Protein, CKD & Older Adults: What to do?

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Learning Objectives

Put into practice current protein recommendations for both older adults and people with Chronic Kidney Disease.

Illustrate an understanding of the rationale for a low protein diet and the benefits of plant vs. animal protein sources for Chronic Kidney Disease.

Compare and contrast the risks and benefits of a low protein diet for older adults with Chronic Kidney Disease.

Financial Disclosures

Consultant, Otsuka Pharmaceuticals

Consultant, Livongo/Teladoc

Owner, The Kidney Dietitian Blog

Outline

Protein recommendations for older adults

2020 KDOQI/AND Nutrition Guidelines for CKD

"New" renal diet

Frailty & CKD

Balancing protein recommendations

My Cognitive Dissonance

First 8 years of career exclusively in geriatrics, inpatient acute rehab, general medicine & ICU
- "More protein all the time!"
- "Eat more calories!"

Moved to non-dialysis renal dietitian role in 2018
- "Everyone is eating too much protein"
- 0.8g/kg is more than enough protein
- LESS than 0.8g/kg is ideal

=STRESSED & confused Melanie

Protein Needs for Older Adults

RDA = 0.8g/kg

Calls to be even higher (~1.2g/kg)

May be even higher in common conditions
- Chronic illness
- Inflammation with acute illness
- Pressure ulcers
- Malnutrition

Baum et al. *Healthcare*. 2015;3(3):529-543

Benefits of Higher Protein for Older Adults

Prevent/treat sarcopenia

Bone health

Cardiovascular function

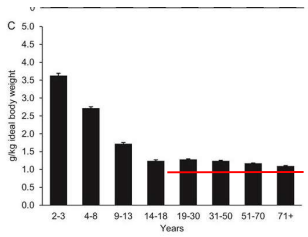
Wound healing

Functional status

Recovery from disease and trauma

Baum et al. *Healthcare*. 2015;3(3):529-543

Average U.S Protein Intake



Berryman C. et al. *Am J Clin Nutr* 2018(2):405-413.

CKD is a Big Deal!

Affects ~37 million people in the United States (15% of all adults, 40% older adults)

90% of people with CKD don't know they have it!

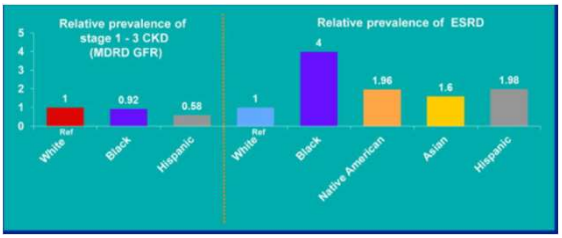
Diabetes (47%) & hypertension (29%) leading causes of kidney disease

Those with CKD & ESRD have lower self-reported quality of life than healthy population & is associated with mortality

SUPER expensive
- $90,000/year for each patient on hemodialysis
- Accounts for 7% total Medicare spending (1% of Medicare population)

https://www.kidney.org/news/newsroom/fsindex
Porter AC, et al. *CJASN*. 2016;11(7):1154-1162

ESRD Disproportionally Affects Minorities



Nicholas et al. *Seminars in Nephrology* 33, no. 5 (September 2013): 409–15.

Prognosis of CKD by GFR and Albuminuria Categories

GFR categories (ml/min/1.73 m²) Description and range				Albuminuria categories Description and range		
				A1	A2	A3
				Normal to mildly increased	Moderately increased	Severely increased
				<30 mg/g <3 mg/mmol	30-299 mg/g 3-29 mg/mmol	≥300 mg/g ≥30 mg/mmol
	G1	Normal or high	≥90			
	G2	Mildly decreased	60-90			
	G3a	Mildly to moderately decreased	45-59			
	G3b	Moderately to severely decreased	30-44			
	G4	Severely decreased	15-29			
	G5	Kidney failure	<15			

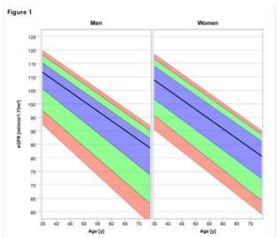
Green: low risk (if no other markers of kidney disease, no CKD); Yellow: moderately increased risk; Orange: high risk; Red, very high risk.
KDIGO 2012

https://www.kidney.org/kidneydisease/siemens_hcp_quickreference

CKD Diagnosis & GFR Decline w/ Age

Criteria for CKD Diagnosis
- Markers of kidney damage **OR**
  - Albuminuria
  - Urine sediment abnormalities
  - Electrolyte imbalances related to kidney function
  - Structural abnormalities (Polycystic Kidney Disease)
  - History of kidney transplant
- Decreased eGFR (<60ml/min)

