

# Nutrition in Dialysis and IDPN

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Board of Directors

The National Forum of the ESRD Networks

Editor-in-Chief

*Journal of Renal Nutrition (JREN)*

[www.JRNjournal.org](http://www.JRNjournal.org)



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## Disclosure of Financial Relationships

**Kamyar Kalantar-Zadeh, MD, MPH, PhD**

Dr. K. Kalantar-Zadeh has received honoraria and/or support in different forms from Abbott, Abbvie, Alexion, Amgen, ASN (American Society of Nephrology), Astra-Zeneca, Aveo, Chugai, DaVita, Fresenius, Genentech, Haymarket Media, Hofstra Medical School, IFKF (International Federation of Kidney Foundations), ISH (International Society of Hemodialysis), International Society of Renal Nutrition & Metabolism (ISRNM), JSDT (Japanese Society of Dialysis Therapy), Hospira, Kabi, Keryx, Novartis, NIH (National Institutes of Health), NKF (National Kidney Foundations), Pfizer, Relypsa, Resverlogix, Sandoz, Sanofi, Shire, Vifor, UpToDate, ZS-Pharma.

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## Objectives

1. To examine pathophysiology and clinical implications of protein-energy wasting, sarcopenia, cachexia and malnutrition in CKD with focus on dialysis patients (ESRD).
2. To discuss role of serum albumin as a potential maker in PEW
3. To review data on high protein intake and IDPN in CKD patients on dialysis.

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### Nutritional and Dietary Management of Kidney Disease: A Patient Care Approach

- **We are what we eat: Learn how to enforce kidney health through nutrition and diet**
- **Saturday, Feb. 29, 2020 – 7:30 am - 4:45 pm**
- **University of California Irvine (UCI) Medical Center, Bldg. 53, Auditorium 101**
- **The City Drive South, Orange, California 92868, USA**
- **UCI Nephrology has teamed up with the nation's leading experts to leverage their interests and expertise to provide insights on real-world clinical management and hands-on workshops for dietary approaches.**
- This is a full-day CME course for physicians (nephrologists, internists, urologists and family practitioners) and other healthcare providers and allied health professionals (dietitians, nurses, nutritionists and researchers) who will learn the pathophysiology and mechanisms related to the role of nutrition in kidney disease and kidney health.

#### SAVE THE DATE

##### Nutritional and Dietary Management of Kidney Disease: A Patient Care Approach

*We Are What We Eat: Learn How to Enforce Kidney Health through Nutrition and Diet*

UCI Nephrology has teamed up with the nation's leading experts to leverage their interests and expertise to provide insights on real-world clinical management and hands-on workshops for dietary approaches.

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#### UCI Health

**Saturday, February 29, 2020**  
7:30 a.m. to 4:45 p.m.

**UCI Health Medical Center**  
Bldg. 53, Auditorium  
101 The City Drive South  
Orange, CA 92868

For more information,  
Kristine Fuentesbella at [Kfuentesb@uci.edu](mailto:Kfuentesb@uci.edu) | 714-456-5142



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## Sources of this Presentation

- Two Textbooks and a Review Article:

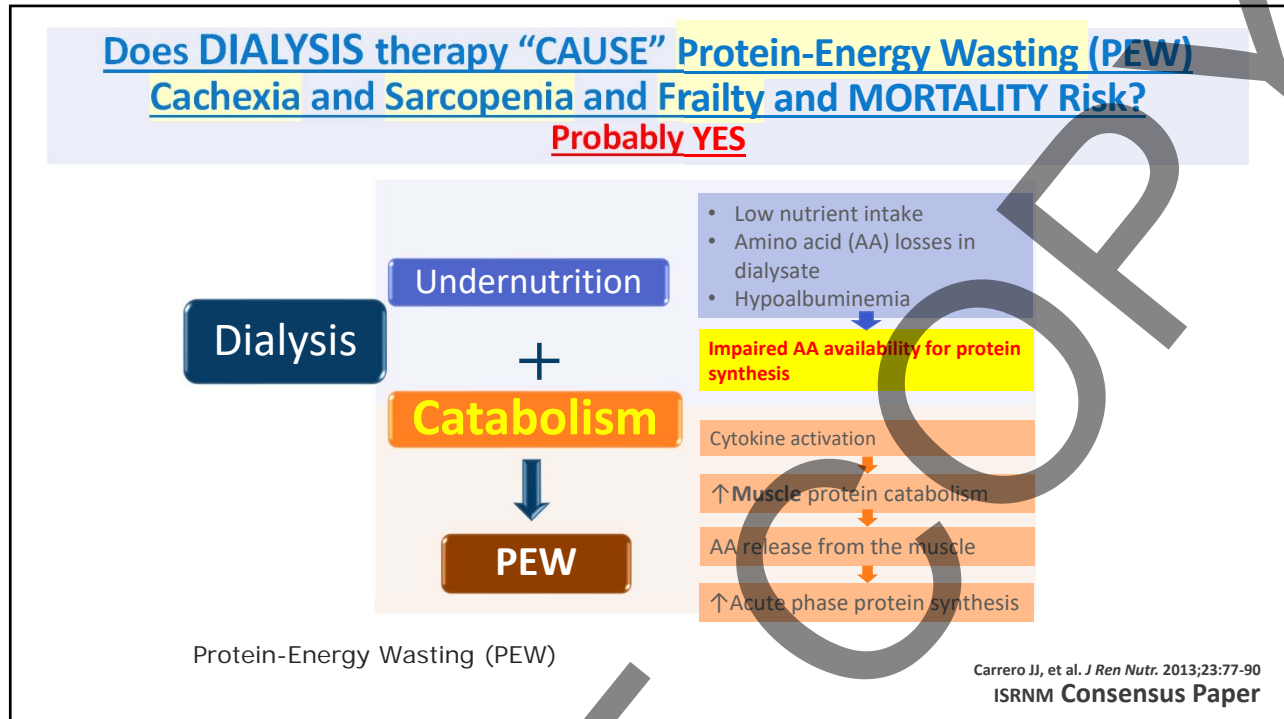


- Kopple, Massry & Kalantar-Zadeh, Nutritional Management of Renal Disease. 3rd Edition, 2013
- Rhee, Kalantar-Zadeh, Brent, Endocrine Disorders in Kidney Disease, 2019
- Kalantar-Zadeh & Foque, Nutritional Management of CKD. NEJM Nov 2, 2017

