What Can My Patients Eat? Nutrition Basics for Chronic Kidney Disease

Melissa Prest MS RDN CSR LDN
December 12, 2018
About Me
Honorarium provided by Nutricia

None pose any conflict of interest for this presentation

The opinions reflected in this presentation are those of the speaker and independent of Nutricia North America
Learning Objectives

1. Distinguish nutrition recommendations and medical nutrition therapy through each stage of chronic kidney disease.
2. Explain nutritional considerations for special populations with chronic kidney disease.
3. Identify common nutrition interventions used in chronic kidney disease patients.
Focus on the Patient

Quality of Life
Quality of Life

- Quality of life (QOL) – subjective evaluation of a person’s perception about his or her happiness and satisfaction with his or her life and environment

- Health-related quality of life (HR-QoL) – a person’s physical health, psychological state, independence, and social relationships

Quality of Life

- Compared to healthy counterparts, patients treated with maintenance hemodialysis (MHD) have lower reported scores on HR-QoL tools.
- HR-QoL is often decreased in any patient dealing with the burden of chronic illness.
- Decreases in HR-QoL is associated with increased rates of morbidity and mortality.

Determinants of HR-QoL in patients on MHD include:

- Disease
- Symptom burden
  - medications, dialysis, fatigue, comorbidities
- Other non-renal factors affect HR-QoL

Factors that affect HR-QoL and Survival

- Decreased cognition
- Depression more common
- Physical function poorer
- Caregiver burden increased
- Work status disrupted
- Nutrition/diet restricted

Depression is an independent risk factor for mortality and common in chronic illness due to high symptom burden.

In patients treated with MHD, depression often leads to **poor dietary intake and poor adherence to treatment prescription**.

Depression has also been reported to be associated with increased hospitalization, sexual dysfunction, increased infection rates, sleep disturbance, disease progression, and treatment withdrawal.

Patients on MHD with poor nutritional status often report decreased HR-QoL, reported changes that lead to poorer nutrition status include:

- Altered food preferences
- Gastrointestinal symptoms
- Decreased dietary intake
- Sensory changes
- Psychosocial concerns

Decreases in HR-QoL usually occur before negative changes in nutritional status are present

<table>
<thead>
<tr>
<th>Author</th>
<th>Subjects</th>
<th>Measure</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dwyer et al.</td>
<td>1,387 MHD patients from the HEMO Study</td>
<td>HR-QoL physical component scores (PCS) to nutritional status</td>
<td>Nutrition markers (albumin, creatinine) highly correlated with PCS</td>
</tr>
<tr>
<td>Allen et al.</td>
<td>1,545 MHD patients from HEMO study</td>
<td>Nutrition factors compared to Short Form-36 (SF-36)</td>
<td>Serum albumin, creatinine, and calf circumference were independently associated with the PCS score (P ≤ .001)</td>
</tr>
<tr>
<td>Vero et al.</td>
<td>94 MHD patients</td>
<td>Cross-sectional secondary analysis using the SF-36 and 7-point scale subjective global assessment (SGA)</td>
<td>A statistically significant relationship was reported between SGA and PCS score (β = 0.275, t = 2.57, P = .012)</td>
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</table>
Chronic Kidney Disease

Introduction to CKD and Inflammation
WHAT DO THE KIDNEYS DO?

- Remove waste products from the blood
- Balance chemicals in the body
- Regulate the building of bones
- Regulate blood pressure
- Control red blood cell production
- Regulate water
What happens when Your Kidneys Fail

- Increase in uremic toxins
- Difficulty to control blood pressure
- Dysregulation of bone mineral metabolism
- Decreased red blood cell production leading to anemia
- Fluid retention and reduced urine production
- Acid base disorders
Causes of CKD

- **Causes** - hypertension, Diabetes, Peripheral vascular disease (small vessels), glomerulonephritis, Polycystic kidney disease, Alports Disease

- **Acute** - drug induced, dehydration, overdoses, hydrenephrosis

- **Diabetes** - long history of diets/medications/illness

- **Is patient very early?**
  - Microalbuminemia or traces of protein without increased creatinine or farther advanced

