Nutritional Assessment of an Adult Receiving Dialysis

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Introduction

Approximately one in nine (20 million) Americans have Chronic Kidney Disease (CKD) and many more are at risk mainly due to the increase in obesity and diabetes. There are approximately 450,000 Americans with Stage 5 CKD (formally known as End Stage Renal Disease or ESRD) requiring dialysis or transplant (1). This represents a significant healthcare issue due to the impact dialysis treatment has on the individual patient, clinical healthcare provision (adequate and comprehensive care), and the financial implication for the healthcare delivery system. Medicare spends about $20 billion annually for the care of patients with CKD and an estimated $16.3 billion annually for providing dialysis (2). Careful management of CKD improves the quality of life for the individual and potentially saves resources by preventing inpatient hospitalizations and slowing the progression of co-morbidities. Nutrition plays a key role in the management of Stage 5 CKD beginning with a thorough nutritional assessment, education, and plan. This paper will discuss the importance of a nutrition assessment and what should be included in the assessment, specifically the anthropometric, biochemical, clinical and dietary components of those patients either receiving hemodialysis or peritoneal dialysis.

Practical Steps to the Nutrition Assessment

When one is evaluating the nutritional status of a patient receiving dialysis, certain steps should be taken to assure a complete assessment (3,4). It is essential to review the medical history, anthropometrics, diet patterns, and lab values. A review of the medical history reveals any concurrent diseases, potential nutrient/drug interactions, recent hospitalization or weight changes. Anthropometric or physical assessment includes a measured height, frame size, current weight, subjective global assessment, arm anthropometrics (triceps skin fold and mid-arm muscle circumference) and the physical appearance of the patient. A diet history should be taken that includes usual intake, any recent changes in appetite or intake, food allergies or intolerances, pica, avoidance of any foods due to religious or cultural beliefs, any previous diet instruction, and use of herbal or nutritional supplements. When assessing the current intake, total calories (kcal), carbohydrate, protein, fat, sodium, potassium, calcium, phosphorus, fluid, vitamins and mineral intake should be evaluated. For the peritoneal patient, calories and carbohydrate from dialysate also need to be factored in. Understanding the living situation, family support, and activity level are key factors as well. Reviewing the laboratory results will highlight specific areas of concern including nutritional status, uremia, bone health, electrolytes, iron status, vitamin and mineral status, hydration and glycemic control if the patient has diabetes. Following the collection of information, an individualized diet prescription and pattern needs to be developed being as liberal as possible to ensure adequate intake of kcals, protein (60% high biological value), sodium, potassium, phosphorus and fluids. Diet instruction also needs to be given including written materials based on the patient's education level and reading level to promote understanding and comprehension. Finally, follow up should be completed within one to three months to assess the understanding and adherence to the diet as well as a nutritional assessment on a regular basis (3,4).

Anthropometric Assessment

The anthropometric assessment is very important to the dialysis patient to assess weight, wounds, dentition, amputation and nutritional status. The National Kidney Foundation (NKF) Kidney Disease Outcomes Quality Initiative (K/DOQI) recommends obtaining the following information on a regular basis: dry weight, percent of usual body weight (% UBW), percent of standard body weight (% SBW), height, skeletal frame size, body mass index (BMI), skinfold thickness, mid-arm muscle area circumference (MAMC) or diameter and the presence of any amputations. Body weight can be somewhat difficult to determine due to the accumulation of fluid commonly seen in dialysis patients (5). Standard body weight (SBW) is also used to determine malnutrition among dialysis patients. SBW is the median body weight of normal Americans of the same height, gender, skeletal frame size and age range determined from the National Health and Nutrition Examination Survey II (NHANES II) data (3).

Dry weight, the weight after treatment of those receiving hemodialysis or the weight when the peritoneum is empty in those receiving peritoneal dialysis, should be recorded and monitored frequently. Determining dry weight is difficult due to a variety of factors such as hypoalbuminemia, congestive heart failure, reduced plasma osmolality, hypoxemia, ischemia, septicemia, and fever or anti-hypertensive medications. In these situations, the patient will appear fluid overloaded but the ultrafiltration goal will be too aggressive, possibly causing the patient to experience unpleasant symptoms of hypotension, cramps or dizziness. Dry weight cannot be assessed by one single parameter but by looking at a variety of parameters such as blood pressure, presence of edema, treatment history, and serum albumin along with other non-clinical factors (6).