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Part 1  
**Does Transition to Dialysis  
 Affect the Nutritional Status and  
 Survival?**

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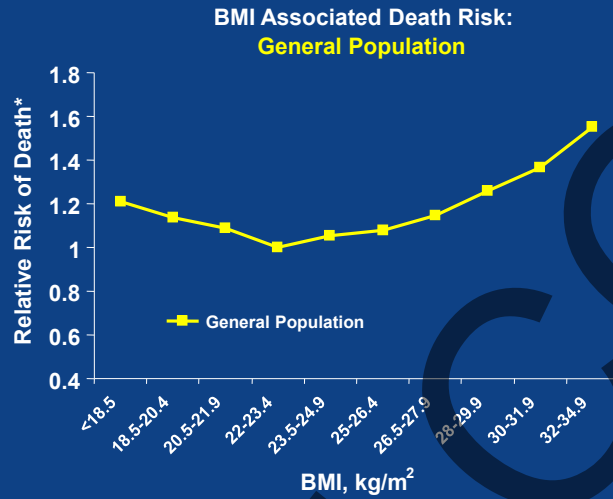
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**Is higher weight good or bad in dialysis patients?**

**Obesity Paradox  
 Reverse Epidemiology**

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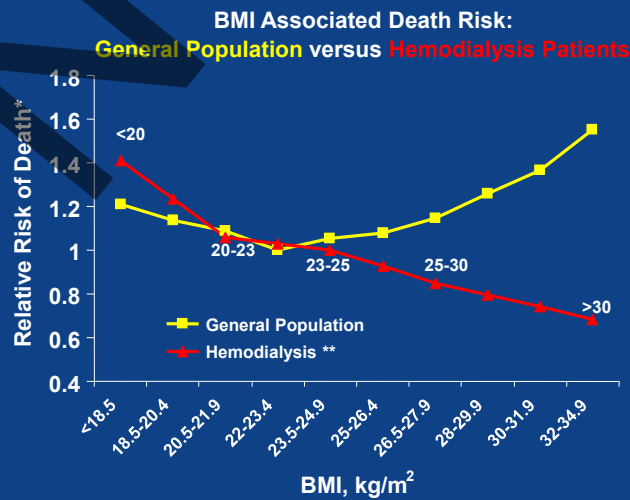
## BMI → ↑ Death in the General Population



Kalantar-Zadeh et al. *Kidney Int.* 2003;63:793-808.

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## Reverse Epidemiology in Dialysis Patients



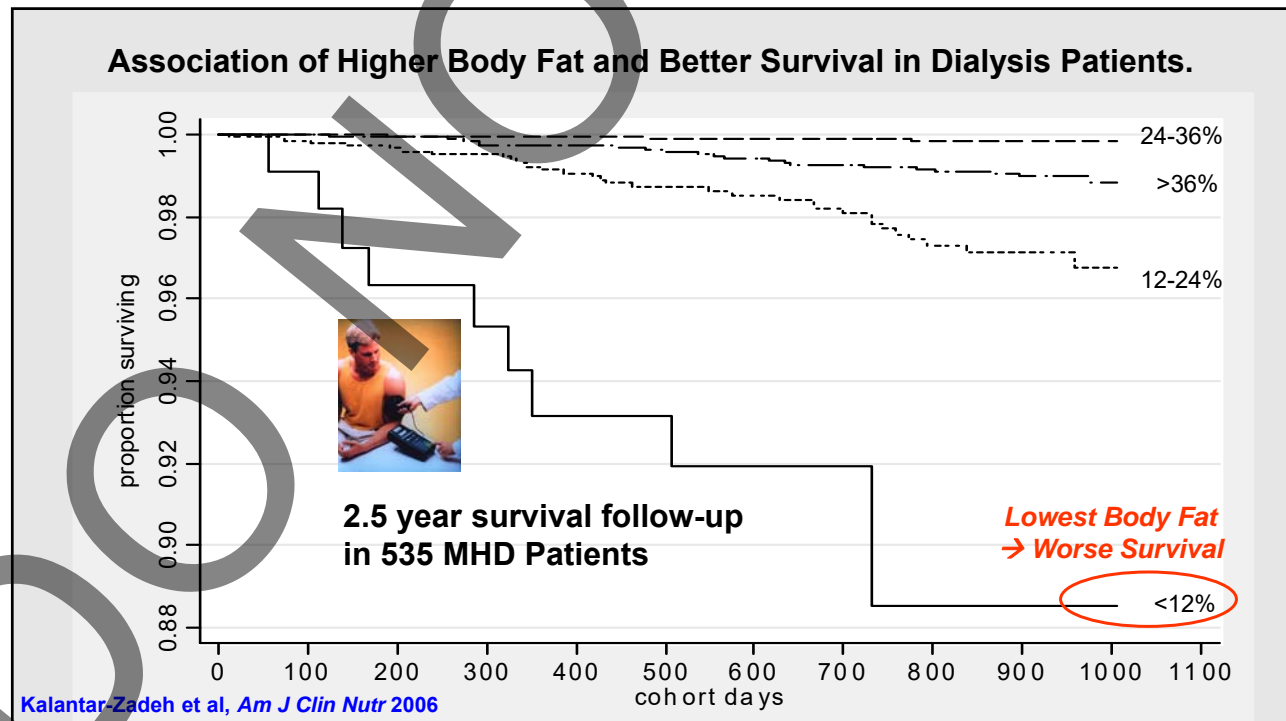
Kalantar-Zadeh et al. *Kidney Int.* 2003;63:793-808.

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## What is “Dry Weight” loss? Fat or Muscle?

- Higher weight is good in dialysis patients?
- Does higher mean higher “fat” or higher “muscle”?

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## Protein-energy wasting: How about **MUSCLE**?