- **Not interested/able to make drastic diet changes?**
  - Be specific about changes desired - consider effects on BS with changes of compostion - early patients - obtain optimal control of BS and BP
<table>
<thead>
<tr>
<th>CKD stage</th>
<th>Description</th>
<th>Possible signs &amp; symptoms</th>
<th>eGFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td>Kidney damage with normal kidney function</td>
<td>High blood pressure, swelling in legs, urinary tract infections or abnormal urine test</td>
<td>90 or higher</td>
</tr>
<tr>
<td>Stage 2</td>
<td>Kidney damage with mild loss of kidney function</td>
<td></td>
<td>89-60</td>
</tr>
<tr>
<td>Stage 3</td>
<td>3a: Mild to moderate loss of kidney function; 3b: Moderate to severe loss of kidney function</td>
<td>Low blood count, malnutrition, bone pain, unusual pain, numbness or tingling, decreased mental sharpness or feeling unwell.</td>
<td>3a: 59-45  3b: 44-30</td>
</tr>
<tr>
<td>Stage 4</td>
<td>Severe loss of kidney function</td>
<td>Anemia, decreased appetite, bone disease or abnormal blood levels of phosphorus, calcium or vitamin D</td>
<td>29-15</td>
</tr>
<tr>
<td>Stage 5 End stage renal disease (ESRD)</td>
<td>Kidney failure and need for transplant or dialysis</td>
<td>Uremia, fatigue, shortness of breath, nausea, vomiting, abnormal thyroid levels, swelling in hands/legs/eyes/ lower back or lower back pain</td>
<td>Less than 15</td>
</tr>
</tbody>
</table>
Inflammation in CKD

- Low grade, systemic inflammation common in advanced stages of CKD
- Linked to acquired immune dysfunction, metabolic and nutritional derangements, and Protein Energy Wasting (PEW)
- Persistent inflammation associated with premature general and vascular aging

Causes of Inflammation in CKD

Consequences of Inflammation

- Comorbidities
- Metabolic and Nutritional Derangements
- Inflammation
- PEW
- Anemia and EPO Resistance

Medical Nutrition Therapy

Goals and Application
Medical Nutrition Therapy Goals

- Slow or stop the rate of progression of the kidney disease
- Maintain good nutritional status
- Prevent or minimize the side effects of uremia or chemical imbalances
Factors that can cause or exacerbate malnutrition in patients with kidney disease

- Increased needs for calories and protein
- Protein losses in treatments
- Inadequate dialysis treatment
- Anorexia/ decreased oral intake
- Excessive dietary restrictions
- Psychosocial problems
- Other illness (CA, HIV, DM)
Nutrition Assessment

- Nutritional screening to identify nutrition related problems
- Use a team approach – nurses may be the first to notice signs of malnutrition (Comprehensive Interdisciplinary Patient Assessment)
Parts of the Interdisciplinary Assessment

- Co-Morbid Conditions
- Dialysis Prescription
- Blood Pressure
- Fluid Management
- Laboratory Profile
- Medication History
- Anemia
- Renal bone disease
- Nutritional Status
- Psychosocial Needs
- Access Type
- Patient participation
- Transplant status
- Family Support
- Activity Level
Nutrition Assessment

- Nutritional Status
- Hydration Status
- Metabolic Parameters (diabetes)
- Anthropometrics
- Appetite and intake
- Gastrointestinal Issues
- Prescribed and over the counter meds
- Previous diets or nutrition education
- Route of Nutrition
- Self Management skills
- Attitude and Motivation
Core Components to Renal Diet

❖ Adequate calories
❖ Adequate protein
❖ Reduced sodium
❖ Phosphorus control (high or low)
❖ Potassium control (high or low)
❖ Fluid management
❖ Micronutrients
## Recommendations

<table>
<thead>
<tr>
<th></th>
<th>HD</th>
<th>PD</th>
<th>Pre-Dialysis/CKD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Protein:</strong></td>
<td>Moderate to High Needs</td>
<td>High Needs</td>
<td>Restricted</td>
</tr>
<tr>
<td><strong>K+:</strong></td>
<td>Restricted</td>
<td>Unrestricted</td>
<td>May be restricted</td>
</tr>
<tr>
<td><strong>Na:</strong></td>
<td>Restricted</td>
<td>Mild Restriction</td>
<td>May be restricted</td>
</tr>
<tr>
<td><strong>Fluid:</strong></td>
<td>Restricted</td>
<td>Usually not restricted</td>
<td>May be restricted</td>
</tr>
<tr>
<td><strong>Phosphorus</strong></td>
<td>Restricted</td>
<td>Restricted</td>
<td>Usually Restricted</td>
</tr>
</tbody>
</table>
Needs for calories differ for each stage of renal failure and age.
Calories

- Provides energy for body functions
- Present in
  - carbohydrates
  - fats
  - protein
- Caloric needs
  - 30 - 35 kcal/kg/day of lean body weight
Protein

