The 5th Karolinska Institutet Advanced Renal Nutrition Conference convened on March 13, 2013, with a record-breaking 110 participants from 18 different countries. Drs Peter Stenvinkel and Juan-Jesús Carrero, of the Karolinska Institutet Division of Renal Medicine, led the conference.

People with chronic kidney disease (CKD) remain at high risk for nutritional shortfall and protein-energy wasting (PEW). Kidney disease patients often eat poorly due to the highly restrictive kidney-specific diet and to disease-related anorexia. Wasting is caused in part by persistent inflammation, which results from kidney disease and from its treatment (dialysis). Together, these conditions set the stage for the program of the Advanced Renal Nutrition Conference. This issue of Renal Nutrition News summarizes the lectures and discussions by leading renal nutrition researchers and educators on the nutrition-related condition of protein-energy wasting (PEW) with CKD.

This meeting was sponsored by Abbott Nutrition and endorsed by the International Society of Renal Nutrition and Metabolism (ISRN), the European Renal Association-European Dialysis and Transplantation Association (ERA-EDTA), the Spanish Society of Nephrology (SEN), and the Centre for Gender Medicine.
The 5th Karolinska Conference makes kidney nutrition come alive

The 5th Karolinska Advanced Renal Nutrition Conference focused on four key topics in renal nutrition: (1) the pathophysiology of PEW in CKD, (2) tools for nutrition screening and assessment, (3) nutrition management for people with CKD, and (4) selected topics: roles of exercise, dietary fat, vegetarian foods, and fiber in nutritional management for CKD patients. In addition, the conference highlighted country-specific challenges and solutions for managing CKD in Brazil, Croatia, Panama, Japan, and India.

Pathophysiology, consequences, and prevalence of PEW

People with CKD are at high risk of undernutrition, which can progress to PEW if it is not diagnosed and treated. Dr Juan-Jesús Carrero defined PEW as a condition of decreased body stores of protein and energy, or simply stated, reduced muscle and fat mass. Due to this high risk for PEW, nutrition plays a key role in managing patients with kidney disease.

Pathophysiology: undernutrition

Protein-energy wasting or PEW is a relatively new term that is aptly applied to the combination of nutritional and metabolic disturbances present in CKD. PEW is considered a single pathological entity, yet it includes elements of both undernutrition and increased catabolism.

It has long been recognized that spontaneous protein intake declines with progression of CKD; inadequate intake of dietary protein and energy becomes particularly severe in patients with end-stage renal disease and on dialysis. Dr Carrero advised, “About half of all patients on hemodialysis report loss of appetite.”

Anorexia leads to inadequate dietary intake. Many factors contribute to anorexia—retention of uremic toxins, metabolic acidosis, and increased inflammation due to kidney, cardiovascular, and other diseases. Additionally, conditions associated with CKD—depression, physical inactivity, and the dialysis procedure per se—can worsen anorexia and accelerate PEW.

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**Protein-energy wasting (PEW)**

<table>
<thead>
<tr>
<th>Undernutrition</th>
<th>Wasting/catabolism</th>
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<tr>
<td>Inadequate diet, anorexia</td>
<td>Inflammation: cytokines and adipokines</td>
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<tr>
<td>Metabolic acidosis, reduced anabolic drive, insulin resistance, dialysis, sedentary lifestyle</td>
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Pathophysiology: wasting

Drs Peter Stenvinkel (Sweden) and Alp Ikizler (USA) provided an overview of the physiologic mechanisms contributing to muscle loss in PEW: increased energy expenditure and catabolism along with decreased anabolism. According to Dr Stenvinkel, having CKD “is like getting old.” Both conditions have many features in common: atherosclerosis, osteoporosis, sarcopenia, poor wound healing, hypogonadism, skin atrophy, depression, and frailty.

