Nutrition in CKD Guideline Update
Part 2: Nutrition Assessment

Introduction

Objectives
- Interpret the guideline recommendations and supporting evidence related to nutrition assessment.
- Compare the differences between the 2000 and 2020 nutrition guidelines.
- Discuss implementation strategies for best clinical practices.

Agenda
- Laura Byham-Gray, PhD, RDN, FNKF
  - Introduction
  - Nutrition Screening and Assessment Tools
  - Body Composition
- Jerrilynn Burrowes, PhD, RDN, FNKF
  - Laboratory Measurements
  - Dietary Intake
  - Conclusion

Questions
Clinical Practice Guidelines

CPGs are statements that include recommendations intended to optimize patient care that are informed by systematic reviews of evidence and an assessment of benefits and harms of alternative care options.

Renal Nutrition Evidence-Based Practice Guidelines (EBPG)

Collaborating on Guideline Development

National Kidney Foundation: Kidney Disease Outcomes Quality Initiative + Academy of Nutrition and Dietetics = Multi-disciplinary, Multi-organizational EBPG

Population and Dates

KDOQI 2000 guideline
- Population: Advanced CRF, Maintenance Dialysis

KDOQI-AND guideline
- Population: Adults with Chronic Kidney Disease stages 1-5 including dialysis and post-kidney transplant
- Literature search dates: 1985 – 2018*

GRADE Methodology

Assigns separate grades for:
1) Evidence Quality
2) Strength of Recommendation

Co-Chairs: T. Alp Ikizler, MD and Lillien Cuppari, PhD

Macronutrients
- Laura Byham-Gray, PhD, RDN, FNKF (Chair)
- Denis Fouque, MD, PhD
- Winnie Chan, PhD, RD
- Jerrilynn Burrowes, PhD, RD, CDN
- Daniel Teta, MD, PhD

Micronutrients
- Angela Wang, MD, PhD (Chair)
- Jordi Fuchs, DSc, APN,NP-C,RD
- Joel Kopple, MD
- Sana Ghaddar, PhD, RDN
- Alp Ikizler, MD

Electrolytes and other nutrients
- Juan Jesus Carrero, PhD Pharm, PhD Med, MBA (Chair)
- Katrina Campbell, PhD, RD
- George Kaysen, MD, PhD
- Allon Friedman, MD, FASN
- Lilian Cuppari, PhD

Guideline work group decision
Nutrition Assessment

Guideline Objectives

Target Population
✓ Adult <18+
✓ Both sexes
✓ CKD 1-5 and transplant
✓ AKD and Critical illness excluded

Interventions and Practices Considered by WG
✓ Nutrition screening, assessment, and diagnosis
✓ Nutrition intervention
✓ Nutrition monitoring and evaluation

EBPG: Sample Clinical Questions

✓ Assessment Questions: Methods to assess:
  • dietary intake requirements of protein, energy, micronutrients etc.
  • nutritional status and body composition

✓ Nutrition Intervention Questions:
  • Effect of:
    • Macronutrient distribution intake on outcomes
    • Protein type (animal vs plant) intake on outcomes
    • Glycemic index/load intake on outcomes
    • Fat type (saturated, unsaturated) on outcomes
    • Specific dietary patterns on outcomes
    • Energy intake on outcomes
    • Methods of replenishment of nutrients

Assessment Recommendations: Usual Care

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<tr>
<td>No specific screening recommendation</td>
<td>Subjective Global Nutritional Assessment (SGA)</td>
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<tr>
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<td>7-point Subjective Global Assessment (SGA)</td>
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<tr>
<td>N/A</td>
<td>Malnutrition Inflammation Score (MIS)</td>
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Nutrition Screening & Assessment Tools
Supporting evidence: Composite nutritional indices

<table>
<thead>
<tr>
<th>Name of Tool</th>
<th>n</th>
<th>Quality of Evidence</th>
<th>Notes</th>
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<td>Subjective Global Assessment (SGA)</td>
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<td>7</td>
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- SGA is valid and clinically useful to assess protein energy nutritional status.
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Nutrition Assessment

**Which Weigh??**

<table>
<thead>
<tr>
<th>Example</th>
<th>IBW</th>
<th>Hamwi</th>
<th>SBW</th>
<th>BMI 22–25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female, 59 years old, 152 cm, large frame</td>
<td>55.0–62.0 kg</td>
<td>45.5 kg</td>
<td>78.0 kg</td>
<td>50.8–57.8 kg</td>
</tr>
<tr>
<td>Male, 45 years old, 165 cm, large frame</td>
<td>63.9–72.0 kg</td>
<td>61.9 kg</td>
<td>79.0 kg</td>
<td>59.9–68 kg</td>
</tr>
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</table>