- French multicenter study, n=7,123



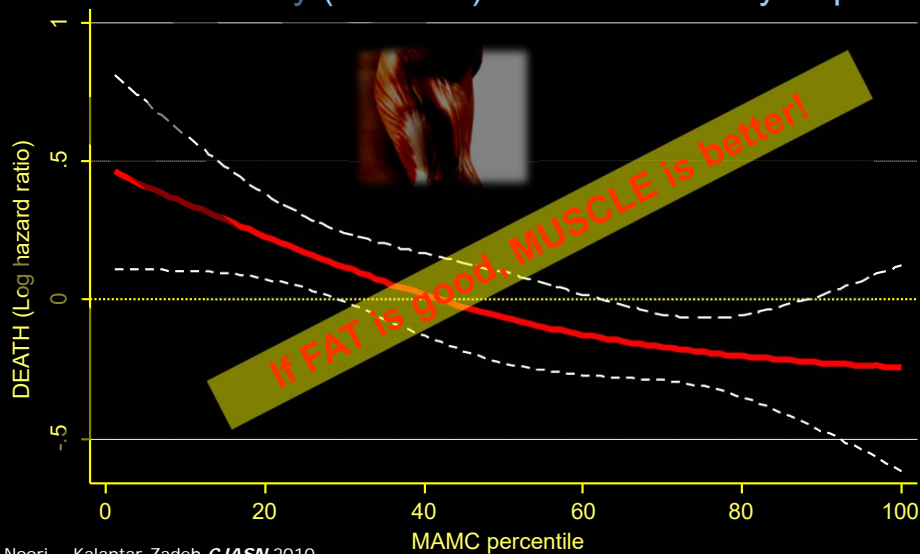
BMI < 20 kg/m <sup>2</sup>	24 %
Muscle mass < 90 % th.	62 %
Serum Albumin < 35 g/l	20 %
Serum transthyretin < 300 mg/l	36 %
nPNA < 1 g/kg/j	35 %

Aparicio et al. *Nephro Dial Transplant* 1999

Courtesy Prof. N. Cano

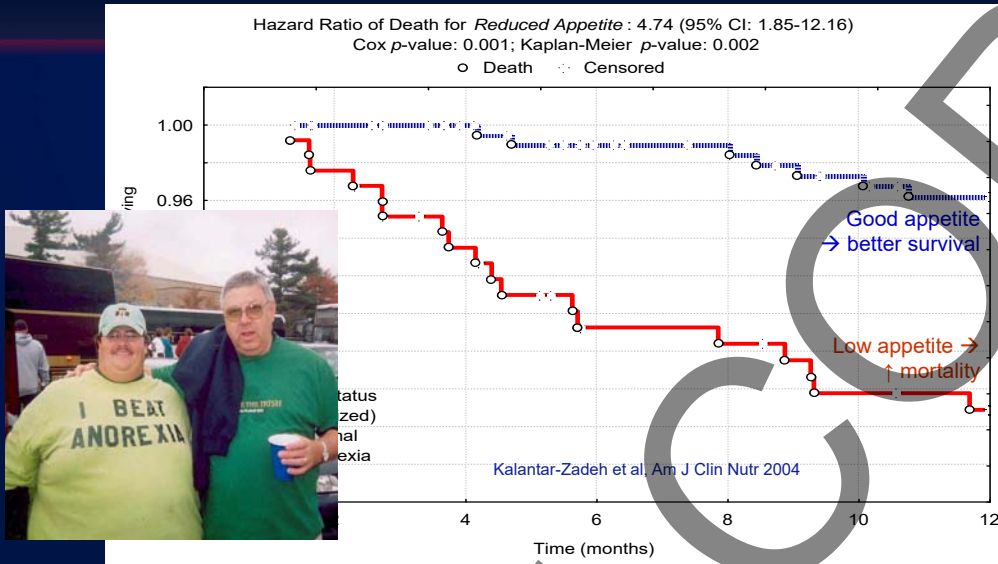
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## Mid-Arm Muscle Circumference and 5-Year Mortality (2001-06) in 792 hemodialysis patients



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# Appetite and Dialysis Outcomes



Kalantar-Zadeh ... Kopple. Am J Clin Nutr. 2004;80:299-307

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## Part 2 Nutritional Assessment Tools and Markers in CKD and Dialysis Patients

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## Protein-Energy Wasting (PEW) Diagnosis

<http://www.kidney-international.org> meeting report  
© 2007 International Society of Nephrology

**A proposed nomenclature and diagnostic criteria for protein-energy wasting in acute and chronic kidney disease**

D Fouque<sup>1,2</sup>, K Kalantar-Zadeh<sup>2,17</sup>, J Kopple<sup>2</sup>, N Cano<sup>3</sup>, P Chauveau<sup>4</sup>, L Cuppari<sup>5</sup>, H Franch<sup>6</sup>, G Guarnieri<sup>7</sup>, TA Ikizler<sup>8</sup>, G Kayser<sup>9,10</sup>, B Lindholm<sup>11</sup>, Z Massy<sup>12,13</sup>, W Mitch<sup>14</sup>, E Pineda<sup>15</sup>, P Stenvinkel<sup>11</sup>, A Treviño-Secera<sup>15</sup> and C Wanner<sup>16</sup>

**ISRNM suggested  
3 out of 4 criteria → PEW**

**Table 1 | Readily utilizable criteria for the clinical diagnosis of PEW in AKI or CKD**

Criteria	
<b>Serum chemistry</b>	<b>Serum Chemistry</b>
Serum albumin < 3.8 g per 100 ml (Bromocresol Green) <sup>a</sup>	
Serum prealbumin (transthyretin) < 30 mg per 100 ml (for maintenance dialysis patients only; levels may vary according to GFR level for patients with CKD stages 2-5) <sup>a</sup>	
Serum cholesterol < 100 mg per 100 ml <sup>a</sup>	
<b>Body mass</b>	<b>Body Mass</b>
BMI < 23 <sup>b</sup>	
Unintentional weight loss over time: 5% over 3 months or 10% over 6 months	
Total body fat percentage < 10%	
<b>Muscle mass</b>	<b>Muscle Mass</b>
Muscle wasting: reduced muscle mass 5% over 3 months or 10% over 6 months	
Reduced mid-arm muscle circumference area <sup>c</sup> (reduction > 10% in relation to 50th percentile of reference population)	
Creatinine appearance <sup>d</sup>	
<b>Dietary intake</b>	<b>Dietary Intake</b>
Unintentional low DPI < 0.80 g kg <sup>-1</sup> day <sup>-1</sup> for at least 2 months <sup>e</sup> for dialysis patients or < 0.6 g kg <sup>-1</sup> day <sup>-1</sup> for patients with CKD stages 2-5	
Unintentional low DEI < 25 kcal kg <sup>-1</sup> day <sup>-1</sup> for at least 2 months <sup>e</sup>	