Increased energy expenditure. Reduction in kidney function is associated with an inflammatory response in both mild and advanced CKD. In CKD, inflammation is a major contributor to the development of PEW and the associated loss of muscle. Persistent inflammation is associated with the production of cytokines and adipokines, e.g., C-reactive protein (CRP), interleukin-6 (IL-6), and tumor necrosis factor alpha (TNF-α), which promote increased energy expenditure.

Direct and indirect catabolic effects. Direct catabolic effects of CKD occur when the inflammatory mediator TNF-related weak inducer of apoptosis (TWEAK) activates protein degradation by way of nuclear factor-κB (NF-κB) and the ubiquitin-proteasome pathway.

To make matters worse, elevated levels of myostatin and/or corticosteroids support catabolism indirectly by inhibiting the usual anabolic responses to insulin. CKD also promotes catabolism indirectly by way of abnormalities in the excretion, synthesis, and action of many hormones—a consequence of the kidneys’ role as an endocrine organ. Thus, the usual anabolic actions of insulin, insulin-like growth factor-1 (IGF-1), growth hormone, and testosterone are reduced. Such effects result in lowered muscle synthesis, which can progress to PEW if untreated. Further studies on replacement of anabolic hormones in CKD are needed.

Reduced anabolic drive. Dr Ikizler advised, “Dialysis is a lifesaving procedure, but it is non-physiological and stressful. Dialysis itself leads to protein loss.” Protein synthesis is limited by the reduced availability of amino acids but can be at least partly restored by consuming protein or amino acids. Intradialytic oral nutrition is well recognized as a way to improve protein homeostasis in dialysis patients, and to provide a longer anabolic effect post-dialysis compared to intradialytic total parenteral nutrition (IDPN).

In addition, metabolic acidosis in patients on hemodialysis often alters protein metabolism by enhancing degradation; however, correction of acidosis with bicarbonate treatment helps restore protein homeostasis. A sedentary lifestyle coupled with CKD may also blunt anabolic responses. Exercise, therefore, may play a key role in preventing or delaying PEW, although the best type and duration of exercise is still unknown.

Mechanisms of muscle loss due to increased inflammation and catabolism in CKD

<table>
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<tr>
<th>Effect</th>
<th>Mechanisms and mediators of muscle loss</th>
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<tbody>
<tr>
<td>Increased energy expenditure</td>
<td>• Production of inflammatory cytokines; CRP, IL-6, and TNF-α</td>
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<tr>
<td>Direct catabolic effects</td>
<td>• Protein degradation via TWEAK, NF-κB, and the ubiquitin-proteasome pathway</td>
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<tr>
<td>Indirect catabolic effects</td>
<td>• Insulin deficiency, increased levels of myostatin or corticosteroids</td>
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<td></td>
<td>• Lowered responses to insulin, IGF-1, growth hormone, lowered testosterone</td>
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<tr>
<td>Reduced anabolic drive</td>
<td>• Limited supplies of protein/amino acids</td>
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<tr>
<td></td>
<td>• Metabolic acidosis</td>
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<td></td>
<td>• Sedentary lifestyle</td>
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Consequences of PEW in CKD

Metabolic and physical changes resulting from PEW have serious negative consequences on physical functionality, quality of life, survival, and cardiovascular health.

Poor quality of life, reduced functionality, increased risk of death

PEW increases the risk of poor outcomes for CKD patients. These outcomes include poor quality of life, reduced physical and mental function, and increased risk of death.

The link between nutritional status and quality of life is well supported. Hemodialysis patients with lower serum albumin levels perceive a poorer quality of life. Poor quality of life in turn predicts a higher risk for mortality in hemodialysis patients. Furthermore, hemodialysis patients (n=809) with the worst malnutrition-inflammation scores (MIS) had significantly lower quality of life in terms of general health, physical role and functionality, and emotional and mental health. In CKD patients not on dialysis, low serum albumin levels likewise predict mortality.

