# **Renal Case Report**

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FNES 366: Medical Nutrition Therapy

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## Pathophysiology

1. **Describe the 4 basic pathophysiological functions of the kidneys. (4)**

The four basic pathophysiological functions of the kidneys are to remove waste products from the body, to regulate red blood cell production and blood formation, to control the body's chemical and fluid balance, and to release the hormones that regulate blood pressure (National Kidney Institute, 2017).

The kidneys main function is to maintain the body's chemical and fluid balance. Healthy kidneys filter ~1600 L/day of blood and produce 180 L of ultrafiltrate, which is ultimately changed into the 1.5 L of urine excreted a day. Each kidney has about 1 million nephrons, which consists of a glomerulus connected to a series of tubules. Each nephron contributes to the final urine. If part of a nephron is destroyed, the nephron is no longer functioning. The glomerulus produces the ultrafiltrate, which is a mostly passive process. The tubules reabsorb most of the components that make up the ultrafiltrate, which is a mostly active process. The tubule produces the final urine, which is funneled into collective tubules and the renal pelvis, which goes to a ureter that carries urine into the bladder. The kidneys are able to regulate water homeostasis. Water excretion is regulated by vasopressin, an antidiuretic hormone. The amount of water in the body controls how much vasopressin is secreted (Wilkens et al., 2017).

Another pathophysiological function of the kidneys is to secrete waste. Renal function is the ability of the kidney to eliminate nitrogenous waste. Nitrogenous waste is the end product of protein metabolism that is excreted in the urine. This contains urea, uric acid, creatinine and ammonia. On average, urine production is 1.5 L/day. A minimum of 500 ml of urine/day needs to be eliminated to get rid daily waste (Wilkens et al., 2017).

The kidneys also have the pathophysiological function of regulating red blood cell production by secreting the hormone erythropoietin, which stimulates the synthesis of red blood cell formation and release in bone marrow (VanPutte et al., 2017).

The fourth pathophysiological function of the kidneys is to regulate blood pressure. The kidneys perform the renin-angiotensin mechanism (Lewis, 2018), which controls blood pressure. When blood volume is decreased, glomerulus cells release renin, which acts on angiotensin in the plasma to form angiotensin I, which is converted to angiotensin II. Angiotensin II is a vasoconstrictor and a stimulus of aldosterone secretion. Because of this, sodium and fluid are reabsorbed, causing blood pressure to return to normal (Wilkens et al., 2017).

2. **List the primary diseases/conditions that most commonly lead to chronic kidney disease (CKD)? Explain the role of diabetes in the development of CKD. (4)**

The primary diseases/conditions that most commonly lead to chronic kidney disease (CKD) are diabetes, hypertension and glomerulonephritis (Wilkens et al., 2017). Other conditions that can lead to CKD are lupus, inherited diseases such as polycystic kidney disease, malformations that happen to a baby in utero, and repeated urinary infections (National Kidney Institute, 2019). Kidney damage caused by diabetes happens slowly. High blood glucose can damage the blood vessels in the kidneys. These blood vessels don't work as well when damaged because they cannot properly clean your blood, causing the body to retain more salt and water than usual, which can result in weight gain and swelling. There can also be protein buildup in your urine and a buildup of waste in your blood. Diabetes can also cause nerve damage, which can make urinating more difficult. When the bladder is full it can cause pressure to back up and damage the kidneys and can also cause an infection from rapid bacteria growth in urine with a high sugar level (National Kidney Institute, 2017). Hypertension is commonly developed in those with diabetes, which can damage the kidneys as well. Preventing diabetes related CKD is possible by having healthy lifestyle habits and taking medication to help you reach your blood pressure and blood glucose goals (National Institute of Diabetes and Digestive and Kidney Diseases, 2017).

**3. State each stage of CKD, basic descriptions and GFR (chart format). From your reading of Mrs. Joaquin's history and physical, what signs and symptoms did she have that correlate with her chronic kidney disease? (4)**

| Stage of CKD | Basic Description | GFR |
|---|---|---|
| Stage 1 | There is kidney damage; kidney function is normal. | 90-130 ml/min |
| Stage 2 | Kidney function is mildly decreased. | 60-89 ml/min |
| Stage 3 | Kidney function is moderately decreased. | 30-59 ml/min |
| Stage 4 | Kidney function is severely decreased. | 15-29 ml/min |
| Stage 5 | There is kidney failure, which requires dialysis, transplantation or medical management. | < 15 ml/min |

(Wilkens et al., 2017).

From my reading of Mrs. Joaquin's chart, the signs and symptoms she had that correlate with her CKD are: fatigue, the inability to urinate, a 4 kg weight gain, edema in extremities, face and eyes, she's Native American, has type 2 diabetes mellitus and doesn't take her medication, has a declining GFR (4 ml/min), is obese, has increasing urea and creatinine concentrations, elevated serum phosphate, muscle weakness, and hypertension (Nahikian Nelms, 2017).

4. **In addition to the possibility of a kidney transplant, medical treatment options for Stage 5 CKD (renal failure / ESRD) include HD and PD. Define hemodialysis and peritoneal dialysis (CAPD and CCPD). Which of Mrs. Joaquin's symptoms would you expect to begin to improve when she starts dialysis? (4)**

Hemodialysis (HD) is when blood is removed from the body and pumped by a machine outside the body into a dialyzer/an artificial kidney. Metabolic waste products are filtered out of the blood by the dialyzer, and the dialyzer then returns the purified blood to the person's body. The amount of fluid returned can be adjusted. Doctors usually create an arteriovenous fistula in patients on hemodialysis to make long-term access to the blood stream easier. The radial artery is usually joined with the cephalic vein in the forearm, resulting in the cephalic vein enlarging and blood flow increasing, which allows for repeated puncture with a needle. If a fistula can't be made, a surgeon can create a graft in the patient's arm. A technician will place a needle into a person's fistula or graft to let the blood to be removed for cleaning (Hechanova, 2017).