- Necessary to make and repair cells
- Essential for growth and maintenance of body tissue
- Provides energy
- Essential to maintain osmotic pressure and fluid balance in blood
Protein

- **Needs**
  - Acute - 0.6 - 0.8 g/kg
  - CKD - 0.6 - 0.75 g/kg
  - HD – 1.2 g/kg
  - PD – 1.2 – 1.3 g/kg
  - Transplant
    - 1.3 – 2.0 post op
    - 0.8 – 1.0 chronic
Protein/Albumin

- **Protein food sources**
  - Meat, poultry, fish, eggs, cottage cheese
  - Plant based protein sources

- **Protein supplements**
  - Protein Powders
  - High Protein snack bars
  - High Calorie Renal Liquid ONS
  - Lower Calorie Non-Renal Liquid ONS
  - Hydrolyzed Concentrated protein

- **Tips to increase protein in diet**
  - Mini-meals 4-6 per day
  - Protein at every meal
Potassium

- Needs
  - Acute 2 g
  - CKD – unrestricted unless high
  - HD – 2 – 3 g
  - PD – 3 – 4 g
  - Transplant – Unrestricted unless high
Food sources of Potassium

- Banana
- Cantaloupe / Melon
- Tomato
- Potato / French Fries
- Pear
- Gatorade
- Potato Chips
- Processed Foods
- Orange Juice
- V8
- Prunes
- Raisins
- Mango
- Avocado
- Milk (also soy milk)
- Nuts
Sodium

- **Needs**
  - Acute: 1 – 2 g
  - CKD: 1 – 3 g
  - HD: 1 – 3 g
  - PD: 2 – 4 g
  - Transplant: 2 – 4 g

- **Excessive salt restricted**
  - Recommend ~2,000 mg.
  - Recommendation for average American is 2300 mg
  - Average intake is 4000 mg

The vast majority of the sodium consumed is from processed and restaurant foods; only a small portion is used in cooking or added at the table.
Fluid Needs

- Acute – Output plus 500 cc
- CKD – no restriction
- HD – Output plus 1000 cc
- PD – Maintain balance
- Transplant – unrestricted unless overloaded
Phosphorus

- Needs
  - Acute – maintain WNL
  - CKD – 10 mg/kg/day
  - HD – 17 mg/kg or 10-12 mg/gm protein
  - PD – Same as HD
  - Transplant - RDA
Phosphorus

- Phosphorus is restricted in HD and PD.
- Phosphorus is not well dialyzed.
- Phosphorus found naturally in many foods and is added to almost EVERYTHING in food processing!
- Organic (naturally occurring sources) better than inorganic (food additives) for phosphorus control
- Diet, dialysis, binders for control
Quick Guide to Food Labels: For those with kidney disease

**SERVING SIZE:**
Look here first. Make sure you calculate how much you’re getting based on the serving size.

**SODIUM:**
Look at the “mg” and NOT the “%”
- Less than 2000mg/day
- Less than 600 mg/meal
- Less than 100-200 mg/snack

**POTASSIUM:**
This listing is not required. No listing doesn’t mean no potassium.
- Low Potassium: < 100mg or <3%
- Medium: 101-200mg or 3-6%
- High: 201-300mg or 6-9%
- Very High: >300mg or >9%
Quick Guide to Food Labels: For those with kidney disease

**PHOSPHORUS:**
Low phosphorus: <50mg or <5%
Medium: 51-150mg or 5-15%
High: >150mg or >15%

Phosphorus usually is not on the label, so you will have to read the ingredient list. Look for words with “phos” in them.

- Phosphoric Acid
- Hexameta-phosphate
- Monocalcium Phosphate
- Tricalcium Phosphate

Stay away from added phosphorus. It can easily add up to 1000mg phosphorus per day.
Calcium

- **Needs**
  - Acute – maintain serum levels WNL
  - CKD – 1.0 – 1.5 g <2 – 2.5 including binder load
  - HD and PD - <2 – 2.5 including binder load
  - Transplant - 0.8 – 1.5g
Vitamins and other minerals

- **Vitamins**
  - Water Soluble
  - Vitamin D

- **Minerals**
  - Iron
  - Zinc
Micronutrient Deficiencies in Dialysis

- Chronic HD pts have been documented as substantially protein-energy malnourished
- Kcal and protein intake shown to be significantly lower than recommended levels for maintenance of body weight, lean body mass and fat stores in HD pts
- Chronic HD population at risk for reduced intake of vitamins, minerals, trace elements associated with adequate energy, protein
Possibly deficient micronutrients

- Pyridoxine (Vitamin B6)
- Cyanocobalamin (Vitamin B12)
- Folic Acid
- Vitamin C
- Iron
- Zinc
Causes for micronutrient deficiencies

- **Uremia**
  - alters disposition and metabolism of all aforementioned vitamins and minerals

- **Losses of essential vitamins, minerals during processes of HD**
  - water-soluble vitamins easily cross HD membranes, lost in dialysate
  - more pronounced in high-flux than in high efficiency dialysis
Causes for deficiencies (cont.)

