The 2020 Updated KDOQI Clinical Practice Guidelines for Nutrition in Chronic Kidney Disease

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Abstract

Over the last 2 decades, there has been a great accumulation of new evidence regarding the management of nutritional and metabolic aspects of kidney disease. The 2020 update to the KDOQI Clinical Practice Guideline for Nutrition in CKD provides a comprehensive up-to-date information on the understanding and care of patients with CKD. It provides updated information on nutritional aspects of kidney disease for the practicing clinician and allied health-care workers. The current manuscript provides an overview of the updated guideline statements on major subjects including nutritional assessment, dietary protein and energy intake, nutritional supplementation, micronutrients, and electrolytes. The guidelines are focused on dietary management rather than all possible nutritional interventions.

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Introduction

Patients with CKD are at risk for multiple nutritional and metabolic abnormalities. These include protein-energy wasting (PEW), obesity, nutrient deficiencies, undesirable accumulation of electrolytes, and metabolic waste products. Provision of optimal nutritional care for CKD patients is essential to prevent and/or to minimize the complications and ultimately to reduce the risk of unfavorable outcomes. Clinical practice guidelines are of paramount importance to assist clinicians with evidence-based recommendations intended to optimize patient care. The original Clinical Practice Guidelines for Nutrition in Chronic Renal Failure by the National Kidney Foundation Disease Outcomes Quality Initiative (KDOQI) was published in 2000. Since then, there has been a remarkable accumulation of new evidence on the assessment and management of nutrition aspects in CKD. New methodology and processes for the development of clinical guidelines have also been introduced [1].

The KDOQI Clinical Practice Guideline for Nutrition in CKD: 2020 Update was developed as a joint effort by National Kidney Foundation and the Academy of Nutrition and Dietetics. The complete guideline development

process is described in detail in the guideline document [2]. In brief, a work group composed of 15 members including physicians, registered dietitians or nutritionists, researchers, and methodological experts was formed. The focus of the updated guideline was defined as adults' aged 19 years and older, CKD stages 1 through 5, including patients on maintenance dialysis and patients with kidney transplant. The 3 main areas covered were macronutrients, micronutrients, and electrolytes. Key questions of assessment and intervention were used for evidence review which covered studies published between 1985 and 2016. For assessment questions, studies on validity, reliability, or relationship of an assessment tool against a comparative tool or mortality were included in the review. For intervention questions, only randomized controlled trials with at least 6 individuals per arm were included. The main outcomes defined were mortality, comorbid conditions, CKD progression, quality of life, nutritional parameters, and nutrient biomarkers.

After completion of data extraction and data synthesis, the workgroup translated the available evidence into action statements. The Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) method was used for development of recommendation. The GRADE method involves 2 major components: a rating for the quality of evidence and a rating of the strength of recommendations. The evidence grades are reported at the end of the recommendation statements (A, B, C, or D) and reflect the confidence in the estimated effects. The second component is rating the strength of the recommendation statement. This rating reflects the extent to which one is confident that desirable effects of an intervention outweigh undesirable effects. The grade for strength of the recommendation can be assigned Level 1 or Level 2. In certain scenarios when there was not enough evidence, or the evidence was of too low, "Opinion" statements were developed.

What Is Different in the Updated Guideline?

The population covered in the updated guidelines was expanded to include adults with CKD stages 1–5, on maintenance dialysis (HD and PD) and individuals with kidney transplant. The extent of certain areas covered in the previous guidelines such as nutritional assessment, protein, and energy intake were expanded with more comprehensive data capture. This led to the development of additional statements with evidence-based information. In addition to previously covered topics, 4 new areas were reported: medical nutrition therapy, nutritional supplementation, micro-

nutrients, and electrolytes. While some of the aspects of these subject areas were reported in the original guidelines published in 2000, the newly updated guidelines incorporated these as standalone sections. Table 1 provides a summary of the statements covered in the KDOQI Clinical Practice Guideline for Nutrition in CKD: 2020 Update.

Nutritional Assessment Recommendations

There was a substantial expansion and update in the recommendations regarding methods to assess nutrition status in patients with CKD. One of the important highlights of the new guidelines is the recognition of poor level of evidence to use one tool over others to diagnose PEW. A comprehensive description on the potential applicability of technical devices and anthropometric methods to assess nutritional status is provided but the evidence was stronger for recommendation of certain established comprehensive methods such as subjective global assessment (SGA) and malnutrition inflammation score (MIS). It is also emphasized that biochemical markers should not be interpreted in isolation to assess nutritional status since they are influenced by other factors in patients with CKD, especially in ones on maintenance dialysis. For example, while serum albumin has been traditionally used as a marker of nutritional status, the predictive value of low serum albumin as a risk for hospitalization and mortality in patients on maintenance dialysis was recognized with the highest level of evidence rather than its use as a diagnostic marker for presence or absence of PEW.