Controversial CKD diagnosis in older adults
- Normal decline in eGFR
- Decline starts at ~30-40 years of age
- Loss of ~1ml/min per year on average
- May accelerate after ~60 years of age
- *eGFR impacted by muscle mass*



https://www.kidney.org/professionals/explore-your-knowledge/what-is-the-criteria-for-ckd
Glassock RJ, et al. Trans Am Clin Climatol Assoc. 2009;120:419-428.

eGFR & Muscle

$$CKD\text{-}EPI\ Equation:\ GFR = 141 \times \min(S_{cr}/\kappa, 1)^{\alpha} \times \max(S_{cr}/\kappa, 1)^{-1.209} \times 0.993^{Age} \times 1.018\ [if\ female]$$

Low Muscle Mass → Low Serum Creatinine → Low eGFR

eGFR may be especially problematic assessing accurate kidney function in elderly

	2020 KDOQI/AND Guideline
Energy	**CKD1-5D (1C) & Post-Transplant (OPINION)** 25-35kcal/kg IBW based on age, gender, physical activity, body composition, weight status, CKD stage, concurrent illness, and inflammation to maintain nutritional status

Ikizler A, et al. *Am J Kidney Dis*. 2020;76(3):S1-S107.

	2020 KDOQI/AND Guideline
Sodium	**Blood Pressure Control: CKD 3-5 without dialysis (1B), dialysis (1C) & post-transplant (1C)** Goal: <2300mg/day **Proteinuria: CKD 3-5 without dialysis (2A)** Goal: <2300mg/day **Dry Body Weight: CKD 3-5D (2B)** Reduced sodium intake to improve better volume control

Ikizler A, et al. *Am J Kidney Dis*. 2020;76(3):S1-S107.

	2020 KDOQI/AND Guideline
Mediterranean Diet	**CKD 1-5 without dialysis and post-transplant** With or without dyslipidemia, suggest prescribing a Mediterranean Diet to improve lipid profile (2C)
Fruits & Vegetables	**CKD 1-4** Suggest prescribing increased fruit and vegetable intake may decrease body weight, blood pressure and net acid production (NEAP) (2C)

Ikizler A, et al. *Am J Kidney Dis*. 2020;76(3):S1-S107.

The New "Renal Diet"

LESS RESTRICTIVE THAN IT ONCE WAS!

Dietary Acid Production

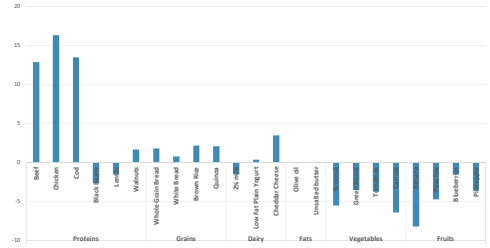
Diet is the main contributor to acid that must be excreted by the kidney

Balance of:
- Endogenous acid production (H^+)
  - Primarily from protein (especially sulfur containing amino acids methionine & cysteine) that are metabolized to cation
- Alkali intestinal absorption
  - Primarily from fruits & veggies
  - Metabolized to produce bicarbonate or anion

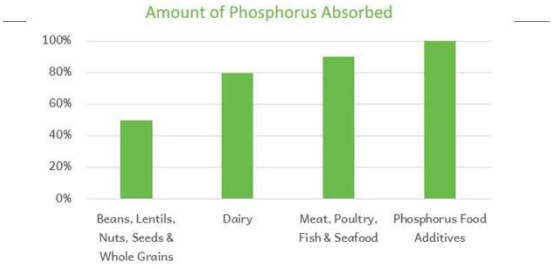
Measuring Acid Load
- Net Acid Excretion (NAE, requires 24-hour urine test)
- Potential Renal Acid Load (PRAL)
- Net Endogenous Acid Production (NEAP)
- GI alkali absorption

Scialla JJ, et al. *Adv Chronic Kidney Dis*. 2013;20(2):141-149.
Ströhle A, et al. *Ann Nutr Metab*. 2011;59(2-4):117-126.

Potential Renal Acid Load (per standard portion size)



Whole Grains, Beans & Nuts on the "Renal Diet" Menu Again!



Noori N, et al. *Iran J Kidney Dis.* 2010;4(2):89-100.
Ribones ST, et al. *Dietary Phosphorus: Health, Nutrition, and Regulatory Aspects.* Published online January 1, 2017:221-233.

