAL			1805	7581	46	75	243	55	64.5	613	815	600
% Energy					10.2	37.4	54					

%HBV ~74%

**65 yo Female, weight ~ 60kg, normal BMI, light activity, CKD stage 5
nausea ++++ and taste aversion +++, unable to consume diet**

Energy ~ 1800kcal/d

Protein ~ 45g/d

No added salt diet

Food Group	no.	E (kcal)	E (kJ)	Protein	Fat	CHO	Na (mmol)	K+ (mmol)	Ca (mg)	PO4 (mg)	Fluid Count (mL)
5 food groups		210	882	6		45	21	4.5	60	105	
Bread/cereal 30g/1 sl	3										
Fruit 1 piece (LK)	2	120	504			30		10	16	30	300
Vegetable- starchy veg (LK)	1	75	315	2		17		6	5	30	
Vegetable - non strachy (LK)	4	120	504			32		20	120	120	
Meat/Fish/Chicken 30g cooked (Lean)	2	160	672	16	10		2	6	8	120	
Milk 150mL - regular	2	180	756	10	12	14	8	12	360	280	300
Milk 150mL - fat reduced (1-2%)	0	0	0	0	0	0	0	0	0	0	0
Milk 150mL - skim	0	0	0	0	0	0	0	0	0	0	0
Fat 20g/1T/ 4tsp	2	280	1176		32		6				
Sugars	10	200	840			50					
Renilon 4.0 (125ml/bottle)	2	500	2100	10	25	60	4	1	15	5	180
Others											
TOTAL		1845	7749	44	79	248	41	59.5	584	690	780
% Energy				9.5	38.5	53.8					

~82% HBV protein

Sample calculation – 70Kg male, Normal BMI

Sample Calculation - 70kg

Weight 70kg (BMI in normal range) Age < 60 yr
 Treatment CKD stages 4-5
 Est. Protein requirement (g/d) ~ 0.8g/kg IBW /d = ~55g/d
 Est. Energy requirement (Kcal/d) ~ 35kcal/kg IBW/d = ~2500kcal/d

Food Group	no.	E (kcal)	E (kJ)	Protein	Fat	CHO	Na (mmol)	K+ (mmol)	Ca (mg)	PO4 (mg)	Fluid Count (mL)
5 food groups											
Bread/cereal 30g/1 sl	6	420	1764	12		90	42	9	120	210	
Fruit 1 piece (LK)	2	120	504			30		10	16	30	300
Vegetable- starchy veg (LK)	1	75	315	2		17		6	5	30	
Vegetable - non starchy (LK)	4	120	504			32		20	120	120	
Meat/Fish/Chicken 30g cooked (Lean)	4	320	1344	32	20		4	12	16	240	
Milk 150mL - regular	2	180	756	10	12	14	8	12	360	280	300
Milk 150mL - fat reduced (1-2%)	0	0	0	0	0	0	0	0	0	0	0
Milk 150mL - skim	0	0	0	0	0	0	0	0	0	0	0
Fat 20g/1T/ 4tsp	5	700	2940		80		15				
Sugars	25	500	2100			125					
Others	0										
TOTAL		2435	10227	56	112	308	69	69	637	910	600
% Energy				9.2	41.4	50.6					

~75% HBV protein

Common issues

“Poor intake” could be in a form of:

Energy	Protein
↓	↓
↓	adequate
↓	↑↑
↑↑	↑↑

Uraemia !!

Patient safety and effective management

- Adhere to best practice
- MST screening is not useful. Must assess
- No guess work for intake assessment and diet prescription

Example of **unsafe** and **ineffective** practice (real cases):

- HP/HE diet for uraemic patients (initial referral was for managing unintentional weight loss and nausea)
- Conservative care was thought to be end of life TNC, no intervention given (eGFR was ~ 18ml/min)
- Calculate protein from protein food group (meat and meat alternatives) only, protein content from other food groups (e.g. bread/cereals, potatoes.....) was ignored
- Not adding up “energy” in diet plan (just say eat more fat and sugars)
- Supplement prescribed, no proper assessment, no diet prescription
- Guess work !!

Take home message

- **Individualised approach:**
 - diet for advanced CKD is prescriptive, but NOT restrictive
- **“Earlier” stages:**
 - Early referral to dietitian (irrespective of planning for dialysis or not)
 - Delay onset of and control symptoms
 - Control complications, including malnutrition
 - Slow progression rate
- **End of life:**
 - “informed decision”, patient’s choice & comfort measure

Question ?



Thank You