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## DIET FOR PATIENTS WITH CHRONIC KIDNEY DISEASE: UPDATES AND BARRIERS TO ACCESSING REGISTERED DIETITIANS WITH SPECIALIZED TRAINING

Brandon Kistler, PhD, RD, FNKF

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### DISCLOSURES

- Academy of Nutrition and Dietetics (Grant Funding, Editorial Board)
- International Society of Renal Nutrition and Metabolism (Council)
- Journal of Renal Nutrition (Editorial Board)

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### LEARNING OBJECTIVES

- Recognize the recommended changes to nutrition therapy for patients with chronic kidney disease in the latest version of the KDOQI clinical practice guidelines for nutrition
- Identify barriers and strategies to accessing a registered dietitian nutritionist for patients with chronic kidney disease

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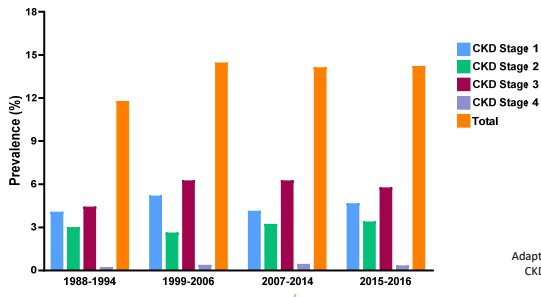
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## PREVALENCE OF CKD IN THE UNITED STATES



## CHRONIC KIDNEY DISEASE IS PROGRESSIVE

STAGES OF CHRONIC KIDNEY DISEASE	GFR*	% OF KIDNEY FUNCTION
<b>Stage 1</b> Kidney damage with <b>normal</b> kidney function	90 or higher	90-100%
<b>Stage 2</b> Kidney damage with <b>mild loss</b> of kidney function	89 to 60	89-90%
<b>Stage 3a</b> <b>Mild to moderate</b> loss of kidney function	59 to 45	59-45%
<b>Stage 3b</b> <b>Moderate to severe</b> loss of kidney function	44 to 30	44-30%
<b>Stage 4</b> <b>Severe</b> loss of kidney function	29 to 15	29-15%
<b>Stage 5</b> <b>Kidney failure</b>	Less than 15	Less than 15%

\* Your GFR number tells you how much kidney function you have. As kidney disease gets worse, the GFR number goes down.

National Kidney Foundation

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## UPDATED GUIDELINES



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## SYSTEMATIC REVIEW PROCESS

- Current search included all stages of CKD
- Published between 1985 and 2016
- Questions related to assessment
  - Controlled trials with at least 6 participants + observational studies
- Questions related to nutrition intervention
  - Controlled trials with at least 6 participants in each group

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## JUST A REMINDER OF THE STRENGTH OF RECOMMENDATIONS AND GRADE FOR QUALITY OF EVIDENCE

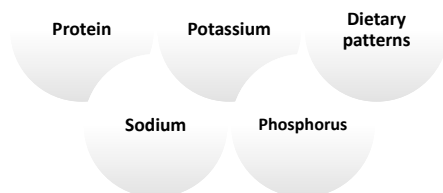
Grade*	Patients	Implications	Policy
Level 1 "We recommend"	Most people in your situation would want the recommended course of action and only a small proportion would not.	Most patients should receive the recommended course of action.	The recommendation can be adopted as a policy in most situations.
Level 2 "We suggest"	The majority of people in your situation would want the recommended course of action, but many would not.	Different choices will be appropriate for different patients. Each patient needs help to arrive at a management decision consistent with her or his values and preferences.	The recommendation is likely to require debate and reconsideration of alternatives before policy can be determined.

\* The additional category "Not Graded" was used, typically, to provide guidance based on common sense or where the high dose for adverse outcomes application of evidence. The most common examples include recommendations regarding monitoring intervals, counseling, and referral to other clinical specialists. The ungraded recommendations are generally written as simple descriptive statements, but are not meant to be interpreted as being stronger recommendations than Level 1 or 2 recommendations.

- A. High quality of evidence. We are confident that the true effect lies close to that of the estimate of the effect.
- B. Moderate quality of evidence. The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
- C. Low quality of evidence. The true effect may be substantially different from the estimate of the effect.
- D. Very low quality of evidence. The estimate of effect is very uncertain, and often will be far from the truth.



























## TODAY WE WILL ONLY TALK ABOUT...



## MOST NOTABLE CHANGE: DIFFERENTIATION OF DIABETES STATUS

### Diabetes and Chronic Kidney Disease in the US population, 2009-2014

METHODS		OUTCOME					
NHANES 2009-2014		Prevalence of CKD by Diabetes Status					
 N = 15,765							
Diabetics N=2,279		25%	16%	4.6%	12%	2.4%	
Non-diabetics N=13,396		5.3%	3%	0.3%	2.5%	0.4%	
 DM status  ACR  eGFR		             					
<b>CONCLUSION</b>		24% (95% CI 19-29%) of CKD among US adults was attributable to diabetes, after adjusting for demographics					
Diabetes is strongly associated with albuminuria and reduced eGFR, independent of demographics and hypertension, and contributes substantially to the burden of CKD in the US.							