Peritoneal dialysis (PD) is when the peritoneum, a membrane lining the abdomen and covering the abdominal organs, acts as a filter. The peritoneum has a large surface area and a lot of blood vessels. Matter from the blood can pass through the peritoneum into the abdominal cavity easily. In PD, dialysate is injected into a peritoneal space in the abdomen through a catheter inserted into the abdominal wall. The dialysate is left in the abdomen for a while to allow waste products from the blood to slowly go into it; it is then drained out and replaced with fresh dialysate. Dialysate is done through a catheter, which can be temporary or permanent through surgery (Hechanova, 2017). There are two types of peritoneal dialysis- continuous ambulatory peritoneal dialysis (CAPD) and continuous cycler-assisted peritoneal dialysis (CCPD). CAPD does not use a machine to administer dialysis; the exchanges are done manually. Each exchange takes 30-40 minutes to administer, and you leave the dialysate in your stomach for 4-6 hours. The solution is usually changed four times a day and you sleep with it in your stomach at night (NIDDK, 2018). CCPD is an automated peritoneal dialysis, meaning a machine does the exchanges while you're asleep. A machine, called a cycler, fills and empties your stomach 3-5 times throughout the night, and you have fresh dialysate in your stomach in the morning. You can leave the dialysate in your stomach all day or do a manual exchange once during the day. Both CAPD and CCPD can be done anywhere you wish; you do not need to go to a dialysis center (NIDDK, 2018).

Once Mrs. Joaquin begins hemodialysis, a few of her symptoms will start to improve. She should have an increased energy level and her anorexia should go away. Her edema should reduce significantly since HD reduces salt and fluid buildup. She should also return to her dry weight once beginning HD, which will help control her blood pressure (NIDDK, 2018).

## Assessment

5. **Calculate Mrs. Joaquin's BMI based on current body weight on admission. Calculate her BMI based on dry weight (UBW). How does edema affect interpretation?**

The formula for BMI is: $BMI = \frac{weight\ (lbs)}{(height\ (in))^2}\ x\ 703$ (Demarest-Litchford, 2017)

BMI based on current body weight on admission: $BMI = \frac{170}{(60)^2}\ x\ 703 = 33.2$

BMI based on dry weight (UBW): $BMI = \frac{161}{(60)^2}\ x\ 703 = 31.4$

Edema affects interpretation of BMI because the accumulation of fluid causes a significant increase in weight, which causes an increase in BMI, which is not an accurate representation of the patient's actual BMI. In both cases, Mrs. Joaquin is obese so the numbers don't matter as much, but in a patient with a different weight edema can be the difference between a normal BMI/overweight or between overweight/obese, etc. which can make a difference in treatment of the patient. When someone has edema, it is difficult to use weight alone to assess overall nutrition status (Demarest-Litchford, 2017).

**Define edema-free weight. State the equation that can be used to calculate the edema-free adjusted body weight as per NFK KDOQI guidelines. (4)**

Edema-free weight is the actual body weight of a patient without the fluid accumulation. This body weight should be used for assessing or prescribing protein and energy intake. For patients on HD, this should be obtained after dialysis. For patients on PD, this should be obtained after the dialysate is drained (Bailie et al., 2007).

The equation used to calculate the edema-free adjusted body weight as per NKF KDOQI guidelines is: $aBW_{ef} = BW_{ef} + [(SBW - BW_{ef})\ x\ 0.25]$ (National Kidney Foundation, n.d.).

6. **What are the energy requirements for CKD (adults not on dialysis and adults on dialysis)? Calculate what Mrs. Joaquin's energy needs will be once she begins hemodialysis. (4)**

The energy requirement for adults with CKD not dialysis is 30-35 kcal/kg IBW (Wilkens et al., 2017). The energy requirement for adults on hemodialysis is 35 kcal/kg IBW (Wilkens et al., 2017). The energy requirement for adults on peritoneal dialysis is 30-35 kcal/kg IBW (Wilkens et al., 2017). Once Mrs. Joaquin begins hemodialysis, her energy needs will be: $35\ kcal/kg\ x\ IBW$ (Wilkens et al., 2017) = $35\ kcal\ x\ 45.5$ = 1592.5 kcal. I would round this to 1600 kcal because it is a simpler number for Mrs. Joaquin to aim for.

