

Case Study: Type 2 Diabetes, Chronic Kidney Disease, and Hemodialysis

Clinical Nutrition and Disease 1
2019 Fall A Semester

Skills: Nutrition Education for Hemodialysis and ESRD Patients, Creation of Diet for Renal Failure, Determination of Energy Needs Using Adjusted Edema-Free Weight, Physiology of Normal Kidney Function, Identification of Abnormal Lab Values in Renal Disease



CS #19: Chronic Kidney Disease (CKD) Treated with Dialysis

By Annika Rockwell

- ✓ *Mrs. Enez Joaquin*
- ✓ *Age 24, Native American (Pima Indian), married with 7 year old daughter*
 - ✓ *T2D since age 13*
- ✓ *Not compliant with diet or meds*
- ✓ *Dx Stage 3 CKD 2 years ago has progressed to Stage 5 ESRD*
- ✓ *Admitted with list of acute symptoms*
- ✓ *Needs hemodialysis & renal transplant*



Patient Overview

- ❖ *Height: 5'0"*
- ❖ *Weight: 170 lbs.*
- ❖ *BMI of 33 (obese I)*
- ❖ *Presenting symptoms:*
 - ❖ *Loss of appetite, N/V,*
 - ❖ *4kg weight gain in past 2 week (water weight)*
 - ❖ *Edema, malaise, SOB*
 - ❖ *Pruritus (itchy skin)*
 - ❖ *Muscle cramps*
 - ❖ *Inability to urinate*

Review: Chronic Kidney Disease (CKD) & Kidney Function

- CKD affects 15% of US adults (37 million)
- Most adults with CDK don't know they have it
- Renal disease **usually caused by** T2D and high BP

Kidneys

- Filter 1,600 Liters of blood per day
- Generate 1.5 Liters of urine per day
- Maintain body's homeostatic balance, body fluids, electrolytes, blood pH.
- Control blood pressure
- Prevent anemia via EPO
- Produce active Vit D3 (for Ca⁺ absorption and Phosphorus excretion)



Mrs. Joaquin's Condition, Risk Factors & Tx

Patient's risk factors for Chronic Kidney Disease (CKD):

- T2D, HTN
- Obesity (BMI 33.2)
- Race (Pima Indian)

❖ CKD deterioration from Stage 3 (two years ago) to Stage 5

- ❖ GFR of 4 mL/min.
- ❖ Oliguria & anuria

❖ Tx: New strict adherence to renal diet and dialysis 3x weekly until kidney-replacement.



Mrs. Joaquin's New Medical Treatment

- ❖ Glucophage (metformin) 850mg BID (lowers BG, biguanide)
- ❖ 6 new medications:
 - ❖ Capoten 25mg BID (HTN)
 - ❖ Erythropoietin 30 units/kg (RBC, anemia)
 - ❖ NaHCO₃ 2g QD (blood pH)
 - ❖ Renal caps QD (vitamins lost during HD)
 - ❖ Renvela TID w/meals (Phosphate binder)
 - ❖ Hectorol 2.5pg QID 3 times/week (Vit D₂, hypocal)
 - ❖ Stool softener (new meds and fluid restriction)



Diet Overview

- ❖ Increased calories **2,500** per day, 50% CHO, 25% PRO, 25% LIP.
- ❖ Restricted intake of K, PO₄, and Na (adjusting with labs)
- ❖ Increased PRO
- ❖ Carb counting
- ❖ Increased fiber intake



Table 1: Renal Diet Exchanges Restricted in Na, K, and P.

	Fruit/Juice	Bread/Starch	PRO	Veggies	Milk	Fat
Breakfast	1	3	1	0	1	2
Lunch	1	3	3	1	0	2
Dinner	1	2	3	1	0	2
Total	3	8	7 oz.	2	1	6

Nutrition Prescription (NP) from eNCPT Intervention

- ❖ Energy modification: 2,500 kcal per day (35g/kg)
- ❖ PRO modification: 72-84g per day
- ❖ Consistent **carbohydrate** diet: 50% of calories at each meal using CHO counting.
- ❖ Increased **fiber** diet: 20-25 grams per day.
- ❖ Fluid restricted diet: 1,000 mL + urine output per day.
- ❖ Decreased phosphorus diet: 2-3g per day (10-15 mg/kg) from food, adjusted based on serum levels.
- ❖ Decreased potassium diet: 2-3g per day from food.
- ❖ Decreased sodium diet: 2-3g per day.