**Assessment Recommendations: Body Composition**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>Anthropometric measures are valid and</strong></td>
<td><strong>Anthropometric measures are valid</strong></td>
<td><strong>Changes</strong></td>
</tr>
<tr>
<td><strong>and clinically useful indicators</strong></td>
<td><strong>and clinically useful indicators</strong></td>
<td><strong>Changes</strong></td>
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<tr>
<td><strong>of protein-energy nutritional status in</strong></td>
<td><strong>of protein-energy nutritional status in</strong></td>
<td><strong>Changes</strong></td>
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<tr>
<td><strong>maintenance dialysis patients. (Evidence and Opinion)</strong></td>
<td><strong>maintenance dialysis patients. (Evidence and Opinion)</strong></td>
<td><strong>Changes</strong></td>
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<tr>
<td><strong>These measures include percent usual</strong></td>
<td><strong>These measures include percent usual</strong></td>
<td><strong>Changes</strong></td>
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<tr>
<td><strong>body weight, percent standard</strong></td>
<td><strong>body weight, percent standard</strong></td>
<td><strong>Changes</strong></td>
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<tr>
<td><strong>body weight, body mass index (BMI), skinfold</strong></td>
<td><strong>body mass index (BMI), skinfold</strong></td>
<td><strong>Changes</strong></td>
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<tr>
<td><strong>thickness, estimated percent body fat, and mid</strong></td>
<td><strong>thickness, estimated percent body fat, and mid</strong></td>
<td><strong>Changes</strong></td>
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<tr>
<td><strong>arm muscle area, circumference, or diameter.</strong></td>
<td><strong>arm muscle area, circumference, or diameter.</strong></td>
<td><strong>Changes</strong></td>
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</table>

**1.1.13 In adults with CKD 5D,** we suggest that waist circumference may be used to assess abdominal obesity, but its reliability in assessing changes over time is low (2C).

**New**

**1.1.14 In adults with CKD 5D on MHD,** we suggest that the conicity index may be used to assess nutritional status (OPINION) and as a predictor of mortality (2C).

**BMI + Waist Circumference as Disease Risk Indicators**

- **Men <40; Women <35**
- **Men: ≥102 cm**
- **Women: ≥88 cm**

**Conicity Index Predicts Inflammation, Poor Outcomes**

- Sample=173 subjects; 58% male
- An increased abdominal fat deposition measured by conicity index was associated with worse outcome independently of age, sex, comorbidities and dialysis vintage [Cox HR 1.93 (95% CI=1.06–3.49)]

"Body weight is a complicated measure in CKD..."...

...and requires careful, clinical interpretation. Regardless of stage of CKD, body weight should be measured serially, and any sudden changes in body weight (e.g., unintentional weight loss or weight gain) can indicate serious changes in health status. A patient’s weight history, and comparison to his/her usual body weight over time assists in determining risk for PEW as well as establishing optimal health goals. When using published weight norms in the anthropometric assessment of adult CKD patients, caution must be used as each norm has significant drawbacks."

KDOQI WorkGroup

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Assessment Recommendations: Laboratory Measurements (1)

KDOQI-AND (2020)  
Changes

<table>
<thead>
<tr>
<th>Use of panels of nutritional measures</th>
<th>Single biomarker measurements</th>
<th>Updated</th>
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</thead>
<tbody>
<tr>
<td>➢ Nutritional status in maintenance dialysis patients should be assessed with a combination of valid, complementary measures rather than any single measure alone (Opinion).</td>
<td>➢ In adults with CKD 1-5D or posttransplantation, biomarkers such as normalized protein catabolic rate (nPCR), serum albumin, and serum prealbumin (if available) may be considered complementary tools to assess nutritional status. However, they should not be interpreted in isolation to assess nutritional status as they are influenced by non-nutritional factors (DR/NDR).</td>
<td>Includes nondialysis CKD and post-transplantation.</td>
</tr>
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Supporting Evidence: Lab Measurements (2)

**Normalized protein catabolic rate (nPCR)**
- 7 studies examined the relationship between nPCR and comparative measures in patients with CKD and MHD.
- 3 studies in MHD
- 2 in PD
- 1 in both MHD and PD
- 1 in CKD patients not receiving dialysis
- Predicted serum albumin concentration and mortality in MHD patients.
- In PD patients, the relationship between nPCR and body composition measurements was unclear, and the relationships with other measures of nutritional status varied.

Supporting Evidence: Lab Measurements (3)

**Serum prealbumin concentration**
- 4 studies examined the relationship between serum prealbumin and comparative measures in patients with CKD.
- 3 studies in MHD patients
- 1 in PD patients
- Evidence showed that serum prealbumin concentration was associated with nPCR, inflammatory marker levels, lean and fat tissue indices, hospitalizations and mortality in MHD patients only.

Assessment Recommendations: Laboratory Measurements (2)

<table>
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<tbody>
<tr>
<td>Serum albumin levels</td>
<td>➢ Serum albumin is a valid and clinically useful measure of protein-energy nutritional status in maintenance hemodialysis (MD) patients (Evidence).</td>
<td>includes nondialysis CKD and post-transplantation.</td>
</tr>
<tr>
<td>Serum albumin levels</td>
<td>➢ In adults with CKD 5D on MHD, serum albumin may be used as a predictor of hospitalization and mortality, with lower levels associated with higher risk (1A).</td>
<td>Updated</td>
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Assessment Recommendations: Laboratory Measurements (3)

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Serum prealbumin</td>
<td>No specific statement</td>
<td>Updated</td>
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<tr>
<td>Serum creatinine</td>
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<tr>
<td>Serum cholesterol</td>
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Serum prealbumin, creatinine and cholesterol are valid and clinically useful measures of protein-energy nutritional status in maintenance hemodialysis dialysis (MD) patients (Evidence and Opinion).