A patient's % UBW will allow the dietitian to determine if there has been any recent weight changes, if weight is stable, or any change in nutritional status. The % UBW is determined by

dividing actual body weight by the patient's usual body weight and multiplying by 100 (5). A patient's % SBW is also used to assess nutritional status and is found by dividing actual body weight by SBW, then multiplying by 100. Determining the patient's height is essential for the nutritional assessment. If the patient is unable to stand, recumbent height, or knee height can also be used to determine the patient's stature (3,5). Knee height is obtained by having the patient lie in the supine position with the knee and ankle at a 90 degree angle. A fixed blade of the knee height caliper is placed under the heel while the moveable shaft is parallel to the fibula, just behind the head of the fibula. Pressure is applied to the tissue to measure the distance between the heel and the top of the knee (3,7). To obtain the patient's height, the measurement of the knee height is plugged into a basic equation based on the patient's sex: Male height (cm) = 88.48 – (0.24 – age) + (2.02 x knee height) and female height (cm) = 64.19 – (0.04 – age) + (1.83 x knee height). The knee height measurement should be taken twice and agree within 5 mm (3). Another equation adapted by Chumlea, Guo and Steinbaugh can also be used. The knee height equations are broken down by race (black or white), gender and age. It is important to use the left leg when using these equations (7).

Knee Height Equation

Age*	Equation**
Black Females:	
> 60	S= 58.72 + (1.96 KH)
19-60	S= 68.10 + (1.86 KH) – (0.06A)
6-18	S= 46.59 + (2.02 KH)
White Females:	
> 60	S= 75.00 + (1.91 KH) – (0.17A)
19-60	S= 70.25 + (1.87 KH) – (0.06A)
6-18	S= 43.21 + (2.14 KH)
Black Males:	
> 60	S= 95.79 + (1.37 KH)
19-60	S= 73.42 + (1.79 KH)
6-18	S= 39.60 + (2.18 KH)
White Males:	
>60	S= 59.01 + (2.08 KH)
19-60	S= 71.85 + (1.88 KH)
6-18	S= 40.54 + (2.22 KH)

*Age in years rounded to the nearest year
**S= stature, KH= knee height, A= age in years

Another anthropometric measurement used in the nutritional assessment of the dialysis patient is frame size. Frame size is used with the height and weight tables and can be determined either by wrist circumference or elbow breadth. However, some researchers do not believe that frame measurements improve the ability to differentiate between body fat from body weight and do not recommend their use (7). Wrist circumference can be found by measuring the circumference of the right wrist just above the wrist bone. If the right wrist is swollen the left wrist can be used but it is important to note it. Once the measurement is taken in centimeters, it is divided by the patient's height (in centimeters). That result is then compared with the conversion tables (3). Wrist circumference can also be found using a quick method. The patient is asked to "…encircle their nondominant wrist with the thumb and index finger of their dominant hand at the level of the radius and ulnar styloid process" (2,4). The patient is considered small frame if the thumb and index finger overlap, medium frame is the thumb and index finger touch and large frame if the thumb and index finger do not touch (3,5). Elbow breadth is measured by having the patient stand, facing the assessor with their feet together. The right arm should be extended in front of the body at a 90 degree angle with the inside of the arm facing the patient's body. Either the thumb and index finger or calipers are placed against the two prominent bones on either side of the elbow. The distance is then measured to the nearest 0.1 cm. It is best to take this measurement at least two different times. Frame size is then determined using a chart from the Meropolitian Life Insurance Company with the patient's height and elbow breadth (7).

Determining Frame Size Using Elbow Breadth

Males:

Height*		Small Frame		Medium Frame		Large Frame	
in.	cm	in.	mm	in.	mm	in.	mm
61-62	155-158	< 2 ½	< 64	2 ½-2 ⅞	64-73	> 2 ⅞	> 73
63-66	159-168	< 2 ⅝	< 67	2 ⅝-2 ⅞	67-73	> 2 ⅞	>73
67-70	169-178	< 2 ¾	< 70	2 ¾-3	70-76	> 3	>76
71-74	179-188	2 ¾	< 70	2 ¾-3 ⅛	70-90	>3 ⅛	>79
> 75	>189	2 ⅞	< 73	2 ⅞-3 ¼	73-83	>3 ¼	>83

Females:

Height*		Small Frame		Medium Frame		Large Frame	
in.	cm	in.	mm	in.	mm	in.	mm
57-58	145-148	< 2 ¼	< 57	2 ¼-2 ½	57-64	> 2 ½	> 64
59-62	149-158	< 2 ¼	< 57	2 ¼-2 ½	57-64	> 2 ½	> 64
63-66	159-168	< 2 ⅜	< 60	2 ⅜-2 ⅝	60-67	> 2 ⅝	> 67
67-70	169-178	< 2 ⅜	< 60	2 ⅜-2 ⅝	60-67	> 2 ⅝	> 67
> 71	> 79	< 2 ½	< 64	2 ½-2 ¾	64-70	> 2 ¾	> 70

** height is measured without shoes.*

Body mass index (BMI) is an important calculation used to assess the dialysis patient. BMI is the weight in kilograms divided by the height in meters squared (8). Once the patient's dry weight has been established, the BMI can be calculated. BMI levels less than 19 and greater than 28 has been linked with higher morbidity and mortality (5).

Body composition is used in the nutritional assessment and is associated with patient survival. Mortality is found to be significantly higher in patients with muscle atrophy (8). Skinfold thickness is used to assess body fat and energy stores. When tracked over time, this measurement can detect early malnutrition. Skinfold thickness should be taken after dialysis at four sites: triceps, biceps, subscapula, and iliac crest (3,5). Muscle mass can be estimated by measuring the mid-arm circumference (MAC). This can be found by measuring the arm midway between the acromial and olecranon process, perpendicular to the long bone and where the triceps skinfold measurement (TSF) is taken (3,7). The mid-arm muscle circumference (MAMC) is calculated using the following formula involving the MAC and triceps skinfold: MAMC = MAC – (3.1416 x TSF/10) (8). Excess fluid can affect these measurements so it is recommended to take these measurements post treatment in hemodialysis (using non-access arm) and when the peritoneum is empty in those receiving peritoneal dialysis (5).

Another factor to consider when doing an anthropometric assessment is any amputation(s) the patient may have. Adjusting for the amputation is necessary for computing the patient's kcal and protein needs. According to the Guidelines for the Nutrition Care of Renal Patients, the following is used for amputation adjustments: (5)

Amputation adjustments

Body Segment:	Average Percentage (%) of Total Body Weight
Entire arm	5.0
Upper arm (to elbow)	2.7
Forearm	1.6
Hand	0.7
Entire leg	16.0
Thigh	10.1
Calf	4.4
Foot	1.5

Interdialytic weight gain (IDWG) is the weight gained between dialysis sessions. These gains should be kept to a minimum. Gains greater than 5% of estimated dry weight (EDW) are considered excessive, indicating the patient may be consuming too much fluid and can cause false laboratory results, hypertension, peripheral edema, ascites and pleural effusion (4). One study found that patients with IDWG greater than 3% of EDW had a higher incidence of myocardial infarction, coronary artery bypass graft (CABG) operations, coronary artery dilation and death (5). IDWGs less than 2% of EDW are considered low which can be reflective of inadequate intake of foods and fluids and can cause falsely elevated lab results due to dehydration (4).

Biochemical Assessment

There are several biochemical parameters that must be assessed when determining the nutritional status of a patient receiving dialysis. These lab results need to be monitored regularly with some more frequently than others. Some of the reference ranges are different for patients with CKD than that of people with healthy kidneys.

One laboratory parameter used by dietitians to assess the dialysis patient is serum creatinine. Serum creatinine is the nitrogenous waste product of muscle metabolism not associated with protein intake but reflective of muscle mass. In CKD, the higher the creatinine result, the greater degree of renal failure. This value usually reaches a stable state once dialysis is started (5). After the person has been receiving regular dialysis, the predialysis creatinine level is indicative of protein intake and skeletal muscle (9).

Serum albumin (Alb) is a very important laboratory value used to assess the dialysis patient. This important nutritional marker is an indicator of morbidity and mortality and emphasizes the need for nutrition management (4). It is a measure of both muscle and visceral protein and is considered to reflect both nutritional intake and inflammation (10). Alb is the most commonly used indicator of protein status, it is an independent predictor of total and cardiovascular mortality, is readily available in the clinic setting, and is recommended by K/DOQI (4,7,11). Mortality risk is strongly correlated with low Alb and, therefore, regular monitoring is recommended (9). Alb is a negative acute-phase reactant which is influenced by stress and inflammation including the dialysis treatment. High levels can indicate severe dehydration or a recent albumin infusion, while low levels can be due to fluid overload, liver or pancreatic disease, steatorrhea, nephrotic syndrome, protein-energy malnutrition, inflammatory gastrointestinal disease, infection, burns or surgery (3).