Phosphorus Food Additives

Contribute 300-1000mg phosphorus per day

Can increase phosphate content of food up to 70%

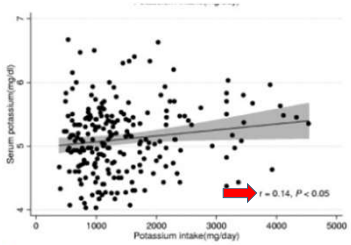
Are becoming more common in food supply
- 37% of foods consumed

Common in many OTC and prescribed medications in CKD
- Norvasc, Amiloride, Januvia, Epogen, Tums, Crestor, Zoloft

Often not reflected in dietary analysis nutrient databases

Calvo MS, et al. *Seminars in Dialysis.* 2013;26(1):54-61.
Benini O, et al. *Journal of Renal Nutrition.* 2011;21(4):303-308.

Potassium Intake ≠ Serum Potassium



Noori N, et al. *American Journal of Kidney Diseases.* 2010;56(2):338-347.

Potassium Food Additives

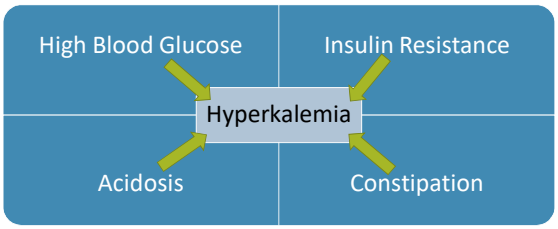
Prevalence in food supply is growing
- 9% of foods consumed in dialysis patients
- Known to be high in meats – especially processed meats
  - 2-3X higher potassium in enhanced meats

Often used in "low sodium" products
- 44% more potassium

Likely more bioavailable than naturally occurring potassium (~90-100% vs. 50-60%)

Picard K. *Journal of Renal Nutrition.* 2019;29(4):350-353.

Is limiting fruits & veggies a good idea?



New Renal Diet

HIGHLY individualized based on stage of CKD & lab values

Protein
- Likely limited with CKD stage 3+
- Consider blood glucose control

Potassium
- Only restricted with hyperkalemia
- Consider potassium food additives first
- Continue to promote plant foods as much as possible
- Use of Lokelma® (sodium zirconium cyclosilicate) & Veltassa® (patiromer) more widely used

Phosphorus
- Natural sources (whole grains, nuts, seeds, etc. okay)
- Consider phosphorus food additives

Dietary Acid Load
- Fruits, vegetables and plant proteins
- Lower protein, especially from animal sources

Less restrictive = greater calorie intake & adherence?

LOTS of fruits & veggies | WHOLE GRAINS!

Unprocessed foods | Lower sodium choices

Smaller portions animal protein | Focus on plant proteins

Back to Protein

Reminder: Protein Needs in CKD

NO Diabetes

CKD stage 3-5: 0.55-0.60g/kg IBW
- OR 0.28-0.43g/kg with keto-analog supplementation

With Diabetes

CKD 3-5: 0.8-0.9g/kg IBW

Why Low Protein?

Reduced glomerular pressure
- Improved proteinuria = improved CKD outcomes

Reduced dietary acid load & acidosis
- Improved uremic symptoms

Improved phosphorus control
- Better bone health

Improved quality of life

Ultimately, preserved kidney function, delayed development ESRD & reduced mortality

Kalantar-Zadeh K, et al. *Nutrients*. 2020;12(7):1931.

Example Moderate Protein Diet

150lb (68kg) patient
0.8g/kg = 54g protein

Breakfast
- 1 ½ cups cornflakes **3g**
- ¾ cup rice milk
- 1 apple

Lunch
- 1 cup black bean soup **11g**
- 1 wheat dinner roll w/ 1 tablespoon margarine **3g**
- 1 peach

Dinner
- 3oz baked salmon w/ 2 tsp olive oil **22g**
- ¾ cup wild rice w/ 1 tbs unsalted butter **5g**
- 1 cup asparagus w/ 1 tsp olive oil

Snack
- 2 cups microwave popcorn
- 1 cup blueberries
- 20 baby carrots w/ 2 tbs hummus **3.5g**

Nutrient Totals:

1470 calories (22kcal/kg)

56g protein (0.8g/kg)

2089mg sodium

2863mg potassium

975g phosphorus

Example LOW Protein Diet

150lb (68kg) patient
0.6g/kg = 41g protein
0.3g/kg= 20g protein

Breakfast
- 1 ½ cups cornflakes
- ¾ cup rice milk
- 1 apple

Lunch
- 1/2 cup black bean soup
- 1 wheat dinner roll w/ 1 tablespoon margarine
- 1 peach

