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EDITORIAL

Renal Telenutrition for Kidney Health: Leveraging Telehealth and Telemedicine for Nutritional Assessment and Dietary Management of Patients With Kidney Disorders

TELEHEALTH REFERS TO the delivery of health-care services from a distance using telecommunication techniques such as video and audio, mostly in real time but across different locations. During the COVID-19 pandemic in 2020, mandated social distancing has led to reinvigoration and colossal expansion of telehealth. Telehealth is expected to continue through 2021 and even after COVID-19 pandemic is overcome, given its many advantages including its exceptional level of patients' and providers' convenience and high level of efficiency, while reimbursements remain comparable to in-person visits. However, there are undeniable drawbacks including inability to provide a real physical examination with verifiable vital signs including objective weight and height recording and missing auscultation and percussion along with all other touch-dependent components of an actual patient visit. There are technical challenges including timely connection for a tightly scheduled appointment and time lost during connection setup, video and voice issues, sporadic loss of connection, slow video stream from bandwidth restrictions, etc. Even if all these technical issues are resolved or compensated for by other means, there is something inherent to real face-to-face visit that may not be replaced by telehealth approaches. Nevertheless, telehealth technology is here to stay and expand, with or without pandemics or other disasters from climate change. Hence, most healthcare providers and clinical researchers welcome and embrace telehealth.

Telehealth has different domains including telemedicine and telenutrition, which are usually provided by physicians and dietitians, respectively. Telemedicine is a well-rooted and constantly expanding and evolving operation, whereas telenutrition is somewhat less recognized; while in 2020, it has been practiced increasingly more frequently by many dietitians including in renal nutrition.[1] According to the Academy of Nutrition and Dietetics, telenutrition involves the interactive use, by a registered dietitian nutritionist, of electronic information and telecommunications technologies to implement the nutrition care process, including nutrition assessment, nutrition diagnosis, nutrition intervention/plan of care, and nutrition monitoring and evaluation, with patients or clients at a remote location, within the provisions of their state licensure as applicable.[1,2] Even before COVID pandemic, telenutrition was used as an innovative approach to adapt weight loss interventions.[3,4] In recent months, there has been a tsunami-like growth in the use of telenutrition in kidney care. We define "renal telenutrition" as the use of telehealth in nutritional and dietary management of kidney health and kidney disease by a registered dietitian or other nutrition professionals and expect that this new and fast expanding field will continue to evolve to become the prevailing facet of many activities that renal dietitians and other nutrition and dietetic professionals will be involved in care of patients with kidney health–related problems.

Renal telenutrition assessments include two main domains:

(1) Assessment of the nutritional status of patients with chronic kidney disease (CKD) including those under dialysis therapy or kidney transplantation. The two core assessment tools used in renal nutrition include the Subjective Global Assessment (SGA) of Nutrition and the Malnutrition-Inflammation Score (MIS, Kalantar Score),[5-7] and they both can be effectively implemented via telenutrition. The MIS has 10 components, each with a severity score of 0 (normal) to 3 (most severely malnourished), including the first seven components that are the fully quantitative versions of the seven SGA items (hence, running MIS can also generate an SGA score at the same time), including five nutrition history components (weight loss, food intake, gastrointestinal symptoms, functionality, and comorbidity); two nutritional physical examination components (fat loss and muscle loss), both of which can be assessed upon video visualization and description by the patient or care partner; body mass index as the 8th component of the MIS; and two laboratory values (albumin and transferrin).[8-10] In addition to the telenutrition-based

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assessment of nutritional status via the MIS, frailty including muscle mass and function can be assessed via telemedicine as well including handgrip strength or other components of the Fried Frailty Index[11] using its telehealth compatible versions.[12,13]

(2) Assessment of diet and food intake among patients with CKD: This can be done by interviewing patients on what they eat including 3-day diet record with supplementary diet interview (which for patients on hemodialysis should include one dialysis day and two surrounding no-dialysis days),[14] 24-hour diet recall including via phone, and food frequency questionnaires.[15]

Upon completion of these two core assessments of nutritional status and diet, the remainder of telenutrition including nutritional diagnosis, nutrition and dietary intervention with plan of care, and plans for periodic nutrition and diet monitoring and evaluation can be discussed during the telehealth session with the patient. Overall, telenutrition allows for specialized nutrition care to be delivered more cost-effectively and to more patients in need. Telenutrition can offer a useful means for clinical studies when there is heightened need for social distancing. In a study by Kelley et al[16] that examined the experiences of patients with CKD in managing dietary recommendations, including their perspectives on the use telehealth to support dietary management in CKD, the authors concluded that easy-to-use telehealth options had the potential to overcome the shortcomings in current health service delivery. Telehealth including telenutrition provides patients with CKD with pragmatic tools and comprehensible and consistent information which fosters ownership and self-monitoring.[16]

In this issue of the *Journal of Renal Nutrition* (*JReN*), Bakkal et al[8] examined the relationship between handgrip strength, using a hand dynamometer, and nutritional status by the MIS (Kalantar Score) and biochemical measures in 132 patients on hemodialysis in Turkey, who have been on hemodialysis treatment for at least 6 months. The authors reported that the lower the handgrip strength, the higher the MIS value as a sign of a more severe malnutrition. They also found that only the MIS had a statistically significant impact on handgrip strength in the regression models.[8] It remains to be determined if similar MIS-based investigations can be reciprocated by means of telehealth technology.

