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Authors

Kalantar-Zadeh, Kamyar

Saville, Jessianna

Moore, Linda W

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Unleashing the Power of Renal Nutrition in Value-Based Models of Kidney Care Choices: Leveraging Dietitians' Expertise and Medical Nutrition Therapy to Delay Dialysis Initiation



VALUE-BASED MODELS OF kidney care are upstream expansions of the pre-existing end-stage renal disease (ESRD) payment models in that they encompass medical care of persons with far-advanced chronic kidney disease (CKD) not yet on dialysis. These patient-centered models are paradigm shifting because they provide rewards, including financial incentives for delaying dialysis initiation in patients with late-stage (Stages 4 and 5) CKD when the estimated glomerular filtration rate (eGFR) is below 30 mL/min/1.73 m², which is in sharp contradistinction to traditional ESRD models of earlier dialysis therapy transition. The value-based models are within the “Kidney Care Choices” (KCC) platform developed by the Center for Medicare and Medicaid Services (CMS) of the United States Department of Health and Human Services as an expansion of the pre-existing Comprehensive ESRD Care.¹ Besides adding strong financial incentives to healthcare providers to delay the onset of dialysis, the CMS value-based models also incentivize earlier kidney transplantation and encourage home-based dialysis when renal replacement therapy is indicated, as opposed to little prevention of disease progression and an unplanned start to in-center hemodialysis treatment in traditional ESRD models.² Currently, the KCC models consist of four payment options, including one payment option under the Kidney Care First (KCF) and three under the Comprehensive Kidney Care Contracting (CKCC), i.e., Graduated, Professional, and Global CKCC options.¹

As to how to delay dialysis initiation, there has been an exponential emergence of kidney care companies that announce expertise in doing so under value-based models. Some of the approaches presented are vague and include computerized models using artificial intelligence to postpone dialysis with the varying engagement of patients

and their care partners.³ According to CMS, the patient should be a key component of the KCC model design, including across KCF and CKCC options. Persons with far-advanced CKD may be better prepared for kidney care choices if they actively participate in shared decision-making in the context of practicing health equity and patient activation. An overarching approach includes both pharmacologic therapies and diet and lifestyle modifications in the form of integrated multimodal strategies, embraced by patients and their care partners with the goal of living well with kidney disease.⁴

The most likely nonpharmacologic interventions to be employed under the value-based models include practicing patient-centered nutritional management of CKD that is evidence-based and pragmatic and can slow disease progression and control uremia.^{2,5} As a foundation, this strategy should include using low and very low protein diets, i.e., dietary protein intake of 0.6–0.8 g/kg/day and <0.6 g/kg/day, respectively. An approach to this strategy is derived from plant-dominant (PLADO) diet regimens where >50% of the protein source is from plant-based proteins, and that is implemented in the form of medical nutrition therapy (MNT) by trained dietitians.^{6,7} The PLADO-based MNT should be the cornerstone of the integrated multimodal approach to delay dialysis initiation, while it will benefit from adjunct pharmacotherapy for fluid management, acidosis and anemia corrections, management of potassium and phosphorus load, and treating unpleasant symptoms of uremia such as pruritus and gastrointestinal symptoms.⁸ In addition, continued research on underlying mechanisms of CKD progression relative to nutrition with the goal of nutritional treatment strategies to modulate gut health and microbiota, uremic toxin production and micronutrient provision will likely impact the outcomes of patients with CKD, including in the post-COVID pandemic era.⁹

Given concerns about the risk of protein-energy wasting, secondary sarcopenia, and cachexia that may ensue in far-advanced CKD if there is inadequate nutrition, the PLADO-based low and very low protein diets may benefit from nutritional supplementation, including essential amino acids and/or keto-analogs of amino acids.^{10–12} However, clinical trials of low- and very-low

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Address correspondence to Kamyar Kalantar-Zadeh, MD, MPH, PhD, Division of Nephrology, Hypertension, and Kidney Transplantation, University of California Irvine, Orange, CA 92668, USA. E-mails: kkz@uci.edu, kamkal@ucla.edu