Nutrition Assessment (Part 1)

Estimated kcal needs:

- 35 kcal/kg (National Kidney Foundation guidelines) using adjusted edema-free weight with NHANES II data of Standard Body Weight (SBW)
- SBW = 60kg for medium frame female with height 152.4 cm (NHANES II data table).
- $BW_{ef} = (170\#) \rightarrow 77.3 \text{ kg} - 4\text{kg}$ (edema weight gain in last 2 weeks) = 73.3kg
- $(aBW_{ef}) = BW_{ef} + [(SBW - BW_{ef}) \times 0.25] =$
 - $73.3\text{kg} + [(60\text{kg} - 73.3\text{kg}) \times 0.25] =$
 - $73.3 - (3.325) = 69.98 \text{ kg}$

Energy needs: $69.98 \times 35 \text{ kcal/kg} = 2,449 \text{ kcal!}$



Nutrition Assessment (Part 2)

Estimated Protein Needs:

- ❖ *Range of 72 -84g* per day based on 1.2 g/kg of **SBW** or **(aBWef)** with >50% HBV (High Biological Value)
- ❖ SBW: $60 \text{ kg} \times 1.2 = 72\text{g}$ (using NHANES II SBW data)
- ❖ (aBWef): $69.9 \text{ kg} \times 1.2 = 83.9 = 84\text{g}$

Estimated fluid needs:

- ❖ 1,000 mL per day + urine output.
- ❖ Hemodialysis patients cannot gain more than 5% body weight bt dialysis sessions.
- ❖ Mrs. Joaquin is no longer producing urine and must limit liquids.

Reference: Academy's Manual of MNT, 2019



Nutritional Rx (Part 1)

- ❖ Restrict K⁺ intake to 2-3g per day based on lab value of 5.8 mEq/L to avoid hyperkalemia, smooth muscle change, cardiac effects, and nervous system decline.
- ❖ Restrict PO₄ intake to 2-3g (10-15 mg/kg) per day and adjust based on serum levels. Take phosphate binder.
- ❖ Restrict Na⁺ intake to 2-3g per and customize based on edema, blood pressure, and thirst.
- ❖ Calcium intake should not exceed 2-2.5g per day and can be adjusted based on lab values.

Reference: Academy's Manual of MNT, 2019



Nutritional Rx (Part 2)

- ❖ Increase PRO (≥ 1.2 g/kg) daily to prevent protein malnutrition.
 - ❖ Dialysis causes protein loss.
 - ❖ Protein sources should have $\geq 50\%$ of High Biological Value (HBV) in order to create less nitrogenous waste in blood.
- ❖ 1 serving of cold-water fish three times per week for hyperlipidemia (Manual of MNT, 2019).
- ❖ Restrict fluid intake to 1,000 mL + urine output
 - ❖ Liquids include soups, frozen liquids, ice, ice cream, sherbet, popsicles, yogurt, custard, gelatin (Jell-O).
 - ❖ Limit salt intake in order to prevent excess thirst.



Nutritional Rx (Part 3)

- ❖ CHO intake 50% of caloric intake using CHO counting to control BG.
- ❖ Fiber intake should be adequate (20-25g) in order to prevent constipation caused by medications and fluid restrictions (Manual of MNT, 2019).
- ❖ Education twice weekly to transition onto the renal diet for Stage 5 & hemodialysis.
- ❖ Critical importance of carefully following the new diet and Rx (matter of life or death).



Abnormal Lab Values

- ❖ Many labs are abnormal and getting worse:
 - Kidneys are failing/unable to filter the blood, maintain **homeostasis**, regulate **electrolytes**, **minerals**, **pH**, activate vitamin D, or produce enough **EPO** to prevent anemia.
- ❖ Abnormal lab values seen: Na, K, Ch, CO₂, Bicarb, BUN, Cr, BUN/Cr ratio, GFR, BG, Phosphate, Ca, Osmolality, protein, albumin, cholesterol, VLDL, Triglycerides, HbA1c, RBC, Hgb, Hct, urine pH, protein, glucose, and ketones, ABG pCO₂, and HCO₃.



Patient Resources

FLUIDS

Limit Your Fluids to 32 ounces a day

8 oz + 8 oz + 8 oz + 8 oz = 32 oz

1 cup = 8 ounces

Fluids include:

Distinguish different cup sizes:

Potassium

Control Your Potassium Intake. Potassium is a mineral found in many fruits and vegetables, and it helps your nerves, muscles, and heart work properly. For people with CKD, the kidneys can no longer remove excess potassium, so high levels can build up in the blood, leading to nausea, weakness, irregular heartbeat, and even heart failure. So it's important to control the amount of high-potassium foods you eat.