In assessing energy requirements to guide dietary energy intake, indirect calorimetry remains the gold standard for measuring resting energy expenditure. However, since it is not readily available, use of disease-specific predictive resting energy expenditure equations for patients on maintenance dialysis is encouraged although further research is necessary for this area. When assessing dietary intake needs, a new statement points out that factors beyond food intake such as knowledge, beliefs, attitudes, behavior, and access to food as well as psychological and cognitive aspects should be taken into consideration to effectively plan nutrition interventions in patients with CKD. Additional suggestions are provided for further research in this area, especially in terms of development of risk prediction models using multiple nutritional markers, determining the effects of various nutritional interventions on nutritional markers and whether changes in values of a nutritional marker correlate with outcomes as a marker of efficacy.

Table 1. Summary and updates of the statements covered in the KDOQI clinical practice guideline for nutrition in CKD: 2020 update

	Statements
Guideline 1 <i>Nutrition Assessment</i>	Technical devices and anthropometric measurement of body composition – DEXA – Gold standard Assessment with laboratory measurements Handgrip strength Methods to assess energy requirements Composite nutritional indices – SGA as gold standard Tools/Methods to assess protein and calorie intake
Guideline 2 <i>Medical Nutrition Therapy</i>	Medical nutrition therapy – Implementation in routine nutrition care
Guideline 3 <i>Protein and Energy Intake</i>	Energy intake – Consider demographic and clinical variables Protein amount – Apply LPD and VLPD as indicated Protein type Dietary patterns
Guideline 4 <i>Nutritional Supplementation</i>	Oral, enteral, and IDPN Dialysate nutrition supplementation – As indicated
Guideline 5 <i>Micronutrients</i>	Micronutrient assessment Folic acid Vitamin C (Ascorbic acid) Vitamin D Vitamin E and A Vitamin K Trace minerals – selenium and zinc
Guideline 6 <i>Electrolytes</i>	Acid load Consider strategies to reduce Calcium Phosphorus Potassium Sodium – Effective in fluid retention and blood pressure control

DEXA, dual-energy X-ray absorptiometry; SGA, subjective global assessment; LPD, low-protein diet; VLPD, very low-protein diet; IDPN, intradialytic parenteral nutrition.

Intervention Recommendations

Medical Nutrition Therapy and Energy and Protein Recommendations

A new topic added in the updated guideline is the recommendation for Medical Nutrition Therapy (MNT). The recommendation emphasizes the importance of providing this collaborative approach by the health-care team to optimize the nutritional care by tailoring it to the individuals' needs, nutritional status, and comorbid con-

ditions. Due to the dynamic nutritional changes that occur during CKD, the importance of monitoring and evaluation a set of nutrition-related markers to achieve the benefits of MNT is pointed out in this new guideline statement.

In the new guideline document, protein and energy intake recommendations were updated, and new statements were added. The recommendation for protein intake for non-dialysis patients has changed considerably in this updated guideline. Over the last 2 decades, sub-

stantial a number of well-designed studies were published allowing a more comprehensive analysis of the effectiveness of protein restriction with or without keto-acid analogs supplementation on several relevant outcomes [3]. In the updated statements, it is highlighted that the low-protein diet (0.55–0.6 or 0.28–0.43 g/kg/day with keto-acid analogs) should be delivered for nondiabetic and metabolically stable patients with stages 3 and 4 CKD. This should be done under close clinical supervision, preferentially by a dietician to reduce any risk that might be associated with decreased nutrient intake. On the other hand, for patients with diabetic kidney disease, a more modest dietary protein restriction is recommended (0.6–0.8 g/kg/day). This is based on expert opinion and with limited high-quality studies in this patient population.

Number of patient-specific factors and clinical conditions affect the energy needs of patients with CKD. Therefore, a wider range in the prescription of energy intake (25–35 kcal/kg/day) was recommended based on age, sex, level of physical activity body composition, weight status goals, and concurrent illnesses.