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protein diets and meta-analyses of these trials have been inconsistent.¹³ Another challenge is that half or a higher proportion of persons with advanced CKD have diabetes or suffer from obesity and metabolic syndrome, where obese sarcopenia is more likely and for which higher dietary protein intake is traditionally recommended. Higher protein intake may worsen CKD progression and uremic symptoms by increasing the level of nitrogenous end-products of amino acids leading to higher circulating levels of uremic toxins;^{11,14,15} moreover, individual disease states may benefit from distinct nutritional interventions given data supporting ketogenic diet for polycystic kidney disease, gluten-free diet for IgA nephropathy, and lower glycemic index foods for diabetic kidney disease.¹² However, engaged dietitians equipped with well-designed dietary management models can implement patient-centered MNT strategies using telenutrition and other educational and monitoring modalities.⁹ Nutritional status can be watched closely by means of screening tools, including the malnutrition-inflammation score (MIS) and MIS-based algorithms can be developed to minimize the risk of protein-energy wasting from advanced uremia. Healthcare providers, including nephrologists and kidney care companies can partner for better education and research and improved understanding of the utility and implementation of nutritional management strategies using principles of culinary medicine-based MNT and addressing the need of patients and care partners with the goal of living well with kidney disease.³

In this issue of the *Journal*, Russell et al.¹⁶ examined the utility of mobile diet apps used for the nutritional management of CKD available on the App Store and Google Play Store, using such selection criteria as CKD stage specificity, adjustment for individual dietary needs, tracking nutrient intake, patient data accessibility to clinicians, and inclusion of CKD-friendly recipes. The investigators found that these criteria were not consistently met and that none of the apps used the most contemporary nutrition guidelines for CKD. They also noted limitations with diet app usability, information accuracy, and the need for high-level e-literacy. Other issues identified included variable user costs, privacy and security concerns, and the inability of caregivers or family care partners to use apps to assist in patient care.¹⁶ The value-based models provide unique opportunities to innovate and improve CKD diet apps for delaying dialysis initiation.

Wong et al.¹⁷ examined data of 15,859 persons with nondialysis-dependent CKD in outpatient clinics in British Columbia, Canada, and found that 9% of them were prescribed oral nutritional supplements within a year of CKD clinic entry and that these patients exhibited lower baseline eGFR, body mass index, and serum albumin among others. The likelihood of oral nutritional supplement prescription increased by 32% for every unit increase in dietitian full-time equivalents per 1,000 CKD

patients. Findings from this and similar studies may help better understand the needed dietitian workforce trajectory for successful and safe implementation of nutritional management of CKD to delay dialysis initiation under the value-based modes of kidney care. Okada et al.¹⁸ examined a cohort of 553 patients with renal failure and liver cirrhosis, including hepatic encephalopathy, and reported that 503 patients who received branched-chain amino acid infusion had 49% lower mortality than those who did not, including decreased in-hospital mortality in patients with Child-Pugh class. These data, too, may have implications for value-based models where nutritional management may include amino acid supplements.

Stout et al.¹⁹ examined the utility of a smart water bottle to improve urine volume in a randomized trial of 85 stone-former subjects with <1.5 L/day fluid intake and found that use of a smart bottle was associated with greater increases in 24-hour urine volume and less difficulty remembering to drink. Brennan et al.²⁰ describe their CKD Taste Plate as a novel tool to assist clinicians with the management of taste alterations in CKD, given that perception of taste can affect dietary management of CKD. Bielopolski et al.²¹ developed and examined a novel metric that incorporates serum phosphorous and normalized protein catabolic rate, a surrogate of dietary protein intake, to examine the associations with mortality in 63,016 people of maintenance hemodialysis and report that the metric predicts mortality in people on dialysis, probably reflecting both nutrition and inflammation state independent of RKF. The metric enables better phosphorus monitoring, although adequate dietary protein intake is ensured and may improve the prediction of outcomes in the clinical setting. Fishbane et al.²² discuss the challenges of controlling hyperkalemia in persons with advanced CKD such as ESRD based on the traditional dogma of avoiding potassium-rich foods that are mostly high fruits-and-vegetables diet. Given that PLADO diet regimens that may help delay dialysis under the value-based models may be considered high-potassium diets, the use of potassium binders as adjunct therapy may be a useful strategy.