Another indicator of acute-phase response to inflammation is the C-reactive protein (CRP). Both synthesis and serum concentrations of this protein (in addition to others) are increased during inflammation thus designating them as acute-phase proteins (5). CRP levels are strongly associated with serum Alb levels in both hemodialysis and peritoneal dialysis patients and are a better indicator of cardiovascular mortality than albumin (10).

Normalized protein catabolic rate (nPCR) can be used to estimate protein intake and is determined from urea kinetics. During a steady state, protein intake is equal to or slightly greater than nPCR, although this result can be affected by lack of uniformity in post dialysis measures of BUN levels (9).

Renal osteodystrophy or mineral bone disease (MBD) is another challenging aspect for the multidisciplinary team, especially the dietitian. Abnormalities in bone and mineral metabolism are associated with increased mortality and morbidity (12). Calcification is the hardening of soft tissues. When found in the myocardium, cardiac valves and coronary arteries, it has been significantly linked to congestive heart failure, cardiac arrhythmias, ischemic heart disease and death. Calcification in the lungs can cause pulmonary hypertension, right ventricular hypertrophy, right side congestive heart failure, pulmonary fibrosis and impaired

pulmonary function. Vascular calcification can involve all arteries in the body. It can be so widespread, the arteries become stiff, causing difficulty during dialysis access surgeries along with the detection of both blood pressure and pulse (12). The laboratory values associated with renal osteodystrophy include parathyroid hormone (PTH), serum calcium, phosphorus and calcium phosphorus product. K/DOQI has recommended target levels to help negate problems associated with MBD. Most patients do not achieve the goal levels for all four target areas. The Dialysis Outcomes Practice Patterns Study (DOPPS) looked at laboratory data for approximately 2200 patients receiving hemodialysis in the United States and found 26.2% of patients were in range for PTH, 44.4% for phosphorus, 46.1% for calcium and 60.8% for calcium phosphorus product (12). These low numbers indicate the need for a coordinated and aggressive plan by all members of the treatment team. More recently, Kidney Disease: Improving Global Outcomes (KDIGO) has published evidence-based clinical practice guidelines for the "…prevention, diagnosis, evaluation, and treatment of metabolic bone disease in individuals with CKD" (13). KDIGO is an international initiative which has not been completely adopted by all practicing nephrologists in the United States.

PTH is secreted by the parathyroid gland and regulates calcium and phosphorus in the blood (bone physiology). This hormone is able to regulate calcium from the kidneys, GI tract and bones. Active vitamin D is needed to maintain calcium homeostasis by increasing calcium absorption from the gut. Vitamin D needs two hydroxyl groups added to become active. This activation occurs first in the liver and second in the kidney. In advanced CKD, the second addition of the hydroxyl groups does not occur which impairs absorption of calcium from the GI tract. When the parathyroid gland senses low calcium, PTH is triggered, releasing calcium from the bones and thus causing weak and brittle bones (5). K/DOQI's reference range for PTH is 150-300 pg/mL while KDIGO recommends between 2 and 9 times the normal limit (normal limit is 10-65 pg/mL) (3,13). K/DOQI recommends checking PTH levels every 3 months (5) while KDIGO recommends every 3 to 6 months (13).

An important mineral associated with renal osteodystrophy is calcium (Ca). Ca is the most abundant mineral in the body with 99% found in the bones and teeth and the remaining 1% located in the extracellular fluid, intracellular structures and cell membranes (5,7). It is needed for muscle contraction, nerve conduction, blood clotting, enzyme reactions, and as a hormone trigger. Serum Ca is bound to Alb and needs to be adjusted when Alb levels are low. The formula for adjusting Ca levels based on Alb is as follows:

Corrected Ca (mg/dL) = [(4- reported Alb) x (0.8)] + reported Ca

Alb = serum Alb level (g/dL), Ca = serum Ca level (mg/dL) (5).

Low Ca levels trigger PTH secretion which can lead to parathyroid gland hyperplasia and increase the rate of calcification. The Ca reference range for the dialysis patient is the same as those without kidney disease, 8.5-10.2 mg/dL (13).