Given 6-8 times greater in-hospital mortality rate of patients on dialysis than nondialysis population and given the potential role frailty may play in poor outcomes of these patients, Jiang et al[17] examined national data of 1,424,026 hospitalized maintenance dialysis patients between 2005 and 2014, who were classified based on frailty status. The investigators found that hospitalized dialysis patients with frailty had 5 days longer hospital stays, incurred $40,000 more in-hospital costs, and were at double the risk of in-hospital mortality and three times the risk of discharge to long-term facilities than those without frailty. Of note, the impact of frailty on these outcomes was even greater among patients on dialysis younger than 65 years. Hence, accurate assessment of frailty including via telehealth and development of adequate interventions for frailty including via telenutrition are of high priority.

Given that the appropriate dietary protein intake target range for patients on hemodialysis with frailty is less clear, Hasegawa et al[18] examined calculated normalized protein catabolic rate, a urea kinetic–based surrogate of dietary protein intake, in a longitudinal study of 2,404 patients on hemodialysis from the Japanese Dialysis Outcomes and Practice Pattern Study. Patients in the low–normalized protein catabolic rate group, i.e., lowest dietary protein intake, showed a higher prevalence of frailty. Although mortality data were not significantly different, these data suggest a clinically relevant association between dietary protein intake and frailty in patients on dialysis.

Yamamoto et al[19] examined the efficacy of a supervised exercise therapy protocol starting immediately after kidney transplantation to prevent or correct frailty. They compared 10 patients with usual care plus exercise training comprised of supervised aerobic training and physical activity instruction from day 6 to 2 months after kidney transplantation, versus 14 patients with usual care alone. At 2 months, the exercise therapy group showed significant improvement in 6-minute walking distance and isometric knee extensor strength. Hence, supervised aerobic training and physical activity instructions initiated in the early phase after transplantation may improve physical performance.

Suresh et al[20] studied the perspectives of 118 renal dietitians on different approaches to obesity management for dialysis-dependent patients using an online 21-item survey that was distributed via individual outreach and a professional organization e-mail Listserv. More than 90% of responding dietitians indicated that kidney transplantation goal was the main reason that patients on dialysis with obesity sought weight loss interventions. Calorie restriction was rated as the most common weight loss approach. Exercise, diet counseling, and stress management were variably prioritized as weight loss management strategies. Barriers to obesity management in dialysis settings included lack of time, lack of training in weight loss counseling, and gaps in current renal nutritional guidelines.[20] This study also provides a relevant example of an exclusively online conducted investigation that did not require in-person contact and therefore in line of the social distancing requirements for research conduct under COVID-19 pandemic.

In this issue of *JReN*, there are three studies related to dietary phosphorus and fibroblast growth factor-23 (FGF-23). Anand et al[21] measured 24-hour urinary phosphorus and serum FGF-23 in 1,192 study participants in rural and urban India including 70 urban nonvegetarians, 564 urban vegetarians, and 558 rural vegetarians and found that urinary phosphorus excretion was higher in rural than in urban vegetarians (503 vs. 365 mg/day), while FGF-23 levels did not differ by residence or dietary preference. Pool et al[22] examined racial differences in the associations between food insecurity and FGF-23 in a large multisite cohort including 3,421 black and white participants with follow-up time of 20 to 30 years, who were enrolled in the study between the ages of 18 and 30 years. During follow-up period, 29% of blacks and 14% of whites experienced change in food security. Developing food insecurity was associated with a 48% greater odds of increasing to the highest quartile of FGF-23 among blacks; the authors concluded that among blacks, food insecurity was associated with an increase in levels of FGF-23.[22] For more accurate assessment of dietary phosphorus load, Narasaki et al[23] developed a novel Phosphatemic Index (PI) based on phosphorus bioavailability and evaluated the effect of foods with different PIs in mixed meals on serum intact FGF-23 concentration. They found that ingestion of high PI test meals was associated with a higher serum FGF-23 and lower 1,25-dihydroxyvitamin D levels compared with ingestion of low PI test meals. If reproduced and validated in additional studies, the PI can emerge as a patient- and dietitian-centered tool to accurately evaluate the dietary phosphorus load of various foods and may help patients make appropriate food choices for dietary phosphorus control in patients with CKD.[23]

Anadon-Ruiz et al[24] examined a cohort of 85 patients undergoing three different types of dialysis modalities and found that patients, in whom a low selenium level was associated to nearly 3-fold higher death risk ratio than in patients with normal or high selenium (>118 mug/L). Interestingly, low-albumin patients of this cohort exhibited an almost six times higher likelihood of having a low serum selenium.[24] In a proof-of-concept study by Viramontes-Horner et al[25] on potential effect of dietetic intervention on skin autofluorescence, a correlate of advanced glycation end-products, in dialysis-dependent patents, dietetic support was associated with stable autofluorescence levels despite an increase in dietary advanced glycation end-product intake among 41 patients on hemodialysis and 8 patients on peritoneal dialysis under the study, suggesting that interventions to improve nutrition may be important in preventing the rise in skin autofluorescence observed in malnourished dialysis populations.

In a qualitative study with semistructured interviews among 34 adults undergoing maintenance hemodialysis in a UK teaching hospital using audio-recorded, transcribed interviews, Morris and Lycett[26] showed that the so-called low-potassium diets bring practical and psychosocial consequences with significant impact on the perception of living with kidney disease. Some patients experienced financial difficulties, and decisions were made to prioritize family needs over their own dietary prescriptions. The authors concluded that renal health professionals should offer more support to people on a low-potassium diet.[26] Sussman et al[27] reviewed the contemporary literature on the evidence behind the prevailing dogma that although potassium-rich fresh fruits and vegetables provide many health benefits, there has long been the concern over presumable risk of hyperkalemia. The authors identified the unmet need for clinical trials including in patients on hemodialysis to compare the current standard of care or so-called "renal diet," which is a potassium-restricted diet, to a potassium-liberalized diet comprising abundant fresh fruits and vegetables combined with a potassium binder.[27]

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