Accurate assessment of nutritional status can emerge as an important component of conservative management of patients with advanced CKD without dialysis.²³ Ha et al.²⁴ studied nutritional risk index (NRI) score in 242 immunosuppressive drug-naïve patients with antineutrophil cytoplasmic antibody-associated vasculitis and the association of this score with all-cause mortality and ESRD occurrence during follow-up of these patients. Delgado et al.²⁵ examined changes in body composition over time and their association with survival in 325 adults receiving hemodialysis using whole-body bioimpedance spectroscopy at baseline and then at 12 and 24 months; they found that intracellular water, which was associated with greater survival, declined over time, whereas fat

mass and extracellular water remained relatively stable and that higher extracellular water but not fat mass was associated with worse survival. Avesani et al.²⁶ examined the utility of their recently developed “Global Leadership Initiative on Malnutrition” against 7-point subjective global assessment (SGA) and MIS as reference standards in two cohorts of dialysis patients in Italy and Brazil and found that their new tool showed low agreement, sensitivity, and accuracy in identifying malnourished subjects by either SGA or MIS. Considering the high likelihood of wasting disorders in advanced CKD, the well-established 7-point SGA and MIS methods may be more useful in the clinical setting of monitoring patients who will be under the delay-dialysis protocols in the context of value-based models.

Wu et al.²⁷ studied the incidence of CKD in a cohort of 7,825 Taiwanese people who underwent 3-dimensional body surface scanning with an average follow-up of 14.3 years and found that while larger chest width and waist circumference are associated with higher CKD, body limb measurements, including larger thigh circumference predict the lower occurrence of CKD. Suzuki et al.²⁸ examined the utility of a modified creatinine index and geriatric nutritional risk index (GNRI) in 472 patients undergoing hemodialysis and their respective rates of change over a 1-year period and found that creatinine index at one timepoint and its trajectory had consistently stronger associations with clinical events than the GNRI in patients undergoing hemodialysis. This study further emphasizes the importance of risk screening using a marker of nutritional status in patients with advanced CKD and may have implications in the era of value-based models.

Close monitoring of physical performance and functionality are of immense importance under the value-based models when delayed dialysis initiated is attempted. Reis et al.²⁹ examined the association of nutritional status using MIS and quality of life using SF-36 with physical function, according to the revised European Working Group on Sarcopenia in Older People in 77 dialysis patients. They employed handgrip strength, Short Physical Performance Battery, sit-to-stand test, and gait speed as physical function tests and found that poor nutritional status and quality of life are associated with low physical function. Wilkinson et al.³⁰ identified 129 clinical and epidemiological studies in 35,192 persons with CKD examining the use of handgrip strength as an outcome. They report that the heterogeneous methodologies underscore the need to standardize HGS measurement and propose a comprehensive handgrip strength assessment protocol for use in CKD. Bennet et al.³¹ sought to identify global policy-related enablers, barriers, and strategies to increase exercise participation and physical activity behavior for people living with kidney disease, guided by the Behavior Change Wheel theoretical framework, in that

50 global renal exercise experts developed policy barriers and enablers to exercise program implementation and physical activity promotion in kidney care. The expert report includes recommendations targeting multiple stakeholders, including nephrologists, nurses, allied health clinicians, organizations providing renal care and education, and renal program funders, and suggests that increasing physical activity, strength, fitness, and function may improve the lives of people living with kidney disease. Similarly, Barros et al.³² advocate strategies that can enhance the presence of exercise professionals in dialysis clinics. Monitoring the physical performance of patients with far advanced CKD without dialysis initiation may become a critical task under the value-based models.

In conclusion, the emergence of value-based models offers a unique opportunity to venture into the field of person-centered nutritional management of CKD without dialysis by using the power of upstream engagement of dietitians with expertise in kidney nutrition in the form of well-crafted MNT strategies based on Precision Nutrition and personalized diet plans, and inclusive of all stages of kidney disease.³³ The core component of these MNT models is effective PLADO-derived low and very low protein diet regimens that can be supplemented with amino acid or keto-analogs of amino acids to ensure safety and to minimize the risk of protein-energy wasting sarcopenia and cachexia. Nutritional screening tools such as MIS can help identify and preempt patients at risk of protein-energy wasting. When dialysis becomes necessary, it can start gradually in the form of incremental dialysis at home or center, along with the continuation of PLADO regimens on nondialysis days so that residual kidney function can longer be preserved. The MNT is the quintessential component of integrated multimodal approaches that are effective and safe, as well as feasible and inexpensive for the era of value-based kidney care models in lieu of the conventional dialysis treatment.

Kamyar Kalantar-Zadeh, MD, MPH, PhD
*Division of Nephrology
Hypertension and Kidney Transplantation
University of California Irvine
Orange, CA*

Jessianna Saville, MS, RDN, LD, CLT
*Kidney Nutrition Institute
Titusville, FL*

Linda W. Moore, PhD, RDN, CCRP
*Department of Surgery
Houston Methodist Hospital
Houston, TX*

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