The only surprise is an association between obesity and increased CKD survival, which has been called the "obesity paradox." Being overweight or obese is protective in CKD patients, unlike in the general population. CKD patients are more at risk from the short-term consequences of PEW; they do not live long enough to die of the adverse effects associated with obesity.

Cardiovascular disease

It is well known that CKD patients with PEW are at increased risk of cardiovascular disease (CVD). In his view, patients with kidney disease and PEW are at increased risk of CVD because they experience nutritional deficiencies, excessive catabolism and inflammation, and hypothyroidism.

Prevalence of PEW is high with CKD

- 15 to 18% in CKD stages 3 and 4
- 35 to 50% in patients on hemo- or peritoneal dialysis
- 30% in post-transplant patients

Prevalence

Dr Carrero noted, “The reported prevalence of PEW in CKD patients varies widely and depends on the method of measurement, selected cutoff points, and geographical location.” For example, when different diagnostic criteria were used, the prevalence of malnutrition in peritoneal dialysis patients ranged between 24% (body mass index < 23 kg/m²) and 65% (Subjective Global Assessment score 2-5). In his review of the available studies, Dr Carrero found that the prevalence of PEW is 15% to 18% in stages 3 and 4 patients; 35% to 50% in patients on hemodialysis or peritoneal dialysis; and 30% in post-transplant patients. Since studies typically enroll stable patients, these are likely low estimates.

Undernutrition and catabolism of protein-energy wasting in CKD can lead to cardiovascular disease.

The undernutrition and catabolism of PEW in CKD can lead to heart disorders. In severe starvation, the heart muscle is catabolized, reducing its ability to handle fluid challenges, which results in significant edema and oxidative stress. Such changes promote cardiovascular disease, and low cardiac output in turn puts more strain on kidney function. Further, low intakes of micronutrients also associate with CVD; deficiencies of vitamins A, C, D and K exacerbate inflammation, oxidative stress, and vascular calcification. Subclinical hypothyroidism is also common among those with CKD and PEW. With starvation, the body compensates by reducing thyroid hormone production to reduce energy expenditure and minimize protein catabolism. In the short term, these changes are beneficial. In CKD, however, long-term reduction of thyroid activity results in subclinical hypothyroidism/low T3 syndrome, which increases the risk of CVD mortality.
PEW awareness: a call to action

The CKD population is unique in that their likelihood of becoming malnourished is predictable. For care of patients with CKD, including those in early stages of disease, Dr Kamyar Kalantar-Zadeh (USA) emphasized that the highest priority should go to assessing and improving nutritional status.

Dr Kalantar-Zadeh pointed out, “Regular nutritional surveillance in patients with kidney disease facilitates the diagnosis of wasting before frank PEW is evident.” The importance of nutrition is clear. Measures of nutritional status better correlate with CKD mortality than do conventional risk factors (obesity, hypertension, and high serum cholesterol). Among biomarkers of nutritional status, low serum albumin is by far the strongest predictor of poor survival in dialysis patients, and serum prealbumin may be even more sensitive. A nutritional intervention that can increase serum albumin by as little as 0.2 g/dL can have an important positive impact on survival of CKD patients. Dr Kalantar-Zadeh reminded us that new International Society of Nutrition and Metabolism (ISRN) guidelines will soon be released and will emphasize the prevention and treatment of PEW and malnutrition.

Diagnosis of PEW: criteria and tools

Dr Carrero discussed PEW diagnostic criteria from the ISRN. He reported that these multiple criteria emphasize the multifaceted nature of PEW. However, Dr Carrero stated that debate continues about how many categories must have positive test results in order to support a PEW diagnosis. He advised that PEW is likely to be under-diagnosed if a single category/test is used. For example, serum albumin is a good predictor of survival in CKD, but measurement of albumin alone is insufficient to define nutritional status. On the other hand, a requirement for a positive test in 3 of the 4 categories appears to be too strict a cutoff. Dr Carrero stressed that these criteria can be used for patient monitoring, but no specific combination has yet proven definitive for diagnosis. Clinical judgment remains key.