Phosphorus control is an extremely challenging area for dietitians with approximately 44.4% of patients achieving laboratory values within the reference range in the United States. Phosphorus is mainly found bound to calcium which forms bone tissue and is also a component of fat, protein and cell membranes (5). It is also needed for energy production and storage. As renal function decreases, the body is unable to filter and excrete excess phosphorus in the urine. Accumulation of phosphorus in the blood stimulates the release of PTH which then releases calcium from the bones. Phosphorus binding medication (binders) is commonly prescribed, acting as a sponge to "soak up" dietary phosphorus, which is then excreted in the stool. These medications need to be taken with every meal and snack. Phosphorus clearance is poor in both hemodialysis and peritoneal dialysis. Approximately 800 mg of phosphorus is removed during a hemodialysis session and about 250-300 mg is removed during a peritoneal exchange. Because of the poor clearance, binders are extremely important. K/DOQI's reference range for serum phosphorus levels is 3.5-5.5 mg/dL and KDIGO recommends "towards normal" (3,13).

Potassium is the primary cation found within the cells of the body and must be assessed in the dialysis patient. Potassium is also located in extracellular tissues and involved with muscle activity, especially the heart. The kidneys are the main filter for this ion. When the kidneys are not functioning properly, potassium levels rise. Too much or too little potassium could weaken muscles and affect the heart (5). Normal potassium range for a dialysis patient is 3.5-5.0 mEq/L (7).

Another common condition among dialysis patients is anemia and there are several laboratory tests used to diagnosis this. Hemoglobin (Hgb) is one of the most important measures of anemia. Hgb is the oxygen carrying pigment of red blood cells. In someone with functioning kidneys, erythrocytes are produced in the bone marrow and released into circulation every 120 days. Erythropoietin, a hormone produced by the kidneys, triggers the production of red blood cells or erythrocytes (5). In CKD, erythropoietin is not produced therefore erythrocytes are not made. Due to the lack of erythrocytes, oxygen is not properly carried to all other cells in the body, thus resulting in anemia. Some symptoms of anemia are fatigue, shortness of breath, trouble sleeping and loss of appetite. With the development of synthetic recombinant human erythropoietin (EPO), anemia management among dialysis patients has greatly improved (5). Hgb results varies amongst dialysis patients for several reasons including comorbidities, intercurrent events and practice patterns. The amount of EPO needed to maintain Hgb within target ranges vary from patient to patient (14). The Hgb range for dialysis (10-12 g/dL) is different from the healthy public and does not vary between males and females (3).

Adequacy of dialysis is very important for the dialysis patient and correlates with morbidity and mortality. Urea kinetic modeling (UKM)

measures the adequacy of dialysis per a single session of dialysis. K/DOQI recommends UKM to be performed at least one time per month per patient. Urea reduction ratio (URR) is the simplest measure of urea clearance using pre-dialysis and post-dialysis blood urea nitrogen (BUN) results. The Centers for Medicare and Medicaid Services (CMS) recommends a URR > 65%. The formula for URR calculation is:

$$URR = \left[\frac{\text{Pre-BUN} - \text{Post-BUN}}{\text{Pre-Bun}} \right] \times 100$$

BUN is the measurement of nitrogenous waste products of protein. It can be either elevated or decreased for several reasons and can not be used exclusively to assess nutritional status or adequacy of dialysis (5). The reference range (60-80 mg/dL) is also increased for someone with CKD Stage 5 as long as they are anuric, well-dialyzed and eating adequate protein (3).

Kt/V is also used to determine the adequacy of dialysis. Kt/V is best described by K/DOQI as "the fractional clearance of urea as a function of its distribution volume" (5). K (clearance) is used to represent the dialyzer clearance measured in liters per minute (including any residual renal clearance unless the patient is anuric), t is the treatment time in minutes and V is the distribution of urea. The following formula is used to calculate single pool Kt/V:

$$Kt/V = -Ln[R - (0.008 \times t)] + [4 - (3.5 \times R)] \times (UF/wt)$$

Ln =the natural logarithm; R = ratio of postdialysis to predialysis BUN; t = time of dialysis in hours; UF =the amount of ultrafiltration in liters; wt = postdialysis weight in kilograms (5).

It is recommended to obtain a Kt/V monthly to ensure the patient is receiving the prescribed and most appropriate dose of dialysis for his or her condition, body size and residual renal function. Kt/V > 1.2 is recommended for the hemodialysis patient and if not achieved, adjustments in the dialysis prescription need to be made. Kt/V is also calculated in the peritoneal dialysis patient measuring urea clearance by dialysis and urine output and total creatinine clearance in liters per week which measures creatinine clearance removal related to the patient's body size. K/DOQI's Kt/V recommendation for peritoneal dialysis is based on modality and can range from 2.0 to 2.2 (5).