**For stages 1 and 2 CKD predialysis, stages 3 and 4 CKD predialysis, patients state the protein requirements and rationale in chart format. Calculate Mrs. Joaquin's protein needs on dialysis. (4)**

| Stages CKD | Protein Requirement | Rationale |
|---|---|---|
| **1 and 2 CKD predialysis** | 0.8 g/kg with 60% HBV (Wilkens et al., 2017) | Studies have shown that dietary protein increases glomerular pressure and leads to quicker loss of renal function, so protein restriction may slow this down. The NIDDKD recommends that those with a GFR greater than 55 ml/min have 0.8 g/kg/day (Wilkens et al., 2017). |

| | | |
|---|---|---|
| **3 and 4 CKD predialysis** | 0.6 g/kg with 60% HBV (Wilkens et al., 2017) | As mentioned above, studies have shown that decreasing protein intake may decrease the rate of progression of CKD. The NIDDKD recommends that those with a GFR of 25-55 ml/min have 0.6 g/kg/day (Wilkens et al., 2017). |
| **Hemodialysis** | 1.2 g/kg IBW (Wilkens et al., 2017) | Protein recommendations for patients on dialysis are higher than for those not on dialysis. Hemodialysis patients require increased protein because of losses through the artificial kidney membrane and blood loss (Karupaiah, 2018). |
| **Peritoneal dialysis** | 1.2 – 1.5 g/kg BW, at least 50% HBV (Wilkens et al., 2017) | Protein intake needs to be increased because dialysis is a drain on the body. Patients with PD can have protein losses of 20-30g/day (Wilkens et al., 2017). |

Once she begins dialysis, Mrs. Joaquin will have a protein requirement of 1.2 g/kg IBW (Wilkens et al., 2017). Her needs will be: $1.2\frac{g}{kg}\ x\ IBW = 1.2\frac{g}{kg}\ x\ 45.5 = 54.6\ g.$ I would round her needs to 55 g of protein/day to make it a round number, which is simpler to keep track of.

**7. Mrs. Joaquin has a $PO_4$ restriction. Why? What foods have the highest levels of phosphorus? (4)**

Mrs. Joaquin has a $PO_4$ restriction. Normally, excess phosphate (~99%) is excreted in the urine. When GFR decreases, phosphorus is retained in the plasma. Patients will gain about half of the phosphate they consume since phosphate is not easily removed by dialysis because of its large molecular weight (Wilkens et al., 2017). An overload of phosphate and hyperphosphatemia are risk factors for cardiovascular mortality, vascular calcification, left ventricular hypertrophym and progression of CKD (Gonzalez-Parra et al., 2013). High protein-foods have the highest levels of phosphorus. These foods include milk products, dried beans, nuts and meats. Phosphorus in animal foods is more readily absorbed than phosphorus in plant foods (National Kidney Institute, 2019). Highly processed foods contain a lot of phosphate additives that are about 100% absorbed, compared to naturally occurring phosphorus, which is about 60% absorbed. This makes it more challenging to follow a low phosphorus diet (Wilkens et al., 2017). Common processed foods with high levels of phosphorus include canned and bottled drinks, fast foods, enhanced meats and chocolate (National Kidney Institute, 2019).

8. **Mrs. Joaquin is on a fluid restriction. What foods are considered to be fluids? What fluid restriction is generally recommended for someone on hemodialysis? Is there a standard guideline for maximum fluid gain between dialysis visits? If a patient must follow a fluid restriction, what can be done to help reduce his or her thirst? (4)**

   Foods that are considered to be fluids are anything that is liquid at room temperature (ex: coffee, soup, ice cream) (Wilkens et al., 2017). The generally recommended fluid restriction for someone on hemodialysis is 750 ml/day, plus the amount equal to urine output (Wilkens et al., 2017). The standard guideline for maximum fluid gain between dialysis visits is 4-5 pounds or 2-3 kg. The goal is to have a fluid gain of less than 4% body weight (Wilkens et al., 2017). If a patient must follow a fluid restriction, the best way to reduce their thirst is to have them follow a low-sodium diet, because eating salt makes us thirsty. Other ways to deal with thirst without drinking fluids include sucking on ice chips, eating sour candies, having cold fruit, or even using artificial saliva (Wilkens et al., 2017).

9. **Evaluate Mrs. Joaquin's chemistry report. For each lab listed, state if it is abnormal (high or low) and the reason it is high or low based on her having kidney failure. (12)**

| Lab | High or low | Reason |
|---|---|---|
| **Sodium** | Low (130) | Mrs. Joaquin has hyponatremia because she has too much fluid in her body (related to edema). With chronic kidney disease, the kidneys cannot get rid of extra fluid in the body. Having excess fluid dilutes the sodium in the body, making the sodium level low (National Kidney Foundation, 2017). |
| **Potassium** | High (5.8) | Potassium is high because kidney dysfunction effects potassium homeostasis. 40-50% of people with CKD have hyperkalemia. Hyperkalemia can be caused by Mrs. Joaquin's prescription for Capoten/captopril (ACE inhibitors) since blood pressure medications are associated with a 2-3x higher risk. Mrs. Joaquin also has diabetes, and patients with both CKD and diabetes have a greater risk of developing hyperkalemia (National Kidney Foundation, 2019). |
| **$PO_4$** | High (6.4) | Abnormal level is associated with decreased renal function (Noland & Litchford, 2017). With CKD, the kidneys cannot remove phosphorus well which causes high levels of phosphorus in the blood (National Kidney Foundation, 2019). |