<table>
<thead>
<tr>
<th>Category</th>
<th>Test</th>
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<tr>
<td>Serum chemistry</td>
<td>• Serum albumin &lt;3.8 g/dL (Bromocresol Green)</td>
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<td></td>
<td>• Serum prealbumin (transthyretin) &lt;30 mg/dL (for maintenance dialysis patients only; levels may vary according to GFR level for patients with CKD stages 2–5)</td>
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<td>• Serum cholesterol &lt;100 mg/dL</td>
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<tr>
<td>Body mass</td>
<td>• BMI &lt;23 kg/m²</td>
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<tr>
<td></td>
<td>• Unintentional weight loss over time: 5% over 3 months or 10% over 6 months</td>
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<td></td>
<td>• Total body fat percentage &lt;10%</td>
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<tr>
<td>Muscle mass</td>
<td>• Muscle wasting: muscle mass reduced by 5% over 3 months or 10% over 6 months</td>
</tr>
<tr>
<td></td>
<td>• Reduced mid-arm muscle circumference area (reduction &gt;10% in relation to 50th percentile of reference population)</td>
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<td></td>
<td>• Creatinine appearance</td>
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<tr>
<td>Dietary intake</td>
<td>• Unintentionally low DPI &lt;0.80 g/kg BW/day for at least 2 months for dialysis patients or &lt;0.6 g/kg BW/day for patients with CKD stages 2–5</td>
</tr>
<tr>
<td></td>
<td>• Unintentionally low DEI &lt;25 kcal/kg BW/day for at least 2 months</td>
</tr>
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Abbreviations: BMI=body mass index; DEI= dietary energy intake; DPI=dietary protein intake; GFR=glomerular filtration rate
Tools for nutrition screening and assessment

Since CKD patients are at high risk for malnutrition and have an associated risk for death, it is important to screen for and quantify these risks. Dr Alison Steiber (USA) reviewed screening and assessment tools for their relevance and applicability to CKD.

Screening Tools

**MUST and MST**. Of all screening tools available, Dr. Steiber recommends using either MUST or MST to screen all CKD patients, as these screening tools are widely used in renal patients.

**Handgrip strength**. Clinicians are increasingly called upon to measure parameters and predict outcomes that matter to patients, such as strength and physical function. Handgrip strength is an easy-to-use screening instrument for malnutrition and inflammation in patients on maintenance hemodialysis. Lower hand grip strength values were independently associated with higher inflammation and malnutrition among patients on maintenance hemodialysis.

**How is your appetite?** Dr Carrero explained that asking the dialysis patient ‘How is your appetite?’ actually has predictive value. For patients who report a poor appetite, the survival rate is significantly worse than for patients who report having a good appetite.

Assessment Tools

**SGA**. The 7-point Subjective Global Assessment (SGA) tool is recognized to distinguish different degrees of PEW associated with increasing risks of mortality in chronic hemodialysis patients. With this scoring system, 7=normal nutritional status, and 1=severe PEW.

**MIS**. The malnutrition-inflammation score (MIS) is a composite scoring tool that uses 7 components from the SGA and 3 additional components: body mass index (BMI, in kg/m²); serum albumin; and total iron–binding capacity (TIBC). Notably, both BMI and serum albumin are PEW diagnostic criteria.

Can nephrologists learn from hibernating bears?