Fouque, Kalantar-Zadeh, Kopple ... Wanner *Kidney International* 2008

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# Serum ALBUMIN

**Low Albumin → Death**

**High Albumin → Survival**

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Question

**Which of the following is the strongest predictor of BFR and SURVIVAL in dialysis patients?**

- A. Higher blood hemoglobin
- B. Lower serum phosphorus
- C. Higher serum albumin
- D. Lower serum Calcium

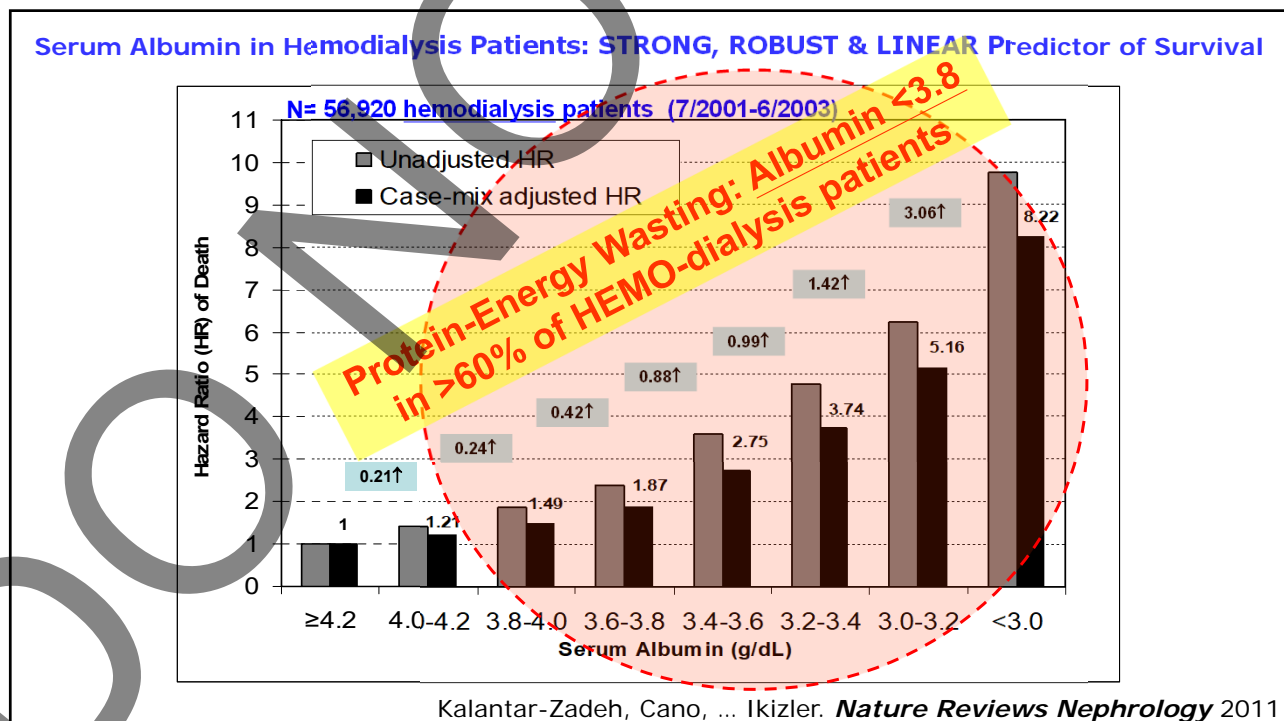
**Tweet**

Int'l Society of Renal Nutrition and Metabolism  
@ISRNM\_Social

Should serum albumin be used as a marker of nutrition in patients with CKD? Check out this debate between @kamkaltar and @JoanneBargman at #ISRNM2020

5:54 AM · Jan 17, 2020 · Twitter Web App

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## Does it matter to be twice-a week or thrice a week HD?

ORIGINAL RESEARCH

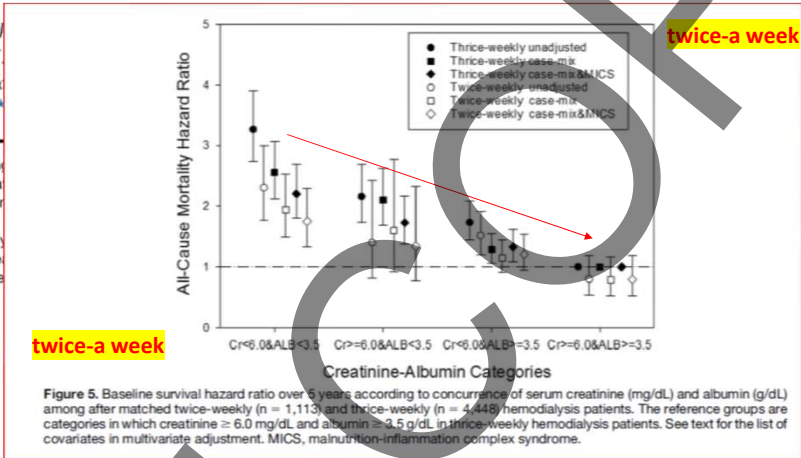
### Concurrence of Serum Creatinine and Albumin With Lower Risk for Death in Twice-Weekly Hemodialysis Patients



Jialin Wang, MD,\*† Elani Streja, MPH, PhD,†  
 Joline L. T. Chen, MD, MSc,\*‡ Connie M. Rhee,  
 Miklos Z. Molnar, MD, PhD,¶ Csaba P. Kovesly,  
 Kamyar Kalantar-Zadeh, MD, MPH, PhD\*

**Objective:** Markers of better nutritional status including creatinine (as a measure of the muscle mass) are associated with survival. However, data for these associations in twice-weekly hemodialysis patients, are lacking.