| | | |
|---|---|---|
| **Total $CO_2$** | High (32) | Kidneys help maintain normal total $CO_2$ levels. Abnormal results are due to kidney disease. Changes in total $CO_2$ levels are due to Mrs. Joaquin's fluid retention (MedlinePlus, 2019) |
| **Albumin** | Low (3.3) | Low albumin is an indicator of kidney disease (MedlinePlus, 2019). It can be caused by not getting enough protein or calories in the diet (National Kidney Foundation, 2018). It can also be due to metabolic acidosis (DaVita, n.d.) |
| **Protein** | Low (5.9) | There is low protein in Mrs. Joaquin's blood because protein is being excreted in her urine – she has high urine protein levels (National Kidney Foundation, 2017). |
| **BUN** | High (69) | Renal failure (Sanna-Gouin, 2018); BUN is increased due to poor filtration of urea (Wilkens et al., 2017). When kidney function slows down, BUN levels rise (National Kidney Foundation, 2018) Once Mrs. Joaquin begins dialysis, the excess urea nitrogen will be removed from the blood (Wilkens et al., 2017). |
| **Creatinine** | High (12) | Creatinine, a waste product in the blood, is high because it is usually removed from the blood by the kidneys. When kidney function decreases, creatinine levels increase (National Kidney Foundation, 2018). |
| **Calcium** | Low (8.2) | Normally, the kidneys turn vitamin D into calcitriol, which increases calcium absorption into the blood. With CKD, patients are lacking this, and they are normally on a low phosphorus diet, which means they are not eating enough calcium either (DaVita, n.d.). Both of these factors contribute to low blood calcium. |
| **RBC, Hgb, Hct** | Low (3.1, 10.5, 33) | Low levels of RBC, Hgb and Hct are symptoms of anemia (National Kidney Foundation, 2018). We know that Mrs. Joaquin has normochromic, normocytic anemia, which is causing these levels to be low. |

| | | |
|---|---|---|
| **Urine protein, glucose** | High (+2, +1) | Urine protein is high because they kidneys are not filtering the blood properly. The protein is being excreted instead of kept in the blood (National Kidney Foundation, 2018) – we see that she has low blood protein levels. She has high urine glucose because of her uncontrolled diabetes (MedlinePlus, 2019). |
| **GFR** | Low (4) | There is a low GFR because she is in renal failure (National Kidney Foundation, 2018). |

All lab values were taken from Nahikian-Nelms (2018).

**10. The following medications were prescribed for Mrs. Joaquin. Explain why each was prescribed (the indications/mechanism) and describe any nutritional concerns and dietary recommendations related to the medication. (10)**

| **Medication** | **Indications** | **Nutritional Concerns (Food/Nutrient – Drug Interaction)** |
|---|---|---|
| **Capoten/ captopril** | Prescribed to treat high blood pressure. Also treats kidney disease. Captopril is an ACE inhibitor, which means it causes blood to flow more smoothly and allows the heart to pump blood more efficiently (MedlinePlus, 2017). | Avoid salt substitutes containing potassium. If prescribed a low-sodium diet, follow carefully. This medication may cause a salty/metallic taste and a decreased ability to taste (MedlinePlus, 2017). |
| **Erythropoietin** | This medication is prescribed to treat anemia in patients with chronic kidney failure. This medication is an erythropoiesis-stimulating agent; it causes the bone marrow to increase red blood cell production (MedlinePlus, 2019). | It's important to try and control your blood pressure and increase iron levels so this medication can work well. Erythropoietin can cause nausea, vomiting, weight loss and mouth sores (MedlinePlus, 2019). |

| | | |
|---|---|---|
| **Sodium bicarbonate** | This medication is normally prescribed to patients with metabolic acidosis to make the blood and urine less acidic (MedlinePlus, 2017). A small group of studies has shown that taking sodium bicarbonate with CKD can help prevent CKD from getting worse (National Kidney Foundation, 2019). | Need to be careful when on a low-sodium diet, as sodium bicarbonate increases the amount of sodium in your body. Sodium bicarbonate can cause increased thirst, stomach cramps and gas (MedlinePlus, 2017). |
| **Renal caps** | This is a multivitamin given to people on dialysis, since it can affect your vitamin needs. You might have a poor appetite, limited food options on a kidney diet, medications may change vitamin absorption, and vitamins can be lost during dialysis treatment (DaVita, n.d.) | There are no nutritional concerns with Renal Caps. |
| **Renvela** | Prescribed to control high levels of phosphorus in people with CKD who are on dialysis. Renvela is a phosphate binder, which means that it binds phosphorus from foods you eat and prevents it from being absorbed in the blood stream (MedlinePlus, 2017) | Follow a low-phosphorus diet. This medication may cause diarrhea, nausea, vomiting, stomach pain, gas, heartburn or constipation (MedlinePlus, 2017). |
| **Hectorol** | This medication is prescribed to patients receiving dialysis. Hectorol is a vitamin D analog, meaning it helps the body utilize calcium found in foods/supplements by regulating the body's production of parathyroid hormone (MedlinePlus, 2016). | For this medication to work, you need to be eating the right amount of calcium. If eating calcium is too difficult, a supplement can be prescribed. A low-phosphate diet may also be needed. Hectorol may cause heartburn, fluid retention, and weight gain (MedlinePlus, 2016). |

| | | |
|---|---|---|
| **Glucophage** | This medication is used to treat type 2 diabetes. Glucophage is a biguanides; it helps control the amount of glucose in your blood, decreases the amount of glucose you absorb from food and the amount of glucose made by your liver. It also increases your body's response to insulin (MedlinePlus, 2019). | A major concern is that Glucophage will cause lactic acidosis, which is dangerous in those with kidney disease. Make sure to follow diet and exercise recommendations made by a health care professional. This medication can cause diarrhea, bloating, stomach pain, gas, indigestion, constipation, metallic taste in mouth, heart burn and muscle pain (MedlinePlus, 2019). |

## Diagnosis

**11. Choose two high-priority nutrition problems and complete a PES statement for each. (4)**

a. Excessive sodium intake NI-5.10.2 related to intake of foods high in sodium as evidenced by diet recall, hypertension, and 3+ pitting edema in the extremities, face and eyes

b. Decreased protein needs NI-5.3 related to renal dysfunction as evidenced by increased phosphorus, BUN, creatinine and potassium, decreased GFR and 3+ pitting edema

## Intervention

**12. Why is it recommended for patients to have at least 50% of their protein from sources that have high biological value? (2)**

It is recommended that patients have at least 50% of their protein from sources that have high biological value because it allows for optimal protein use - the body is able to easily digest it and use the amino acids (Wilkens et al., 2017).