Since muscle loss is prevalent in people with reduced renal function, nephrologists have long sought ways to prevent this serious complication. Dr Peter Stenvinkel suggested that renal researchers take a closer look at a remarkable natural model of reduced kidney function—the hibernating black bear. Hibernating bears have a 70% reduced glomerular filtration rate (GRF) and anuria because kidney filtrate is almost completely resorbed by the body. Following the winter hibernation, black bears show no signs of muscle loss even though they did not move, eat, drink, or urinate for 6 months. On awakening in the spring, the bears return to near-normal physical function within minutes; mobility, strength and endurance are intact. By contrast, prolonged bed rest in humans causes profound loss of muscle strength and function. Why are hibernating bears so different from bedridden humans? Two features of bear metabolism explain why there is little or no rise in blood urea nitrogen (azotemia) and minimal loss of muscle (sarcopenia) during hibernation: (1) nitrogenous waste levels are very low because the bear primarily metabolizes fat, and (2) the majority of urea that is generated is recycled back into protein, thus bears are protected from muscle loss.

Further studies are needed to reveal the regulatory mechanisms responsible for the metabolic switches that protect hibernating bears from azotemia and sarcopenia, and to determine if such insights can benefit people with CKD.
What is a renal diet?

Dr Alison Steiber noted that the diet for people with CKD is one the most restrictive for any patient group, including guidelines that contradict current recommendations for healthy eating. Kidney patients are intolerant of high fluid volume, and they must also limit intake of electrolytes such as phosphorus, potassium, sodium, and calcium. The typical CKD diet is low in certain fruits and vegetables due to high potassium content, low in whole grains due to high phosphorus, and low in dairy due to high phosphorus and calcium. Such a diet is deficient in micronutrients and low in fiber.

Despite the importance of dietary compliance, a recent US study found that 88% of CKD patients who started on hemodialysis had never seen a dietitian; however, those who had seen a dietitian were less likely to have low serum albumin levels and less likely to die within the first year of dialysis.

Given the risk for cardiovascular disease in people with CKD, a diet containing heart-healthy fats is particularly important. For maintaining heart health, the American Heart Association recommends fats derived from foods rich in the essential fatty acids: linoleic acid (omega-6) and alpha-linolenic acid (omega 3), as found in seeds and nuts.

Vegetarian diet: is there a role in CKD?

Vegetarian diets have been used in some cultures for centuries and are now resurging in Western culture as a more healthy option. Concerns have been expressed about vegetarian diets for people with CKD because some fruits, vegetables and legumes have high potassium and phosphorus content. On the other hand, plant-based foods are generally high in fiber and antioxidants, and lower in saturated fats. In fact, results of a very recent study showed that plant-based diets with nuts and olive oil can reduce risk of heart disease by 30%.

Dr Allison Steiber summarized, “Research results, though limited, have shown vegetarian diets to be safe and without negative impact on nutritional status of people with CKD.”

Nutritional needs of renal patients

Dr Kalantar-Zadeh specifically addressed protein needs of patients with kidney disease. Before dialysis, people with poor kidney function are advised to reduce protein intake to avoid over-working the impaired kidney. With advancing failure and the use of dialysis, higher levels of protein and other calories are needed to overcome shortfalls driven by catabolic disease and by dialysis-related losses. He cited the “magic numbers” recommended for protein intake as 0.6-0.8 g protein/kg of body weight (BW)/day for patients not on dialysis and more than 1.2 g/kg BW/day for those on dialysis.

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“Magic numbers” for protein intake by people with renal disease are:
- 0.6-0.8 g/kg /day for non-dialyzed patients
- > 1.2 g/kg /day for patients on dialysis

Dr Daniel Teta (Switzerland) advised, “We need to close the nutrition gap in order to prevent PEW.” For CKD patients on dialysis, he recommended an energy intake of 30-35 kcal/kg BW/day with > 1.2 g protein/kg ideal body weight (IBW)/day. He advised that some micronutrient supplementation may be required, including the B vitamins, vitamins C and E, and trace elements such as zinc and selenium.