**Design and Subjects:** We identified 1,113 twice-weekly dialysis cohort of incident hemodialysis patients over 5 years. We analyzed data across two-by-two combinations of serum creatinine and albumin frequency yielding a total of 8 groups.



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#### Part 4

## Nutritional Scoring Systems in CKD and Dialysis Patients

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**suggested 3 out of 4 criteria → PEW**

**PEW Diagnosis**

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**Criteria**

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 Serum cholesterol < 100 mg per 100 ml<sup>a</sup>

**Body Mass**  
 BMI < 23<sup>b</sup>  
 Unintentional weight loss over time: 5% over 3 months or 10% over 6 months  
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**Muscle Mass**  
 Muscle wasting: reduced muscle mass 5% over 3 months or 10% over 6 months  
 Reduced mid-arm muscle circumference area<sup>c</sup> (reduction > 10% in relation to 50th percentile of reference population)  
 Creatinine appearance<sup>d</sup>

**Dietary Intake**  
 Unintentional low DPI < 0.80 g kg<sup>-1</sup> day<sup>-1</sup> for at least 2 months<sup>e</sup> for dialysis patients or < 0.6 g kg<sup>-1</sup> day<sup>-1</sup> for patients with CKD stages 2-5  
 Unintentional low DEI < 25 kcal kg<sup>-1</sup> day<sup>-1</sup> for at least 2 months<sup>e</sup>

**Table 2 | Other potential tools (including those still in development) for assessment of PEW in individuals with CKD stages 3-5 or AKI**

**Appetite, food intake, and energy expenditure**  
 Appetite assessment questionnaires  
 Population-based dietary assessments: food frequency questionnaires  
 Measuring energy expenditure by indirect or direct calorimetry

**Body mass and composition**  
 Weight-based measures: weight-for-height  
 Total body nitrogen  
 Total body potassium  
 Energy-beam-based methods: DEXA, NIR, BIA, and Vector  
 Bioimpedance Analysis  
 Underwater weighing and air displacement weighing  
 14 kDa fragment of actomyosin  
 Microarrays  
 Muscle fiber size  
 Relative proportions of muscle fiber types  
 Muscle alkaline soluble protein  
 CT and/or MRI of muscle mass

**Laboratory markers**  
 Serum biochemistry: transferrin, urea, triglyceride, bicarbonate  
 Hormones: leptin, ghrelin, growth hormones  
 Inflammatory markers: CRP, IL-6, TNF-α, IL-1, SAA  
 Peripheral blood cell count: lymphocyte count or percentage

**Nutritional scoring systems**  
 SGA and its modifications, including DMS<sup>54,57</sup> and CANUSA version<sup>58</sup>  
 MIS<sup>59</sup>  
 Other scoring tools: Wolfson et al.,<sup>60</sup> Merkus et al.<sup>61</sup>

**Nutritional Scoring Systems**

Fouque, Kalantar-Zadeh, Kopple ... Wanner *Kidney International* 2008

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**SGA Rating**

- **Score A:** well-nourished
- **Score B:** mildly to moderately malnourished
- **Score C:** severely malnourished

Kalantar-Zadeh K, Luft FC, et al; Total iron binding capacity-estimated transferrin concentrations in dialysis patients correlate with the subjective global assessment of nutrition; *Am J Kidney Dis*; 31(2):263-272; February 1998.

**Subjective Global Assessment Scoring Sheet**

Patient Name: \_\_\_\_\_ Patient ID: \_\_\_\_\_ Date: \_\_\_\_\_

**Part 1: Medical History**

1. **Weight Change**

A. Overall change in past 6 months: \_\_\_\_\_ kg.  
 B. Percent change: \_\_\_\_\_ gain < 5% loss  
 \_\_\_\_\_ 5-10% loss  
 \_\_\_\_\_ > 10% loss  
 C. Change in past 2 weeks: \_\_\_\_\_ increase  
 \_\_\_\_\_ no change  
 \_\_\_\_\_ decrease

2. **Dietary Intake**

A. Overall change: \_\_\_\_\_ no change  
 \_\_\_\_\_ change  
 B. Duration: \_\_\_\_\_ weeks  
 C. Type of change: \_\_\_\_\_ suboptimal solid diet \_\_\_\_\_ full liquid diet  
 \_\_\_\_\_ hypocaloric liquids \_\_\_\_\_ starvation

3. **Gastrointestinal Symptoms (persisting for >2 weeks)**  
 \_\_\_\_\_ none; \_\_\_\_\_ nausea; \_\_\_\_\_ vomiting; \_\_\_\_\_ diarrhea; \_\_\_\_\_ anorexia

4. **Functional Impairment (nutritionally related)**

A. Overall impairment: \_\_\_\_\_ none  
 \_\_\_\_\_ moderate  
 \_\_\_\_\_ severe  
 B. Change in past 2 weeks: \_\_\_\_\_ improved  
 \_\_\_\_\_ no change  
 \_\_\_\_\_ regressed

**Part 2: Physical Examination**

5. **Evidence of:** Loss of subcutaneous fat  
 Muscle wasting  
 Edema  
 Ascites (hemo only)

**Part 3: SGA Rating (check one)**  
 A  Well-Nourished B  Mildly-Moderately Malnourished C  Severely Malnourished

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**3rd Generation of SGA**

Further evolution of the SGA and DMS:  
**Malnutrition Inflammation Score (MIS)**

- Three new components:
  - A) Body Mass Index (BMI)
  - B) Serum Albumin
  - C) Transferrin (TIBC)
- The MIS has 10 components, each with 4 levels of severity: from 0 (normal) to 3 (very severe).
- The sum of all 10 DMS components: ranges from 0 (normal) to 30 (severely malnourished).