**13. Explain the reasons for the following components of Mrs. Joaquin's medical nutrition therapy: (12)**

| **Nutrition Therapy** | **Rationale** |
|---|---|
| 35 kcal/kg | Mrs. Joaquin is on a 35 kcal/kg diet because she is starting hemodialysis, and patients on hemodialysis need 35 kcal/kg IBW to meet their energy needs (Wilkens et al., 2017). |
| 1.2 g protein/kg | Mrs. Joaquin will need 1.2 g protein/kg once she starts hemodialysis. Hemodialysis patients require increased protein because of losses through the artificial kidney membrane and blood loss (Karupaiah, 2018). |
| 2 g K+ | Patients on dialysis have a restricted potassium diet to 2 g K+/day (NCM, n.d.), compared to the average American, who consumes 3-4g/day (Wilkens et al., 2017). When the kidneys aren't working properly, they don't remove enough potassium from the body which can lead to a dangerous buildup of potassium in the blood (National Kidney Foundation, 2017). |
| 1 g phosphorus | Mrs. Joaquin's phosphorus is limited to 1 g/day (AND Evidence Analysis Library, n.d.) because renal patients do not excrete enough phosphorus, which leads to a harmful buildup in the blood (Wilkens et al., 2017). |
| 2 g Na | Dialysis patients need a restricted sodium diet as excess sodium intake can lead to thirst, fluid gain, and hypertension. Patients on HD have both a sodium and fluid restriction to allow for a weight gain of 4-5 pounds between dialysis (Wilkens et al., 2017). |
| 1000 mL fluid + urine output | Fluid is limited to prevent large interdialytic fluid gains (Wilkens et al., 2017). Normally, the kidneys balance fluid in the body but cannot remove enough when on dialysis. Limiting fluid (and salt) helps your body maintain the right amount of fluid, which can prevent swelling, discomfort, high blood pressure, shortness of breath and heart problems (National Kidney Foundation, 2018). |

**14. What resources (i.e. renal diet education guides) and counseling techniques (i.e. motivational interviewing, others) would you use to help Mrs. Joaquin with her diet? (4)**

I would use nutrition counseling based on problem solving strategy (eNCPT C-2.4) to work with Mrs. Joaquin and identify the barriers preventing her from following the diet she was taught two years ago. I would also find out why she stopped taking her prescribed hypoglycemic agent. I would then work with her to come up with a solution for her to be able to follow the newly prescribed renal diet. We would create a meal plan together based on foods that she likes, would be willing to eat, and would be willing to prepare. This is essential since Mrs. Joaquin purchases and prepares her own food. I would also provide her with renal diet education guides, (eNCPT E-1.1) which would include handouts on sodium, potassium, phosphorus, fluid, and protein levels in different foods. If I felt she would be receptive towards it, I would also educate Mrs. Joaquin on the exchange lists so that she can switch up her diet daily. I would also encourage Mrs. Joaquin to be more active throughout the day; she works as a secretary, so she is mostly sedentary. It's important for people with CKD to get in some physical activity as studies have shown that physical activity may decrease the catabolic effects of protein restriction and improve quality of life (AND Evidence Analysis Library, n.d.). Lastly, I would transfer her nutrition care to the RD at the dialysis center (eNCPT RC-2.3). Having this constant follow-up would hopefully be motivation for her to stick to her diet and improve her health.

**15. Based on Mrs. Joaquin's calculated energy, protein, fat and carbohydrate needs, using Appendix 27 (Exchange Lists) and Appendix 29 (Renal Diet for Dialysis) create a 1-day diet plan that meets her needs and complies with her diet orders (see question 13). Write a sample meal plan for her based on her typical intake below. View Exchange Lists for Meal Planning guidelines in Renal Folder in Blackboard. Use the Meal Plan form to create the 1-day diet plan with the sample meal plan, all on one form. Enter sample meal plan into diet analysis software to check totals against MNT prescription for kcal, pro, fat, CHO, K+, Phos, Na. (10)**

| Mrs. Joaquin's typical diet intake PTA |
|---|
| Breakfast: Cold cereal (3/4 cup unsweetened) |
| Bread (2 slices) or fried potatoes (1 med |
| 1 fried egg (occasionally) |
| Lunch: Bologna sandwich (2 slices white bread, 2 slices bologna, mustard) |
| Potato chips (1 oz) |
| 1 can Coke |
| Dinner: Chopped meat (3 oz beef) |
| Fried potatoes (1 ½ medium) |
| HS Snack: Crackers (6 saltines) and peanut butter (2 tbsp) |

Mrs. Joaquin's typical diet intake puts her at about 2100 kcal, 250 g CHO, 94 g fat, 69 g protein, 2600 g K+, 900 g phos, and 3100 g Na (cronometer.com, 2019).