Dr Teta recommended other specific strategies to prevent or treat PEW:
- Ensure adequacy of dialysis dose, particularly for unstable patients who are malnourished.
- Treat metabolic acidosis with bicarbonate to offset negative effects of uremia on food intake.
- Offer regular nutritional follow-up and dietary counseling.
- Recommend oral nutrition supplements (ONS) if spontaneous nutrient intake is low.
- Encourage regular physical activity or formal exercise sessions to maintain lean body mass.
Dr Denis Fouque (France) discussed the strategies of giving supplemental ONS or intradialytic parenteral nutrition for patients on dialysis. With ONS, study results show a wide range of nutritional measures that can be improved: energy and protein intake, serum albumin, SGA, and quality of life scores. In addition, a late evening meal or ONS can reduce the length of nocturnal starvation and the associated breakdown of endogenous protein and fat stores. When enteral nutrition is not possible, e.g., with swallowing difficulties, intradialytic parenteral nutrition (glucose + fat emulsions + amino acids) can be used, as needed, to reach nutritional objectives.

Dr Fouque used a case study to underscore his messages on nutrition and kidney disease.

**Question: Why do hemodialysis patients lose weight, especially lean body mass, and how can this risk be treated?**

**Case example:** A 48-year-old man has been on hemodialysis (3-times per week) for 2 years due to kidney damage from high blood pressure and nephroangiosclerosis. Laboratory findings showed that his serum albumin was 3.9 g/dL, serum creatinine was 11 mg/dL, and urea was 150 mg/dL. Over the past 9 months, the patient has lost 15% of body weight (down to 65 kg) and now has a body mass index (BMI) of 22.5 kg/m². His SGA nutrition score is 6 on a 7-point scale, and he complains of appetite loss, nausea, and vomiting.

**Answer:** This patient is experiencing anorexia and may be showing early evidence of protein-energy wasting (PEW). It is possible that the patient may have gastrointestinal dysfunction, but his poor appetite and wasting are likely resulting from poor kidney function. As kidney function declines, urea and other waste products build up in the blood. This uremic condition, in turn, increases degradation of muscle proteins (elevated creatinine), hypoalbuminemia, and anorexia. The dialysis procedure itself also contributes to PEW; dialysis removes amino acids from the blood and can also cause inflammation. With depletion of the amino acid pool, muscle is broken down to replete the pool.

**Intervention 1 and results:** Order gastroscopy to review gastrointestinal function, and order a 3-day food recall to assess his level of spontaneous intake. Gastroscopy findings were normal. Based on the food recall, the patient consumed only 25 kcal/kg/day of energy (including 0.9 g/kg/day protein) on non-dialysis days, and 22 kcal/kg/day of energy (including 0.7 g/kg/day protein) on dialysis days. Over the next 3 months, weight loss continued (65 kg), and BMI fell further (20.8 kg/m²), while creatinine (9.0 mg/dL) and urea (100 mg/dL) levels were slightly lowered.

**Intervention 2 and results:** Recommend increasing food intake (more small meals per day; snack during dialysis; increased energy density of preferred foods) and prescribe 2 ONS daily after main meals (targeting a total of 35 kcal/kg BW/day including 1.2 g/kg/day protein). Recheck nutrition parameters and kidney function tests in a month. Weight loss continued (68kg), as did BMI (20.0 kg/m²) and serum albumin lowering (3.5 g/dL).

**Intervention 3 and results:** Because the patient was unable to follow your general nutritional advice, order addition of at least 2 kidney-disease-specific ONS for patients on dialysis (high energy, high protein, low potassium, low phosphorus) each day, possibly delivered as small servings at 3 to 5 snacks. Recheck nutritional and kidney parameters in one month. After a month, you finally see modest evidence of weight gain (58.5 kg) and increasing BMI (20.5 kg/m²) and serum albumin (3.7 g/dL). Recheck nutritional status regularly.