Dinner
- 1 ½ cups vegetable stir fry
- 1 cup wild rice w/ 1 tbs unsalted butter
- 1 cup asparagus w/ 1 tsp olive oil

Snack
- 2 cups microwave popcorn
- 1 cup blueberries
- 20 baby carrots w/ 2 tbs hummus

Nutrient Totals:

1461 calories (21kcal/kg)

36g protein (0.5g/kg)

2220mg sodium

2568mg potassium

799g phosphorus

Prevalence of Frailty

Community Dwelling Older Adults (65+)
7-12%

Older Adults 65-74
3.9%

Older Adults 75+
25%

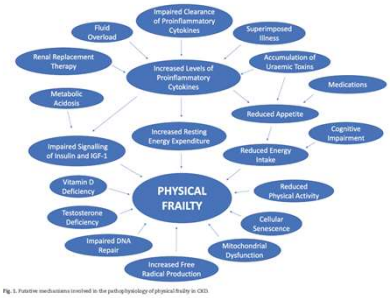
CKD 3
(GFR=49ml/min)
(Age = 65)
7%

CKD 4
(GFR = 27 ml/min)
(Age = 60.5 years)
42.6%

Hemodialysis
(Age = 57.2-59.6 years)
14-73%

Chen X, et al. *Clinical Interventions in Aging* 2014;9:433-441.
Chowdhury R, et al. *Arch Gerontol Geriatr.* 2017;68:135-142.

Increased Risk of Frailty in CKD



Nixon AC, et al. *Clinical Kidney Journal* 2018;11(2):236-245.

Could a Low Protein Diet Improve Malnutrition in CKD?

Improved uremic symptoms → Improved taste & appetite? → Reduced inflammation? → Reduced muscle loss?

Does Protein Type Matter?

Probably!

Animal Proteins (Meat, Poultry, Fish, Seafood, Dairy, Eggs)	Plant Proteins (Beans, Nuts, Seeds, Legumes, Whole Grains)
More protein per serving	Less protein per serving
Higher acid load	Lower dietary acid load
	More fiber & improved constipation
	Less phosphorus bioavailability
	Improved blood pressure control
	Reduced chance of potassium additives
	High biological value protein concept a bit outdated

Benefits of HIGH Protein Diet

In NON-CKD Populations:
- Less muscle loss
- Improved functionality
- Survival

No known research in CKD populations

Benefits of LOW Protein Diet

In GENERAL CKD Populations:
- Slower progression of CKD
- Improved acidosis, phosphorus control, bone health
- Delayed dialysis or need for transplant
- Improved uremic symptoms

No known research in older adults with CKD

Look at the BIG Picture

What does the person sitting in front of you want?
- Stay off dialysis no matter what?
- Independence & functionality more important?

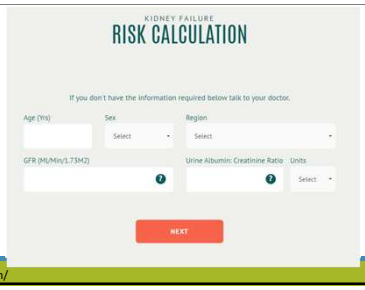
Chances of ever needing renal replacement therapy

How much protein is this actually patient eating? What type of protein?

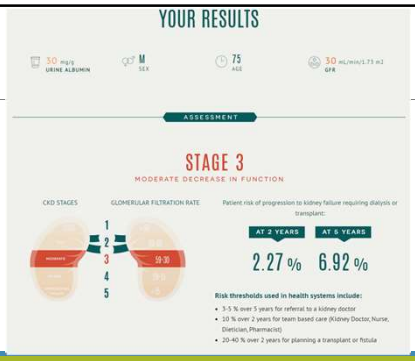
Having uremic symptoms? (most do not until very late in CKD)
- Taste changes, fatigue, itching

Will adding extra restrictions (protein, sodium, potassium, etc.) exacerbate already low energy intake?

Kidney Failure Risk Equation



https://kidneyfailurerisk.com/



https://kidneyfailurerisk.com/

Final Thoughts

Always consider patient goals of care
- Stay off dialysis vs. independence/function
- Chances patient will need renal replacement therapy

Feasibility of low protein diet
- Better to incorporate more plant proteins?

Ensure adequate calories
- Will adding a sodium, potassium, phosphorus or protein restriction result in inadequate energy intake?

As always, LEAST restrictive diet possible

Need more research in older adults with CKD!

Questions?