There are multiple epidemiological studies in the general population indicating benefits or risks of different protein types (plant vs. animal) on multiple clinical outcomes. However, despite notable number of observational studies suggesting benefits of plant-based diets in CKD, the lack of randomized clinical trials has prevented the work group to recommend one type of protein over another in patients with kidney disease. Similarly, a promising dietary approach is the potential benefits of following healthy dietary patterns in patients with CKD. Despite the level of evidence, the work group recommended prescription of Mediterranean diet and a dietary pattern with increased intake of fruits and vegetables in patients with CKD with the potential benefits on lipid profile, blood pressure, and net acid production.

Nutrition Supplementation

The guidelines set on recommendations for nutrition supplementation were greatly expanded addressing different types and routes of nutritional supplementation. Notably, strategies to prevent dialysis induced catabolism and interventions to treat PEW in patients with CKD stages 3–5 and maintenance dialysis patients are updated and presented in detail. The consecutive steps to be taken in CKD patients with PEW or at risk of PEW include dietary counseling, a 3-month trial oral nutritional supplements and enteral tube feeding, if patients suffer from chronically inadequate intake and when the protein and energy requirement cannot be attained by counseling and

oral nutritional supplement. Feeding through the gastrointestinal route should be preferred as long as possible and total parenteral nutrition or intradialytic parenteral nutrition may be considered as an option to administer nutrients if the enteral route fails. Several important considerations regarding prevention and treatment of PEW, such as who to treat (all patients vs. the higher risk individuals), when to administer supplements (e.g., immediately before or during dialysis treatments vs. during the interdialytic interval), how much and for how long to administer, and how to monitor the response are not covered by the current guidelines due to lack of solid data and recommended as further research areas.

Micronutrients and Electrolytes

An important addition to the updated guidelines is the inclusion of vitamins and trace elements recommendations, an important area that was not covered in-depth in the original guidelines. It is noted in the updated guidelines that provision of accurate and reliable evidence-based statements for assessment and administration of micronutrients in patients with CKD remains challenging. Despite the large number of trials on the effects of micronutrient supplementation, most of them do not report the baseline status of the micronutrients examined or the dietary intake during the studies; this has led to significant limitations in the evidence-based recommendations. Furthermore, differences in published studies regarding the doses of the supplements, duration of the intervention, and the outcomes analyzed, among several other issues, make it difficult to provide recommendations on the amounts of micronutrients to be given and the types of CKD patients who should receive these supplements. Taking all these issues into consideration, the work group agreed to develop opinion-based recommendation to guide practitioners and to emphasize the need to individualize micronutrient supplementation.

A set of recommendations on electrolytes is another new area included in the updated guidelines. Disturbances in mineral metabolism and acid-base homeostasis occur early in the course of CKD and are associated with a number of complications of the disease [4]. Management of dietary components is of great importance for the prevention and treatment of electrolyte and acid-base disorders.

Despite the more consistent evidence to reduce net acid production through sodium bicarbonate or sodium citrate supplementation with beneficial effect in the decline of residual kidney function, recent evidence has emerged that increased dietary intake of fruits and vege-

tables may have similar effects. Statements of both approaches are provided in the new guidelines for CKD 1–5.

Regarding dietary phosphorus and potassium, although some traditional dietary recommendations have proposed a certain amount of intake for both nutrients, the efficacy of this recommendation has not been established. Therefore, the recommendation in the updated guideline is that diet should be adjusted to maintain serum phosphorus and potassium in the normal range. Individualization must be considered in conjunction with several other factors and conditions that influence serum concentration of both electrolytes. It was also recognized that bioavailability of dietary phosphorus sources should be considered in the diet planning, and for both phosphorus and potassium, emphasis on food additives is addressed. Regarding sodium, the evidence is more consistent that limiting the intake to less than 2.3 g/day may reduce blood pressure and improve volume control in patients with CKD 3–5D.

Conclusion

The updated nutrition guidelines in CKD took substantial amount of work by multiple individuals and provides extensive information based on recent advancements in the care of patients with CKD. Despite its extensive content, the guideline statements do not cover certain patient populations such as those who are obese, elderly, who have acute kidney injury. The updated guidelines also do not address specific nutritional interventions like exercise or any pharmacotherapies to prevent or treat nutritional abnormalities. Since the guideline updates are a

continuous and dynamic process, these additional areas along with the basic components of the guidelines must be reassessed on a recurring basis in the future. Finally, implementation of the updated guidelines into the clinical practice must be assessed in order to define its real impact on patient care [5].

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Conflict of Interest Statement

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Author Contributions

Dr. Ikizler developed the concept and edited the manuscript for final submission. Dr. Cuppari drafted the first draft and contributed to further editing for final version.

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