**Take-home messages:** PEW advances insidiously over time, so it is important to be aware of risk and advise frequent check-ups. Dietary support should be enforced, and oral nutrition is preferable over parenteral whenever possible. Increasing dietary intake can correct PEW for many patients.
Nutritional considerations for patients with diabetic nephropathy

Dr Rosa Sánchez Hernández (Spain) began her presentation by noting that risk for kidney disease is 4 times higher in people with type 2 diabetes compared to those without. Nutritional recommendations vary according to CKD severity. For people with diabetes who are overweight or obese, weight loss is recommended; either low-carbohydrate, low-fat calorie-restricted, or Mediterranean diets may be effective. Reduction of protein intake to 0.8–1.0 g/kg body weight/day in earlier stages of CKD and lowering to 0.8 g/kg body weight/day in later stages of CKD may help lower urine albumin excretion and slow the decrease in glomerular filtration. However, it is essential to ensure adequate energy intake. Malnutrition and decreased muscle strength can result from reduced energy intake and low-protein diets.

ONS: an intervention that improves survival

New evidence shows marked improvement in survival for hemodialysis patients when they consumed oral nutrition supplements. Clinicians have known for some time that oral supplements can improve nutritional markers and SGA scores in dialysis patients, yet evidence linking ONS to improved survival was lacking.

Results of a new study by Lacson and colleagues showed that consuming ONS during dialysis was indeed associated with increased survival. In an “as-treated” analysis, the research team found that hemodialysis patients had a 34% reduced risk for one-year mortality when they regularly consumed ONS during dialysis visits over a one-year interval.

ONS consumption during dialysis over a 1 year interval was associated with a 34% reduced risk of mortality.

Debate: Is there a role for a low-protein diet in non-dialyzed CKD stages 3 to 5?

Drs Denis Fouque and Alp Ikizler genially debated the “pros” and “cons” of a low-protein diet in people with kidney disease. On the “pro” side, Dr Fouque reviewed a longstanding and traditional history of limiting protein intake to slow the worsening of kidney function. This practice is supported in terms of metabolic parameters, i.e. lowered acidosis and phosphorus levels and improved lipid profiles. However, results of a recent meta-analysis (n=2,000 subjects) showed that reducing protein intake in patients significantly lowers the occurrence of renal death by 32%, as compared with higher or unrestricted protein intake.

Let them eat during dialysis: an opinion from Dr Kalantar-Zadeh

In-center high-protein meals or oral nutritional supplements during hemodialysis is a new but rational and patient-friendly strategy to prevent or treat PEW, despite concerns such as infection control and hygiene, dialysis staff burden, and phosphorus control.

If severe hypoalbuminemia (<3.0 g/dL) cannot be reversed by oral interventions, then parenteral interventions such as intradialytic parenteral nutrition can be considered.

Given the fact that meals and supplements during hemodialysis represent a very small fraction of the total cost of dialysis, this strategy also makes good economic sense.
On the “con” side, Dr Ikizler expressed concern over limited findings from a low-protein diet in full-scale clinical studies. He questioned why overall effects of a low-protein diet on kidney function were less than expected compared to strong animal data and early studies. According to Dr Ikizler, further well-controlled studies are needed to show that metabolic benefits of the low-protein diet translate into delaying CKD progression, especially studies using hard clinical outcomes such as time to initiation of dialysis, cardiovascular events, and survival. On the other hand, Dr Ikizler reported that evidence of harm from a low-protein diet does not exist.

A middle-ground strategy seems rational—a protein-restricted diet that meets individualized needs and is carefully monitored to ensure adequate caloric intake and prevention of PEW in each person. For a stage 3-5 CKD patient who is not dialysis-dependent, the recommendation is to consume 0.6 to 0.8 g protein/kg/day for most patients. If other disease is present, protein needs may be higher, so protein intake up to 1.0 g/kg/day is justified.