Supporting Evidence: Lab Measurements (4)

Serum albumin concentration
- 16 observational studies that compared serum albumin with other methods used to assess nutritional status:
  - 12 studies with MHD patients
  - 2 with PD patients
  - 2 with both MHD and PD patients
- Evidence suggests that lower serum albumin predicted mortality in both MHD (3 studies) and PD patients (2 studies).

Implementation Strategies for Best Practices

Factors to consider when implementing the guidelines for laboratory measurements:
- Fluid status
- Presence of systemic inflammation
- Presence and extent of proteinuria
- Level of residual kidney function

Assessment Recommendations: Dietary Intake (1)

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<tbody>
<tr>
<td>No specific recommendation</td>
<td>Conditions When Assessing Dietary Intake</td>
<td>Updated</td>
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<tr>
<td></td>
<td>➢ In adults with CKD 3-5D or posttransplantation, it is reasonable to assess factors beyond dietary intake (e.g., medication use, knowledge, beliefs, attitudes, behavior, access to food, depression, cognitive function) to effectively plan nutrition interventions (Opinion).</td>
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Assessment Recommendations: Dietary Intake (2)

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<tbody>
<tr>
<td>Dietary Interviews and Diaries</td>
<td>3-Day Food Records to Assess Dietary Intake</td>
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<tr>
<td>➢ Dietary interviews and/or diaries are valid and clinically useful for measuring dietary protein and dietary energy intakes in maintenance dialysis patients (Evidence and Opinion).</td>
<td>➢ In adults with CKD 3-5D, we suggest the use of a 3-day food record, conducted during both dialysis and nondialysis treatment days (when applicable), as a preferred method to assess dietary intake (2C).</td>
<td>Includes nondialysis CKD</td>
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### Assessment Recommendations: Dietary Intake (3)

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<tr>
<td>No specific recommendation</td>
<td>Alternative Methods of Assessing Dietary Intake</td>
<td>New</td>
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<tr>
<td>➢ In adults with CKD 3-5 (Opinion) or CKD 5D (20), 24-hour food recalls, food frequency questionnaires, and nPCR may be considered as alternative methods of assessing dietary energy and protein intake (20).</td>
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### Assessment Recommendations: Dietary Intake (4)

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<tr>
<td>Protein Equivalent of Protein Nitrogen Appearance (PNA)</td>
<td>Included in “Alternative Methods for Assessing Dietary Intake”</td>
<td>New</td>
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<tr>
<td>➢ PNA or protein catabolic rate (PCR) is a valid and clinically useful measure of net protein degradation and protein intake in maintenance dialysis (MD) patients (Evidence).</td>
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### Supporting Evidence: Tools/Methods Used to Assess Protein and Calorie Intake

- 6 studies reported on the use of methods to assess protein and energy intake in individuals with CKD.
- 2 studies each in nondialyzed, MHD and PD patients
- 3-Day Food Records/Diaries to Assess Dietary Intake
  - 4 studies examined food records/diaries for assessing dietary intake of protein and calories; they were reliable and correlated with reference standards.
  - 2 studies in nondialyzed and MHD patients found that food records can provide accurate information if patients are instructed and trained and food intake is recorded for at least 7 days.

### Supporting Evidence: Tools/Methods Used to Assess Protein and Calorie Intake

- Alternative Methods of Assessing Dietary Intake
  - Food frequency questionnaire
    - In MHD patients, 1 validation study compared the Block Brief 2000 FFQ against a 3-day food diary
    - Results showed that the Block Brief 2000 food frequency questionnaire underestimated energy and macronutrient intake in patients receiving HD.
  - Protein catabolic rate
    - 3 studies (1 each in CKD, MHD and PD) examined the use of PCR to assess protein intake.
    - Significant correlations were found between PCR and food records.
    - In PD patients, PCR normalized to desirable body weight was positively correlated better with blood urea nitrogen and Kt/V.

### Implementation Strategies for Best Practices

Factors to consider when implementing the guidelines for measuring dietary intake:
- Accurate reporting of dietary intake inclusive of portion sizes.
- Assess dietary intake using multiple complementary methods, such as FFQ and 24-hour urine collection to measure urinary urea nitrogen, sodium, and potassium to confirm the accuracy of dietary intake estimates.
- Conduct a dietary assessment at the initial visit and whenever there is a change in health status or as per institutional or regulatory policies.
- Determine the frequency with which nPCR should be calculated.
The 2020 guidelines:

- are an excellent report on the state of knowledge and available evidence on nutrition in CKD at the time of writing.
- provide an important and needed update to the 2000 nutrition guidelines based on newly available data.
- highlight gaps in knowledge which should be used to guide future investigative efforts.

Read the complete guidelines on the National Kidney Foundation’s website at: [https://www.kidney.org](https://www.kidney.org)