Good Choices

Apples, berries, grapes, peaches, plums, pineapple, watermelon
Cranberry juice, apple juice, grape juice
Carrots, green beans, cauliflower, eggplant, cucumbers, lettuce, mushrooms
Non-dairy whipped topping, non-dairy creamer, sherbet, sorbet
Unenriched rice milk, non-dairy creamer

Also a good choice when oral nutritional supplements are necessary to meet dietary needs. Use under medical supervision.

Poor Choices

Bananas, oranges, avocados, cantaloupe, dates, apricots, nectarines, raisins, kiwi
Tomatoes, spinach, potatoes, greens, pumpkin, sweet potatoes, Brussels sprouts
Nuts, cooked dried beans, peas, seeds
Yogurt, ice cream, milk
Chocolate

Nepro® with CarbSteady®

Nepro is available at Walgreens, H-E-B, Meijer, Giant, and others. You can also order directly through Abbott Nutrition at abbottstore.com or by calling 1-800-441-1776.

QUICK TIPS TO KEEP IN MIND

Talk with your renal dietitian about a diet plan, and healthier alternatives for your favorite foods.

Avoid toppings high in phosphorus.
Replace bacon and cheese with lower phosphorus foods like lettuce, tomato, and onion.

Spice things up.
Most condiments and sauces aren't very high in phosphorus, but it can still add up. If you're craving a little more flavor in your food, add spices or hot sauce.

Power up with protein.
You need high quality sources of protein (lean meats, fish, and eggs) to stay strong and energized. Ask your dietitian how much protein you should be eating daily and how to measure appropriate serving sizes.

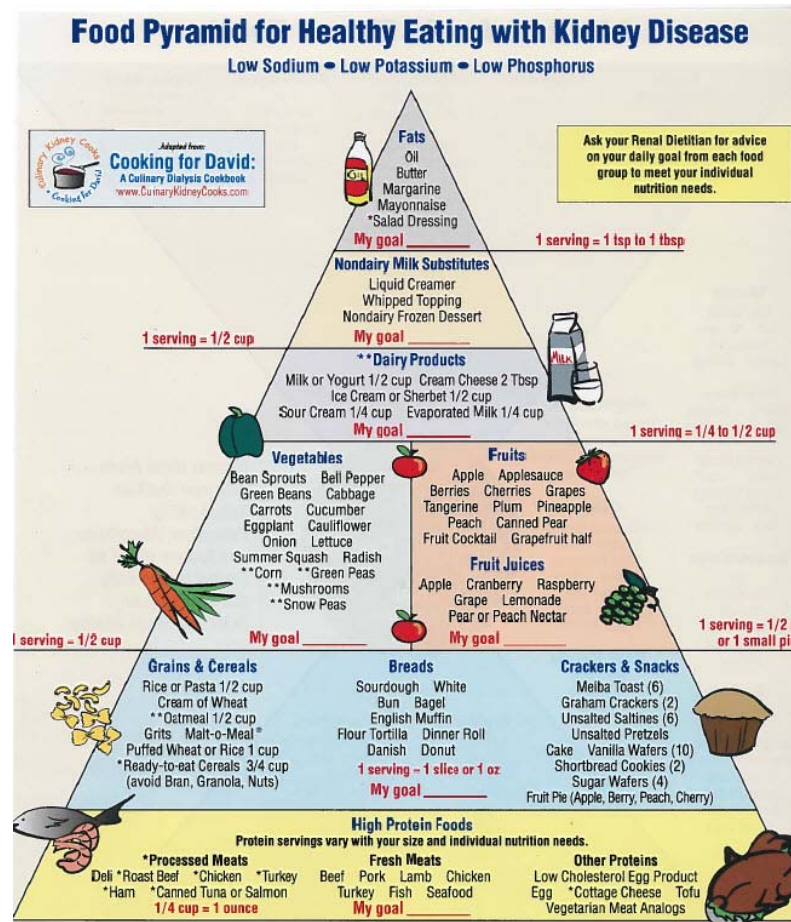
Just say "no" to larger portions.
Eating large portions of any food will increase your daily phosphorus intake. You may even want to try sharing some of your food with others or taking the rest home for leftovers the next day.

This list of foods only includes a few suggestions. Work with your dietitian to create a diet that is appropriate for you.

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Patient Resources



Patient Resources



Patient Resources

Dialysis Support Groups for Lifestyle Changes

- Davita hosts educational support groups nationally
- <https://www.davita.com/education/ckd-life/support/support-groups-for-people-living-with-kidney-disease>