Zelnick 2017. CJASN 12 (12)  
1984-1990.

## PROTEIN RESTRICTION, CKD PATIENTS NOT ON DIALYSIS AND WITHOUT DIABETES

In adults with CKD 3-5 who are metabolically stable, we recommend, under close clinical supervision, **protein restriction with or without keto acid analogs**, to reduce risk for end-stage kidney disease (ESKD)/death (1A) and improve quality of life (QoL) (2C):

- a low-protein diet providing **0.55-0.60 g dietary protein/kg body weight/day**, or
- a very low-protein diet providing **0.28-0.43 g dietary protein/kg body weight/day with additional keto-acid/amino acid analogs to meet protein requirements (0.55-0.60 g/kg body weight/day)**

## HOW DOES KDOQI DEFINE METABOLICALLY STABLE?

- Absence of any inflammatory or infectious disease
- No hospitalization within two weeks
- Absence of
  - poorly controlled diabetes or consumptive diseases (ex: cancer)
  - antibiotics or immunosuppressive medications
  - significant short-term weight loss

## LOW PROTEIN DIET

In adults with CKD 3-5 who are metabolically stable, we recommend that a low-protein diet providing **0.55-0.6g/kg/d** should be prescribed to reduce the risk of ESKD/death and QoL

- ESKD/death: beneficial effect of protein restriction (OR 0.62 [0.39-0.99])
- QoL: scores for general health and physical status improved significantly after protein restriction
- Improvement in serum lipid profile

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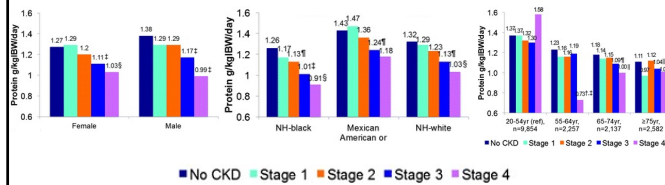
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## Protein intake reduction is not easy...



Kalantar-Zadeh, et al. BMC Nephrology (2016)

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## LOW PROTEIN DIET – IMPLEMENTATION

- Progressive
- Monitor energy intake
  - In controlled research studies LPDs are not associated with wasting
- Emphasize low-protein products
- Individualize
  - Patients with polycystic kidney disease may not benefit

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## PROTEIN RESTRICTION, CKD PATIENTS NOT ON DIALYSIS AND WITH DIABETES

- In the adult with CKD 3-5 and who has diabetes, it is reasonable to prescribe, under close clinical supervision, a dietary protein intake of **0.6-0.8g/kg body weight/day** to maintain a stable nutritional status and optimize glycemic control (*OPINION*).
- Conflicting evidence and high heterogeneity

**Table 1.** Ranges of dietary protein intake vis-à-vis relevant kidney disease conditions in the context of the KDOQI CPG in Kidney Disease 2020

Dietary Protein Intake Range	Daily Grams of Protein Intake per kg Body Weight (g/kg/day) <sup>a</sup>	Comment
Protein-free diet	<0.25 g/kg/day	Generally not recommended for any person including CKD patients. Usually supplemented with essential amino acids or their ketoacids or hydroxy-acids. KDOQI CPG recommends 0.28 to 0.43 g/kg/day with additional keto acid/amino acid analogs to meet protein requirements (0.55 to 0.60 g/kg body weight/day) for metabolically stable CKD patients without diabetes. Recommended by KDOQI CPG for CKD patients without diabetes.
Very low-protein diet	0.25-0.55 g/kg/day	
Low-protein diet for nondiabetic CKD <sup>b</sup>	0.55-0.6	More consistently recommended for advanced CKD (eGFR <45 mL/min/1.73m <sup>2</sup> or substantial proteinuria), usually no supplementation is needed as long as the regimen contains at least 50% high biologic value proteins. This range is recommended by KDOQI CPG for CKD patients with diabetes. Recommended range for adults without CKD but at high risk of CKD including those with a solitary kidney (following nephrectomy), diabetes mellitus, hypertension, and polycystic kidneys. Recommended by KDOQI CPG for metabolically stable patients on maintenance HD or PD.
Low-protein diet (for CKD <sup>b</sup> )	0.6-0.8 g/kg/day	
Moderately low-protein intake	0.8-1.0 g/kg/day	Reported protein intake of average United States adult without CKD. Can be used over limited period of time for acute conditions such as hypercatabolic AKI, high-grade burns, and PEW.
Moderate protein intake	1.0-1.2 g/kg/day	
Moderately high-protein diet	1.2-1.5 g/kg/day	
High- to very high-protein diet	>1.5 g/kg/day	

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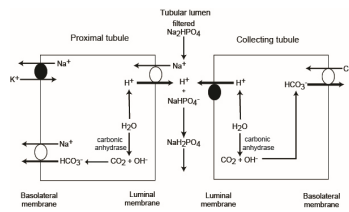
Kistler et al., Journal of Ren Nutr. 2021.