- Poor dietary intake
  - excessive dietary restriction (K+, phos)
  - suboptimal intake of HBV protein, carbohydrate, fat, overall calories

- Medications
  - anti-neoplastic, anti-convulsant
  - birth control, amino acid, or ethanol medications
  - anti-hypertensives i.e. hydralazine (B6)
  - most likely to impact B6, B12, folate status
Guidelines to Supplementation

- Prevention and Maintenance
  - Generally, all HD pts benefit from supplementation of water-soluble vitamins
  - Several products containing B-complex vitamins and Vitamin C exist for use in HD population
Guidelines to Supplementation (Cont.)

- Prevention and Maintenance
  - Conduct nutrition physical exam quarterly
  - Document and follow up areas of particular concerns
  - Monitor serum levels of nutrients for which deficiency is suspected as indicated
  - Adjust supplementation PRN
Anti-inflammatory Interventions

1. Increasing Fiber
2. Increasing Omega-3 Fatty Acids
3. Soy Intake
4. Pomegranate Juice
5. Decaffeinated Green Tea Extracts (catechins)
6. Decreasing Fructose Intake
7. Addition of Nuts and Seeds (gamma-tocopherol)
8. Adding Probiotics/Prebiotics

Intestinal Microbiota

- Progression of CKD associated with metabolic alterations that change the balance of healthy and unhealthy bacteria in the gut.
- Cause bacterial overgrowth, loss of barrier integrity, and increase in bacterial translocation.
- May contribute to CKD progression, accelerated atherogenesis, and PEW.

Modulation of Gut Microbiota

- Prebiotics
- Probiotics
- Dietary Fiber

Fiber adds a benefit in CKD patients to the integrity of the intestinal wall and reducing uremic toxins

- Soluble Fiber
- Insoluble Fiber
- Resistant Starch
Pre- and Probiotics

- Live, beneficial bacteria (probiotics)
- Have been consumed for thousands of years
- Selectively fermented ingredient (prebiotic)
- Available in foods, commercial supplements, and fortified foods
- Used to re-establish microbial balance
- Other benefits from non-CKD clinical trials suggest improvement in blood glucose control, hypertension, weight management, and urinary tract infections
- Fundamental principle of dietetic practice is to recommend nutrients from food sources first, followed by supplements

Prebiotic

- Non-digestible food ingredient that has a beneficial effect through its selective stimulation of the growth or activity of one or a limited number of bacteria in the colon

- Inulin, fructo-oligosaccharides, galacto-oligosaccharides, soya-oligosaccharides, xylo-oligosaccharides, and pryodextrins

- Possibly promotes Bifidobacteria species, mediates weight loss, reduces inflammation, and improves metabolic function

- High fiber intake associated with lower risk of inflammation and reduced mortality in CKD patients

Prebiotic Food Sources

- Asparagus: inulin
- Rye Bread: inulin
- Canned Beans: galacto-oligosaccharide
- Lentils: galacto-oligosaccharide
- Nectarines: fructo-oligosaccharides
- *resistant starches

Probiotic

- Live organisms which offer a health benefit
- Bifidobacteria species, lactobacilli, and streptococci
- Can alter gut microbiota and affect the inflammatory state
- Animal studies show prolonged life in CKD with probiotics
- Human studies show decreases in uremic toxin

Probiotic Food Sources

- Yogurt (fermented milk product): Lactobacillus bulgaricus and Streptococcus thermophilus
- Kefir (fermented milk beverage): Lactobacillus and Lactobobbus genera, and yeast
- Kombucha (tea): Gluconacetobacter, Lactobacillus and Zygosaccharomyces (yeast)
- Kimchi and Sauerkraut: Leuconostoc, Lactobacillus, Pediococcus and Streptococcus genera
- Natto (fermented soy beans): Bacillus subtilis specie

Summary


References


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2) Once webinar code is obtained, visit www.NutriciaLearningCenter.com and click on ‘CE Credit Request’
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