**COMPREHENSIVE MALNUTRITION INFLAMMATION SCORE**

(A) Patients' related medical history:

1- Change in end dialysis dry weight (overall change in past 3-6 months):

0	1	2	3
No decrease in dry weight or weight loss <1.5 kg (>0.5 kg for <1 kg)	Minor weight loss (0.5 kg but <1 kg)	Weight loss more than 1 kg but <1.5 kg	Weight loss >1.5 kg

2- Dietary Intake:

0	1	2	3
Good appetite and no deterioration of the dietary intake pattern	Somewhat sub-optimal solid diet intake	Moderate overall decrease to full liquid diet	Profoundly liquid to starvation

3- Gastrointestinal (GI) symptoms:

0	1	2	3
No symptoms with good appetite	Mild symptoms, poor appetite or nausea/digestion occasionally	Occasional vomiting or moderate GI symptoms	Frequent diarrhea or vomiting or severe anorexia

4- Functional capacity (nutritionally related functional impairment):

0	1	2	3
Normal to improved functional capacity, feeling fine	Occasional difficulty with heavier activities (e.g. being late frequently)	Difficulty with ordinary independent activities (e.g. going to bathroom)	Used chair-ride, or help for no physical activity

5- Comorbidity including number of years on Dialysis:

0	1	2	3
On dialysis less than one year and healthy comorbidity	Dialyzed for 1-4 years, or mild comorbidity (excluding MCC)	Dialyzed 4-8 years, or moderate comorbidity (including MCC)	Any severe, multiple comorbidity (2 or more MCC)

(B) Physical Exam (according to SGA criteria):

6- Decreased fat stores or loss of subcutaneous fat (below eyes, triceps, biceps, chest):

0	1	2	3
Normal (no change)	Mild	Moderate	Severe

7- Signs of muscle wasting (temples, clavicles, scapula, ribs, quadriceps, knee, interosseous):

0	1	2	3
Normal (no change)	Mild	Moderate	Severe

(C) Body mass index:

8- Body mass index: BMI = Wt(kg)/H<sup>2</sup>(m)

0	1	2	3
BMI > 20 kg/m <sup>2</sup>	BMI: 18.5-19.9 kg/m <sup>2</sup>	BMI: 16.5-17.9 kg/m <sup>2</sup>	BMI < 16 kg/m <sup>2</sup>

(D) Laboratory Parameters:

9- Serum albumin:

0	1	2	3
Albumin > 4.0 g/dL	Albumin: 3.5-3.9 g/dL	Albumin: 3.0-3.4 g/dL	Albumin < 3.0 g/dL

10- Serum TIBC (Total Iron Binding Capacity):

0	1	2	3
TIBC < 250 mg/dL	TIBC: 200-249 mg/dL	TIBC: 150-199 mg/dL	TIBC < 150 mg/dL

**Total Score = sum of above 10 components (0-30):**

\*MCC (Major Comorbidity Conditions) include CHF class III or IV, full blown AIDS, severe CAD, moderate to severe COPD, major neurological sequelae and metastatic malignancies or xip recent chemotherapy.  
 † Suggested equivalent measurements for serum transferrin are: >300 (0), 170-199 (1), 140-169 (2), and <140 mg/dL

Kalantar-Zadeh et al; *AJKD* 2001

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Part 5  
**Dietary Intake of Prevalent Dialysis Patients**

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# Dietary Protein Intake in Dialysis Patients

nPCR\*: Protein Catabolic Rate

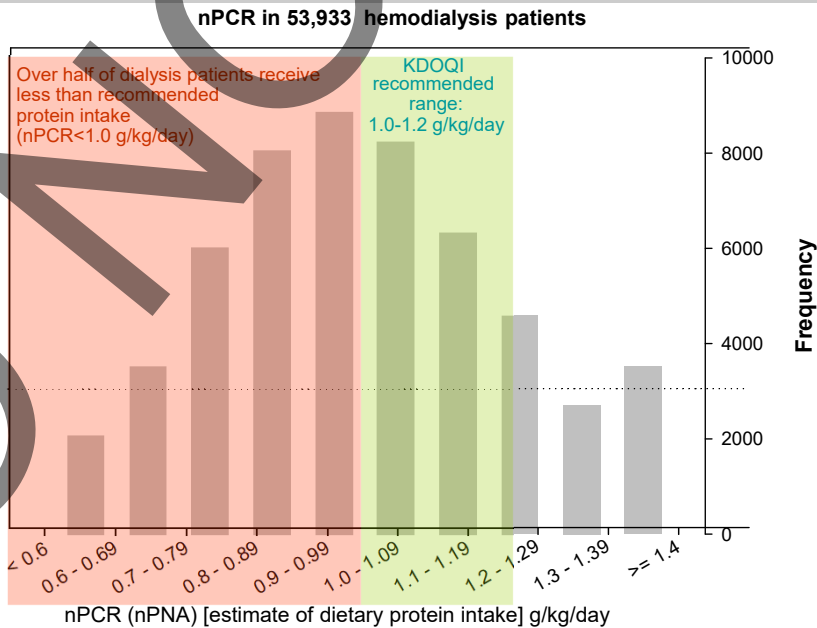
nPNA\*: Protein Nitrogen Appearance

\*n: normalized (divided by body weight in kg)