## PROTEIN TYPE

In adults with CKD 1-5D (*1B*) or post-transplantation (*OPINION*), there is insufficient evidence to recommend a particular protein type (plant vs animal) in terms of the effects on nutritional status, calcium or phosphorus levels, or the blood lipid profile.

- 3 RCTs in HD/PD and 2 cross-over studies in CKD 3-4
  - Type of protein intake was not significantly associated with nutrition status markers, inflammation, or electrolyte markers except for a significant decrease in urinary phosphate (−126.6 [95% CI, −200.4 to −52.7] mg) after VPD compared to APD

## PLANT-BASED FOODS ARE OFTEN LOWER IN PROTEIN AND AMOUNT OF TITRATABLE ACID (PHOSPHORUS AND SULFUR)



## FRUITS AND VEGETABLES

In adults with CKD 1-4, we suggest that prescribing increased fruit and vegetable intake may decrease body weight, blood pressure, and net acid production (NEAP) (2C).

- CKD progression (2 RCTs) mixed results related to GFR decline – (compared to oral bicarb)
- Blood pressure (2 RCTs and 1 non-RCT) SBP -5.6 (95% CI -8.3 to -2.8) mm Hg
- Body weight (2 RCTs) -5.09 (95% CI -7.73 to 2.44) kg

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SODIUM



## SODIUM

- In adults with CKD 3-5 (1B), CKD 5D (1C), or posttransplantation (1C), we recommend limiting sodium intake to less than 100 mmol/d (or <2.3 g/d) to reduce blood pressure and improve volume control.
- In adults with CKD 3-5 we suggest limiting sodium intake to less than 100 mmol/d (or <2.3 g/d) to reduce proteinuria synergistically with available pharmacologic interventions (2A).
- In adults with CKD 3-5D, we suggest reduced dietary sodium intake as an adjunctive lifestyle modification strategy to achieve better volume control and a more desirable body weight (2B).
- Patient education initiatives and skill development (cooking, label reading).
- Renal dietitians are needed to integrate sodium intake with other recommendations
- No gold-standard method

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## HOW TO LIMIT SODIUM IN THE DIET?



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## POTASSIUM



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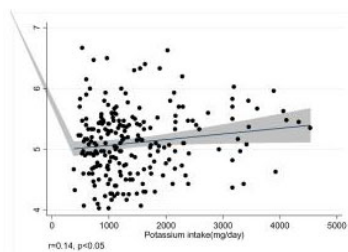
### POTASSIUM - LOWEST LEVEL OF EVIDENCE

In adults with CKD 3-5D and post-transplant, it is reasonable to **adjust** dietary potassium intake **to maintain** serum potassium within the **normal range** (OPINION).

In adults with CKD 3-5D (2D) or post-transplantation (OPINION) with either hyperkalemia or hypokalemia, we suggest that dietary or supplemental potassium intake be based on a patient's individual needs and clinician judgment.

- Patient education initiatives and skill development (cooking, label reading).
- Renal dietitians are needed to integrate sodium intake with other recommendations
- No gold-standard method

### Relationship between dietary potassium and serum potassium is weak



Noori et al. Am J Kidney Dis. (2010).

### SERUM POTASSIUM CAN BE INFLUENCED BY MANY FACTORS OTHER THAN DIET

- Medications
- Residual kidney function
- Hydration status
- Acid-base status
- Glycemic control
- Adrenal function
- Catabolism
- GI problems: vomiting, diarrhea, constipation, and bleeding

A large white rectangular area with the word "PHOSPHORUS" in bold red capital letters in the center. On the left side, there is a vertical red banner with the text "WE FLY" in white capital letters and a small logo at the bottom.

Cupisti, et al. *Nutrients* (2018)

\* Fresh and sweet batata, cocomalanga, dasheen, eddo, black yam, white yam, yellow yam, yampi, malanga, ne-yautia, white yautia and yuca.