**Mrs. Joaquin's calculated needs are as follows:**

- Energy: 1600 kcal/day based on $35\ kcal/kg\ x\ IBW$ for patients on hemodialysis (Wilkens et al., 2017)
- Protein: 15% of total kcal based on 1.2 g/kg IBW (Wilkens et al., 2017). 1.2g/kg IBW calculated comes out to 55g/day = 13.75% of total kcal, but I rounded it to 60g/15% to make it simpler for Mrs. Joaquin
- Fat: 35% of total kcal based on the TLC Diet (NHLBI, 2005), which is ~62g/day

- Carbohydrates: 50% of total kcal (DaVita, n.d.), which is ~200g/day

Mrs. Joaquin's macronutrient breakdown in her usual diet recall is pretty similar to the calculated one- 47% carbohydrates, 13% protein, and 40% fat. She is having too much sodium and potassium. The major discrepancy is that she is eating too many calories, so even though her macronutrient breakdown is similar she is having too much protein, carbs, and fat. The foods she includes in her diet need to be altered to include foods lower in potassium and sodium.

**SAMPLE MEAL PLAN:**

| **EXCHANGE LISTS FOR MEAL PLANNING** | | | | | | |
|---|---|---|---|---|---|---|
| | | | **Carbohydrate**<br>200 g<br>800 kcal<br>50% | **Protein**<br>60 g<br>240 kcal<br>15% | **Fat**<br>62 g<br>560 kcal<br>35% | **Total kcal** =<br>1600 |
| | **Sample Meal Plan** | | | | | |
| **Group** | **Exchanges** | **Food** | **Carbohydrate** | **Protein** | **Fat** | **Kcal** |
| ***Morning Meal*** | | | | | | |
| CHO Group | 1 | ¾ cup cold cereal | 15 | 3 | 1 | 80 |
| Starch | | | | | | |
| Fruit | 1 | ¾ cup blueberries | 15 | 0 | 0 | 60 |
| Vegetable | | | | | | |
| Milk | .5 | ½ cup fat-free milk | 6 | 4 | 0 | 50 |
| Meat group | 2 | Hard-boiled egg + egg white | 0 | 11 | 7 | 100 |
| Fat group | | | | | | |
| ***Morning Snack*** | | | | | | |
| CHO Group | | | | | | |
| Starch | | | | | | |

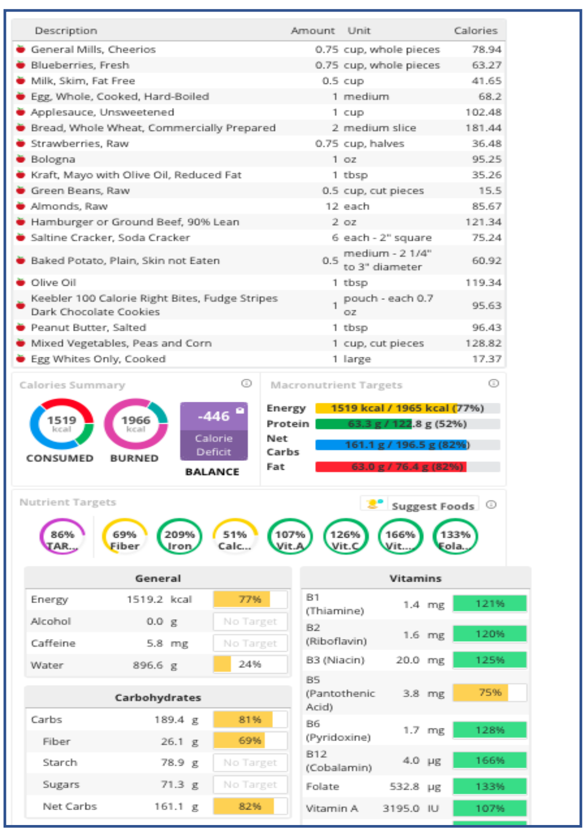
| | | | | | | |
|---|---|---|---|---|---|---|
| Fruit | 2 | 1 cup unsweetened applesauce | 30 | 0 | 0 | 120 |
| Vegetable | | | | | | |
| Milk | | | | | | |
| Meat group | | | | | | |
| Fat group | | | | | | |
| ***Noon Meal*** | | | | | | |
| CHO Group | 1 | 100 cal pack of cookies | 15 | 3 | 4 | 100 |
| Starch | 2 | 2 slices bread | 30 | 6 | 2 | 160 |
| Fruit | 1 | 1 ¼ cup whole strawberries | 15 | 0 | 0 | 60 |
| Vegetable | | | | | | |
| Milk | | | | | | |
| Meat group | 1 | 1 oz bologna | 0 | 7 | 8 | 100 |
| Fat group | 1 | 1 tbsp reduced fat mayo | 0 | 0 | 5 | 45 |
| ***Afternoon Snack*** | | | | | | |
| CHO Group | | | | | | |
| Starch | | | | | | |
| Fruit | | | | | | |
| Vegetable | 1 | 1 cup raw green beans | 5 | 2 | 0 | 25 |
| Milk | | | | | | |
| Meat group | | | | | | |
| Fat group | 2 | 12 almonds | 0 | 0 | 10 | 90 |
| ***Evening Meal*** | | | | | | |
| CHO Group | | | | | | |
| Starch | 2 | ½ baked potato without skin | 30 | 6 | 2 | 120 |
| Fruit | | | | | | |
| Vegetable | 1 | 1 cup mixed veg with corn and peas | 15 | 3 | 1 | 80 |
| Milk | | | | | | |
| Meat group | 2 | 2 oz chopped meat, lean | 0 | 14 | 4 | 90 |