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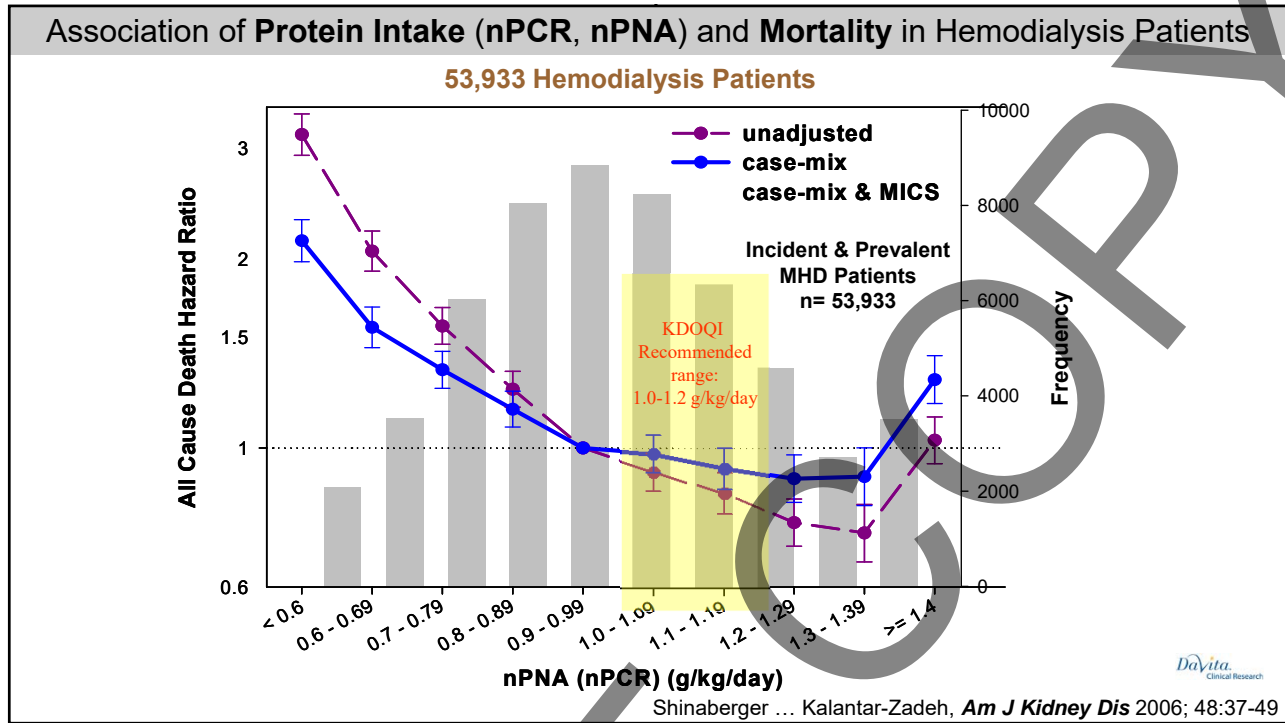
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Distribution of estimated Protein Intake (nPCR, nPNA) in 53,933 Hemodialysis Patients

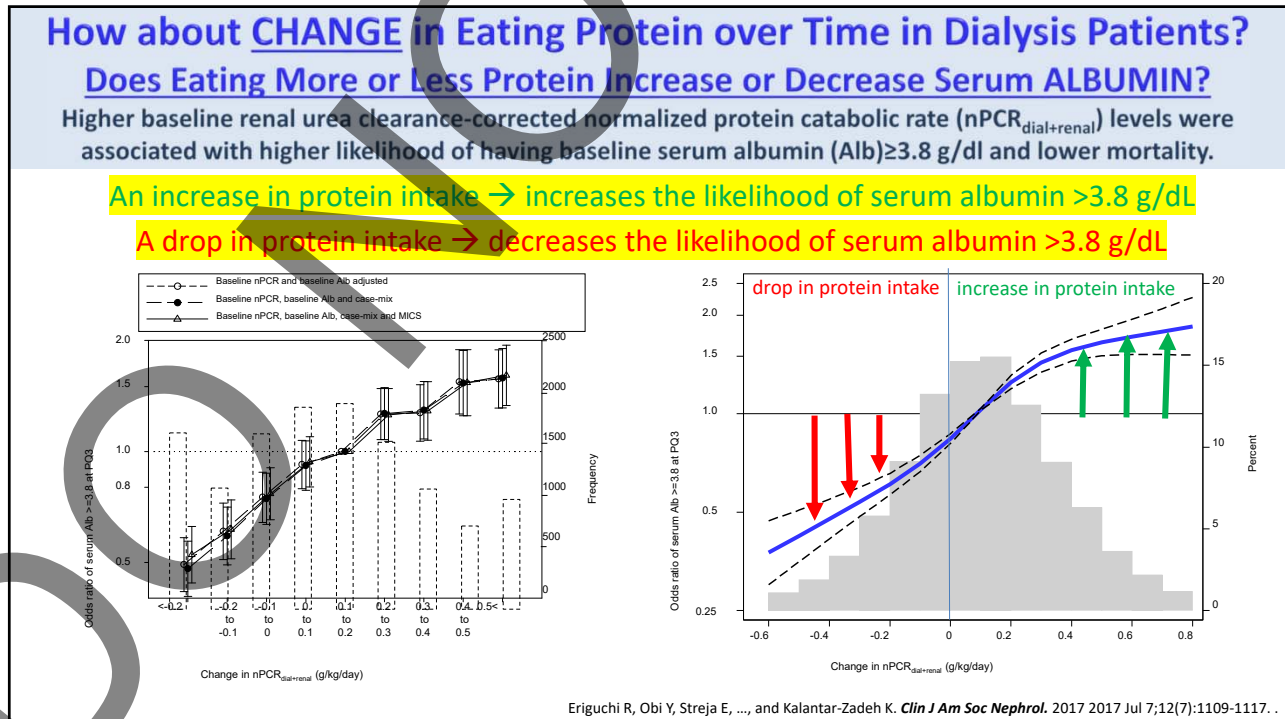


Shinaberger ... Kalantar-Zadeh, *Am J Kidney Dis* 2006; 48:37-49

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## Nutritional objectives in dialysis patients

Nutritional objectives: **1.2 g protein** and **30–35 kcal/kg/d**

**Mean nutritional intakes in dialysis patients:**  
**20–25 kcal/kg/d (esp. in malnourished pts)**  
**0.6–0.9 g protein/kg/d**

Required nutritional supplementation:

**EXTRA sources of Protein are needed!**

Kalantar-Zadeh ... Ikizler. *Nature Nephrology* 2011

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### Question

What are the challenges of high protein diet in dialysis patients?

1. High phosphorus intake
2. High potassium intake
3. High fluid intake
4. High likelihood of acidosis
5. All of the above

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**Question:****What are the challenges of high protein diet in dialysis patients?**

1. High phosphorus intake
2. High potassium intake
3. High fluid intake
4. High likelihood of acidosis
5. **All of the above**

**Rationale:** As shown in the upcoming slides, high protein intake is associated with higher burden of phosphorus and potassium, higher acid generation and high fluid intake.