**The food industry may increase the use of potassium additives to increase potassium content of foods**

Nutrition Facts		Nutrition Facts	
Serving Size 1/2 cup (50g)		Serving Size 1/2 cup (50g)	
Amount Per Serving		Amount Per Serving	
<b>Calories 230</b>		<b>Calories 230</b>	
<b>Total Fat 10g</b>		<b>Total Fat 10g</b>	
Saturated Fat 6g		Saturated Fat 6g	
<b>Cholesterol 0g</b>		<b>Cholesterol 0g</b>	
<b>Total Carbohydrate 32g</b>		<b>Total Carbohydrate 32g</b>	
Dietary Fiber 4g		Dietary Fiber 4g	
<b>Protein 10g</b>		<b>Protein 10g</b>	
Vitamin A 20%		Vitamin A 20%	
Calcium 20%		Calcium 20%	
Iron 10%		Iron 10%	
Percent Daily Values are based on a diet of other people's secrets.		Percent Daily Values are based on a diet of other people's secrets.	
<b>% Daily Value*</b> Total Fat 10g 20% Saturated Fat 6g 12% Cholesterol 0g 0% Total Carbohydrate 32g 64% Dietary Fiber 4g 8% Protein 10g 20% Vitamin A 20% Calcium 20% Iron 10%		<b>% Daily Value*</b> Total Fat 10g 20% Saturated Fat 6g 12% Cholesterol 0g 0% Total Carbohydrate 32g 64% Dietary Fiber 4g 8% Protein 10g 20% Vitamin A 20% Calcium 20% Iron 10%	

## PHOSPHORUS

Restricting phosphorus intake to maintain serum phosphate levels in the **normal** range is recommended in patients with CKD 1-5D (1B)

In patients with CKD 1-5D when making decisions about phosphorus restriction it is reasonable to consider the bioavailability of phosphorus sources (OPINION)

- Choosing foods lower in bioavailable phosphorus
- Reducing processed foods
- Preparation methods, such as boiling.

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## DIETARY PATTERNS

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## DIETARY PATTERNS

In patients with CKD 1-5 and post-transplant with or without dyslipidemia **we suggest the Mediterranean Diet to improve lipid profile** (2C)

In adults with CKD 1-5, we **suggest** increased fruit and vegetable intake to also decrease body weight and blood pressure (2C)

- Resea Nephrol Dial Transplant (2020) 35:1-8 doi:10.1093/ndt/gtz277



Is it time to abandon the nutrient-based renal diet model?

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Sau, University of Lyon, Carriou, Pierre-Benoite, France

Correspondence to David E. St-Jules; E-mail: davidstjules@gmail.com; Twitter handle: @denisfouque1

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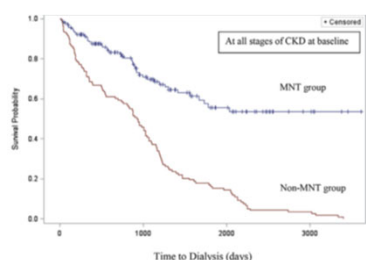
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## ULTIMATELY, GUIDELINES APPLY TO INDIVIDUALS

- In adults with CKD 1-5D, we recommend that a registered dietitian nutritionist (RDN) or an international equivalent, in close collaboration with a physician or other provider provide MNT. Goals are to optimize nutritional status, and to minimize risks imposed by comorbid conditions and alterations in metabolism on the progression of kidney disease (1C) and on adverse clinical outcomes (OPINION).

## MNT PROVIDED BY RDN SLOWS TIME TO DIALYSIS

- Retrospective cohort
- Decline in eGFR 0.3 vs 9.9mL/min/1.73m<sup>2</sup>
- HR for ESKD 2.78(95% CI 1.68-4.60)



De Waal, Heaslip, & Callas. *J Ren Nutr*. 2016. 26(1)

## PRE-HEMODIALYSIS CARE MAY REDUCE MORTALITY DURING FIRST YEAR OF DIALYSIS

Dietitian Care	Tertile 1		Tertile 2		Tertile 3	
	HR (95% CI)	P	HR (95% CI)	P	HR (95% CI)	P
Minimally adjusted model <sup>a</sup>						
None	1.00 (reference)		1.00 (reference)		1.00 (reference)	
0-12 mo	1.26 (1.03-1.55)	0.03	0.92 (0.86-0.99)	0.02	1.02 (0.97-1.07)	0.6
> 12 mo	0.94 (0.61-1.46)	0.8	0.74 (0.65-0.85)	< 0.001	0.81 (0.75-0.88)	< 0.001
Fully adjusted model <sup>b</sup>						
None	1.00 (reference)		1.00 (reference)		1.00 (reference)	
0-12 mo	1.08 (0.74-1.59)	0.7	0.97 (0.90-1.04)	0.4	1.01 (0.96-1.06)	0.7
>12 mo	1.16 (0.44-3.09)	0.8	0.81 (0.71-0.93)	0.002	0.93 (0.86-1.01)	0.1

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Slinin et al. *Am J Kidn Dis*. 2011. 58(4)