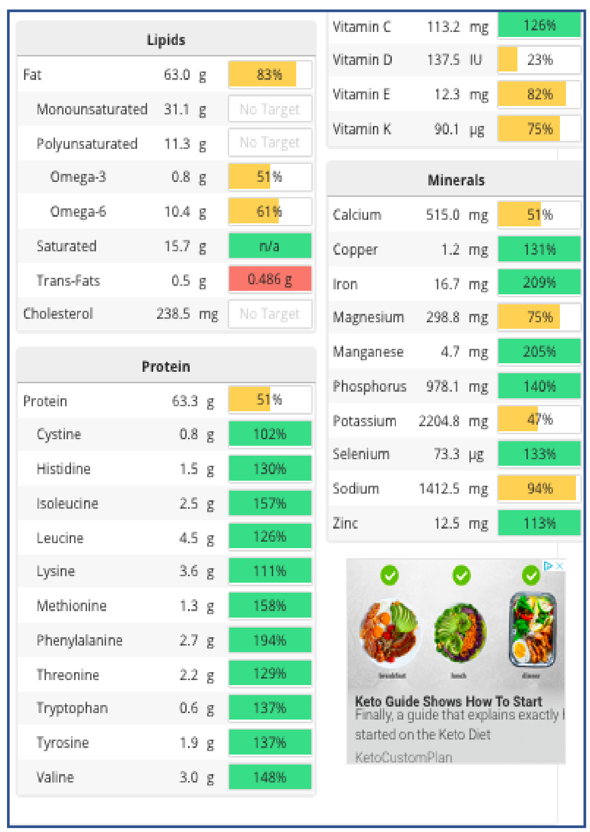
| | | | | | | |
|---|---|---|---|---|---|---|
| Fat group | 2 | 2 tsp olive oil | 0 | 0 | 10 | 90 |
| ***Bedtime Snack*** | | | | | | |
| CHO Group | | | | | | |
| Starch | 1 | 6 saltines | 15 | 3 | 1 | 80 |
| Fruit | | | | | | |
| Vegetable | | | | | | |
| Milk | | | | | | |
| Meat group | | | | | | |
| Fat group | 2 | 1 tbsp peanut butter | 0 | 0 | 10 | 90 |
| **Computer Analysis: (totals will not be exact to prescription but as close as possible)**<br>**Totals:**<br>**CHO g** 191 **PRO g** 62 **FAT** 65 **kcal** 1540<br>**K+ g** 2.2 **Phos g** 0.98 **Na g** 1.5 **Fluid** 900 mL | | | | | | |

Exchanges were taken from the “Choose Your Foods: Food Lists for Weight Management” booklet (2014).

Values of K+, Phos, Na and Fluid were taken from cronometer.com (2019).

These screenshots are the summary of the electronic nutritional analysis showing totals for MNT (cronometer.com, 2019).



The computer analysis, cronometer.com (2019) was very similar to the exchange list. It showed her eating 20 less calories than calculated based on the exchange list, and ±3 g for carbohydrates, protein and fat. Overall, I would say that it was very accurate.

## Monitoring & Evaluation and Documentation

**16. Write an initial ADIME note for your consultation with Mrs. Joaquin. Use the ADIME form provided with the renal case questions. (10)**

| | |
|---|---|
| **A - Assessment** | |
| **S - Subjective** | |
| Chief Complaint: **anorexia, N/V; 4-kg weight gain in the past 2 weeks; edema in extremities, face and eyes; inability to urinate** | |
| UBW: **161 lbs**<br><br>Weight change: **gain** / loss<br><br>Appetite: **anorexia**<br><br>Chewing / swallowing problem / sore mouth **none**<br><br>**Nausea** / **vomiting** / diarrhea / constipation<br><br>Food intolerance / allergies: **none**<br><br>Diet prior to admit: **diet recall was obtained** | Nutritional supplement: **none**<br><br>Vitamins / herbs: **none**<br><br>Food preparation: **self**<br><br>Factors affecting food intake: **anorexia, N/V**<br><br>Social / cultural / religious / financial<br>**Native American, married with 1 child, works 9-5, Catholic**<br><br>Other:**1-2 12oz beers daily, sedentary job** |
| **O - Objective** | |
| Current Diet Order:<br>**35 kcal/kg, 2 g K, 1 g Phos, 2 g Na, 1000 mL fluid + urine output per day**<br>**(prior was low simple sugar, 0.8 g protein/kg, 2-3g Na)** | |
| Medical Diagnosis:<br>**CKD (renal failure)**<br>**T2DM** | Pertinent Medical History:<br>**Poorly compliant with T2DM treatment**<br>**Infant weighed 10 lbs at birth**<br>**Stopped taking prescribed hypoglycemic agent**<br>**Never filled prescription for anti-hypertensive medication**<br>**Progressive decompensation of kidney function** |
| Nutrition Focused Physical Assessment – General (Appendix 21, p 973 Krause text)<br>**General survey: obese**<br>**Skin: dry and yellowish brown**<br>**Eyes: normal**<br>**Nose: noncontributory**<br>**Neck: supple**<br>**Head: normocephalic, equal carotid pulses**<br>**Chest/lungs: patient breathes with poor effort**<br>**Heart: regular rate/rhythm; I/VI systolic ejection murmur**<br>**Abdomen: rounded, obese**<br>**Musculoskeletal: weakness**<br>**Neurologic: oriented, mild asterixis** | |

| Age: | Gender: | Ht: | Wt: | DBW: | BMI: |
|---|---|---|---|---|---|
| **24** | Male ☐ **Female •** | **5'0"** | **170 lbs** **Admit •** Current ☐ | **100 lbs (100 + 5(0)) ± 10%** | **33.2** ($\frac{170}{(60)^2}\ x\ 703$) |

| | | | |
|---|---|---|---|
| % UBW: **106% (170/161 x 100)** | % wt Δ: **6% (161-170/161 x 100)** | % DBW**: 170% (170/100 x 100)** | Other: **obese class I (Calculations based on weight at admission)** |