Dr Kalantar-Zadeh (USA) and colleagues created an algorithm for the nutritional management of non-dialyzed and dialyzed CKD patients. He described the importance of periodic assessment and counseling of patients, and discussed how to use renal-specific oral nutrition supplements (ONS) as a first choice for patients at nutritional risk. Specifically, this management algorithm recommends ONS for CKD patients with any one of these indicators:

- serum albumin < 4.0 g/dL
- poor appetite or poor oral intake
- unintentional weight loss (dry weight)
- MIS score ≥ 5 or SGA score in malnutrition range (B or C).

Exercise: does it matter?

Physical activity is very low among patients new to dialysis, and it often declines with duration of dialysis. In advancing CKD, low physical functioning is associated with poor outcomes, such as frailty and death. According to Dr Alp Ikizler, exercise is an anabolic intervention that represents an attractive strategy to improve muscle mass. However, studies have not yet shown remarkable benefits of exercise alone on body composition or physical functioning over the long-term in CKD dialysis patients.
Global perspectives on kidney nutrition

Because kidney care varies considerably around the world, the Conference provided country-specific snapshots of nutrition problems and solutions in kidney care.

India. Dr Georgi Abraham explained that end-stage renal disease develops in more than 200 people per million per year in India or at least 200,000 individuals in a population of 1 billion. Yet there are only 1000 kidney specialists to care for them. Dr Abraham reported that many end-stage renal patients die within months of diagnosis because they have no nephrologist and cannot afford treatment, especially dialysis. Use of renal-specific nutritional supplements to increase compliance with the low-protein diet can help improve nutritional status, prolong survival, and contain costs.

Brazil. According to Dr Miguel Riella, almost 100,000 Brazilians are now on dialysis. While these patients could clearly benefit from renal-specific nutritional supplements, few can afford them, and the government health care does not pay. He sees greater access to nutritional supplements as a promising approach to improving kidney care in Brazil.

Japan. Dr Takefumi Mori described lessons learned by nephrologists following Japan’s 2012 earthquake and tsunami. Because of shortages in hemodialysis supplies and equipment, many hemodialysis patients were maintained at about 50% of their usual dialysis dose. Individuals who were on peritoneal dialysis fared better in the post-earthquake days because they self-managed care. As a result, use of peritoneal dialysis is now being expanded in Japan. Also, where food shortages existed, the widely used food condiment mayonnaise was identified as a perfect emergency food for kidney patients; mayonnaise is high in calories and low in protein, potassium, and phosphorus.

Croatia. Dr Nikolina Basic Jukic, Vice-President of the Croatian Society of Nephrology, discussed Croatia’s unique strategy for managing patients with renal disease—quick transition to transplant. Of patients with end-stage renal disease, a striking 35% are given kidney transplants. This remarkable transplant rate represents one of the highest in the world. Patients remaining on dialysis are typically older and are not good candidates for the transplant procedure. Dr. Basic stated that all dialysis patients in her center receive ONS to prevent PEW.

Panama. Dr Rafael Perez-Carillo stated that the government health system only pays for kidney-specific nutritional supplements if patients already have evidence of malnutrition. Such a limitation may represent missed opportunities to save money and lives by using nutritional supplements to help prevent PEW.

Meeting faculty

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<th>Name</th>
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<tbody>
<tr>
<td>Georgi Abraham, MD, PhD</td>
<td>India</td>
<td>Rosa Sánchez Hernández, MD, PhD</td>
<td>Spain</td>
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<tr>
<td>Juan Jesús Carrero, MD, PhD</td>
<td>Sweden</td>
<td>Alison L. Steiber, PhD, RD, LD</td>
<td>USA</td>
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<tr>
<td>Denis Fouque, MD, PhD</td>
<td>France</td>
<td>Peter Stenvinkel, MD, PhD</td>
<td>Sweden</td>
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<td>Alp Ikizler, MD, PhD</td>
<td>USA</td>
<td>Daniel Teta, MD, PhD</td>
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<td>Kamyar Kalantar-Zadeh, MD, MPH, PhD</td>
<td>USA</td>
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References