Medical History

The clinical assessment of the dialysis patient should include a review of the medical history (7). This will provide the dietitian with information regarding past and current nutritional status, recent changes and areas that should be addressed in the plan of care. The medical history will also provide information regarding comorbid conditions, medications, hospitalizations, current intake and any condition(s) that may affect intake, weight changes, psychosocial history, and information regarding the current physical exam (5,7). The medication list should provide information on prescription or over-the-counter medication as well as any vitamin, mineral or herbal supplements. Possible drug-nutrient interactions can then be determined. The psychosocial assessment is an important aspect when obtaining a patient's history. Information about education level, alcohol or substance abuse, support systems, and financial status can be found in this section (7). This information will provide guidance when developing a personalized nutrition plan of care and when choosing appropriate nutrition education materials.

Next, a physical exam should be conducted to look for signs and symptoms of malnutrition. Protein-energy wasting (PEW) is very common among dialysis patients and is associated with increased mortality (4). This is described as the decrease in body stores of protein and fat (8). One important tool used to assess the adult dialysis patient is the Subjective Global Assessment (SGA). The SGA has been recommended by K/DOQI since 2000 for assessing the nutritional status of a dialysis patient (14,15). The SGA is a useful, fast, easy and low-cost assessment tool effective in identifying malnutrition (14). It is based on a medical history and physical examination combined with the practitioner's evaluation to obtain a numerical score. The patient is then rated as normal or acceptable nutritional status, mild to moderately malnourished or severely malnourished (5,7,14,16,17). Medical history includes weight loss, dietary intake, functional capacity and gastrointestinal symptoms that have nutritional impact (5,16). The physical examination includes visually looking for loss of subcutaneous fat (below the eyes, biceps and triceps), muscle mass (temples, clavicle, shoulder, scapula, knee, quadriceps and calf), fluid status (view the sacrum in activity-restricted patients and ankles for mobile patients) and dental status (3,5,7,14,16).

There have been many modifications to the SGA used in practice in the dialysis setting. The most common variation is the Malnutrition-Inflammation Score (MIS) that is included within the SGA. These additional components rate BMI, serum albumin and serum iron binding capacity. These markers may indicate the risk of PEW due to inflammation. The MIS has been found to be comparable with serum C-reactive protein and serum interleukin-6 concentrations for anticipating hospitalizations and mortality (15).

Dietary Assessment

Poor appetite is commonly reported in the dialysis population and is associated with inadequate dietary intake, higher inflammatory markers, reduced quality of life, increased hospitalizations and a four-fold increase in the risk of death (18). A thorough dietary history should be taken from the patient or surrogate. This includes a review of usual food intake, meal patterns and factors that could affect intake (5,7). The dietitian should also consider the patient's ability to chew and swallow as well as changes in appetite and intake. Questions regarding food intolerance or allergies, preparation of meals, ability to obtain food, alterations in taste and any gastrointestinal issues should also be asked (7). K/DOQI recommends the use of dietary interviews and diaries

such as three or seven day food records, food frequency questionnaires or twenty four hour recalls, to obtain information regarding protein, energy and nutrient intake (4). Information obtained from these records should be used within the plan of care for that patient (5). Conducting a thorough dietary assessment at least every six months allows for early recognition and treatment of nutritional issues (11). This assessment also allows improved management of the intake of potassium, phosphorus, carbohydrates, sodium, calcium, vitamin or other trace elements and fluid intake by the dialysis patient.

There are several diet modifications that are necessary for the dialysis patient. Dietary protein needs are higher in people receiving peritoneal dialysis compared to those on hemodialysis due to increased protein losses across the peritoneal membrane. When peritonitis occurs, the protein needs increase by as much as ten-fold due to inflammation (5). Potassium and fluids are more restricted with the hemodialysis patient than with someone receiving peritoneal dialysis while there is no change in phosphorus restriction between the two modalities. Several studies have found that promoting self management affects the adherence to the diet modifications and fluid restrictions (17,19).

Conclusion

Due to complications and the significant financial impact CKD has on the Medicare system, the nutritional assessment is an extremely valuable tool used in the care of the dialysis patient. It allows the dietitian to identify patients at risk for malnutrition, provides the foundation for determining the appropriate nutrition intervention and monitoring the impact the intervention has made. It also allows the dietitian to develop an individualized plan of care for the patient and ultimately improves both the morbidity and mortality of the dialysis patient. Dietitians are extremely valuable members of the health care team and can greatly improve the lives of the patients they manage.

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