Nutritionally Relevant Laboratory Data:
**Sodium – 130 ↓**
**Potassium – 5.8 ↑**
**$PO_4$ – 6.4 ↑**
**Total $CO_2$ – 32 ↑**
**Albumin – 3.3 ↓**
**Protein – 5.9 ↑**
**BUN – 69 ↑**
**Creatinine – 12 ↑**
**Calcium – 8.2 ↓**
**RBC – 3.1 ↓**
**Hgb – 10.5 ↓**
**Hct – 33 ↓**
**Urine protein – +2 ↑**
**Urine glucose – +1 ↑**
**GFR – 4 ↓**

Drug Nutrient Interaction:
**Capoten/captopril (ACE inhibitor) – avoid salt substitutes with K, follow low sodium diet; may cause salty/metallic taste in mouth and decreased ability to taste**
**Erythropoietin (ESA) – may cause N/V, weight loss**
**Sodium bicarbonate (antacid) – follow low sodium diet; may cause increased thirst, cramps, gas**
**Renal caps (multivitamin)**
**Renvela (phosphate binder) – follow low phos diet; may cause N/V/D/C, stomach pain, gas, heartburn**
**Hectorol (vitamin D analog) – control calcium intake, low phos diet; may cause heartburn, fluid retention, weight gain**
**Glucophage (biguanides) – may cause C/D, stomach pain, gas, indigestion, metallic taste, heartburn**

| Estimated Energy Need: | Estimated Protein Need: | Estimated Fluid Need: |
|---|---|---|
| **1600 kcal / day**<br>Based on: **35 kcal/kg IBW** | **55 g/day**<br>Based on: **1.2 g/kg IBW** | **1000 ml + urine output / day**<br>Based on: **HD fluid restriction** |

**A - Assessment (A)**

Nutrition Focused Physical Assessment – to support dx of malnutrition (see Appendix 21, p 974-975 Krause text)

1) % of estimated energy intake: < 75% < 50% **other – know intake is poor due to anorexia but don't know for how long or how much of usual dietary she is eating each day, diet recall is ~2100 kcal/day**
2) Weight loss interpretation**:** **0 %** Time **undetermined due to edema**

Physical findings: for each below, choose Mild, Moderate or Severe (based on text description) or None

3) Body fat: **none**
4) Muscle mass: **none**
5) Fluid accumulation: **severe (3+ edema)**
6) Reduced grip strength: **none**

Malnutrition Assessment: Minimum of 2 of the 6 characteristics above is indicative of
______Severe OR _______Non-severe Malnutrition of _____Social/Environmental OR _____Chronic Illness OR __**1**___Acute Illness or Injury

**There is no malnutrition noted because she only has one criteria (we do not know that she has reduced grip strength even though she has muscle weakness, and we do not know exactly how poor her intake is over what period of time, and we don't know if she has lost weight because of the edema. There is also nothing noted about body fat or muscle mass)**

**Nutrition Diagnosis (D)**

State no more than 2 priority Nutrition Diagnosis statements in PES Format. Use Nutrition Diagnosis Terminology sheet
ND Term (Problem) related to (Etiology) as evidenced by (Signs and Symptoms):

1. **Excessive sodium intake NI-5.10.2 related to intake of foods high in sodium as evidenced by diet recall, hypertension, and 3+ pitting edema in the extremities, face and eyes**

2. **Decreased protein needs NI-5.3 related to renal dysfunction as evidenced by increased phosphorus, BUN, creatinine and potassium, decreased GFR and 3+ pitting edema**

**Nutrition Intervention (I)**

**P - Plan**

List Nutrition Interventions. Use Nutrition Intervention Terminology sheet. (The intervention(s) must address the problems (diagnoses)**.**

**ND-1.2.3.3 Decreased protein diet**
**ND-1.2.11.7.2 Decreased sodium diet**
**E-1.1 Content related nutrition education (renal diet education, drug-nutrient interactions for medications listed above)**
**C-2.4 Nutrition counseling based on problem solving strategy (address why previously prescribed T2DM diet was not followed)**
**RC-2.3 Discharge and transfer of care from nutrition professional to another nutrition professional (consistent follow-ups with dialysis center RD)**

Goal(s) (SMART):

1. **Patient will substitute high sodium foods with unsalted alternatives by follow-up with dialysis center RD (within 1 week)**
2. **Patient will decrease protein intake by reducing amount of meat eaten at dinner by 1 oz over the next 2 weeks**

**Plan for Monitoring and Evaluation (M E)**

List indicators for monitoring and evaluation. Use Nutrition Assessment and Monitoring & Evaluation sheets. (Upon follow-up, the plan for monitoring would indicate if interventions are addressing the problems).

**FH-1.5.3.2 Measured protein intake**
**FH-1.6.2.2 Measured mineral intake, sodium (13190)**
**FH-2.1.1 Diet order (renal)**
**FH-5.1.1 Self-reported adherence score**
**BD-1.2.1 Electrolyte and renal profile**
**BD-1.12 Urine profile**

Signature: Penina Langer Date: 10/21/2019

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