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## Recommended macronutrient intakes

	ESPEN (1)	NKF (2)	EBPG (3)
Protein g/kg/day	1.2 - 1.4	1.2	1.1
Energy kcal/kg/day	35	< 60 y: 35 > 60 y: 30	30-35

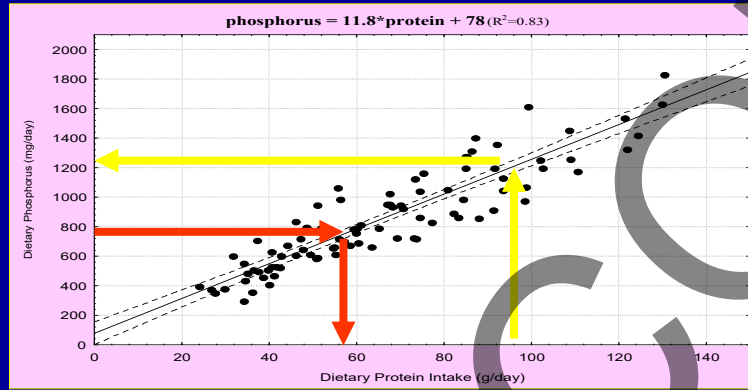
1 - Clin Nutr, 2000  
 2 - Am J Kidney Dis, 2000  
 3 - Nephrol Dial Transplant, 2007



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## Phosphorus Estimation Equation ← Protein Intake (assuming minimal additives)

$$\text{Dietary phosphorus (milligrams)} = 78 + 11.8 \cdot (\text{protein intake [grams]})$$



Kalantar-Zadeh ... Kopple. *CJASN* 2010

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**IS THERE ANYTHING LEFT FOR...?**

*Seminars in Dialysis*

— VIEWS, VISIONS AND VISTAS IN DIALYSIS —

*Seminars in Dialysis*  
Feb 2015

**Dietary Restrictions in Dialysis Patients: Is There Anything Left to Eat?**

Kamyar Kalantar-Zadeh, \*†††† Amanda R. Tortorici, \*† Joline L. T. Chen, \*† Mohammad Kamgar, § Wei-Ling Lau, \* Hamid Moradi, \*† Connie M. Rhee, \* Elani Streja, \*† and Csaba P. Kovessy \*†††

**BvK**

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## Nutritional Therapy / Nutritional Support

- **Oral**
  - Meals during dialysis treatment
  - CKD-specific protein-energy supplements
    - ◆ Oral nutritional supplements
    - ◆ Tube feeding
- **Parenteral**
  - IDPN (intra-dialytic parenteral nutrition)
  - TPN
- **Pharmacologic**
  - Appetite stimulators
  - Anti-Depressant
  - Anti-inflammatory
  - Anabolic &/or muscle enhancing

Kalantar-Zadeh ... Ikizler, *Nature Nephrology* 2011

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Part 6

**IDPN**

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## IDPN Intra-Dialytic Parenteral Nutrition

- Nutritional support therapy designed for hemodialysis patients
- Infusion of amino acids, dextrose and lipids during dialysis
- Given three times/week during dialysis treatment
- Provides 700-1200 calories and 45-75 grams of protein/treatment

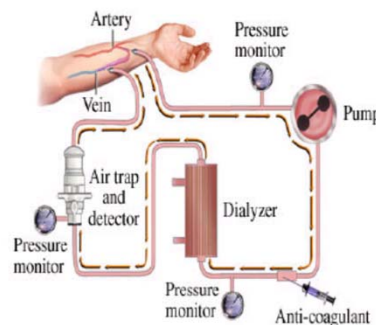
### Improves

- Appetite
- Strength
- Overall well being/nutritional status
- Increases dry weight by building lean muscle mass
- Improves albumin level

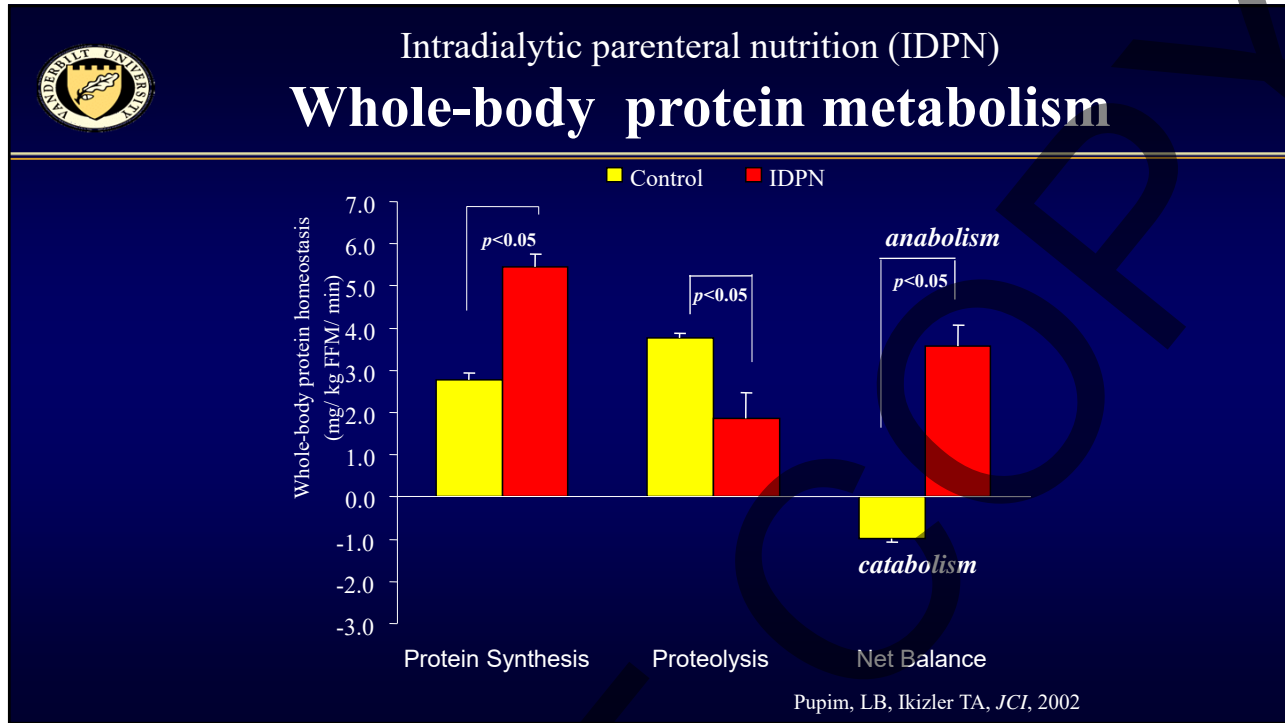
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## Administration of IDPN

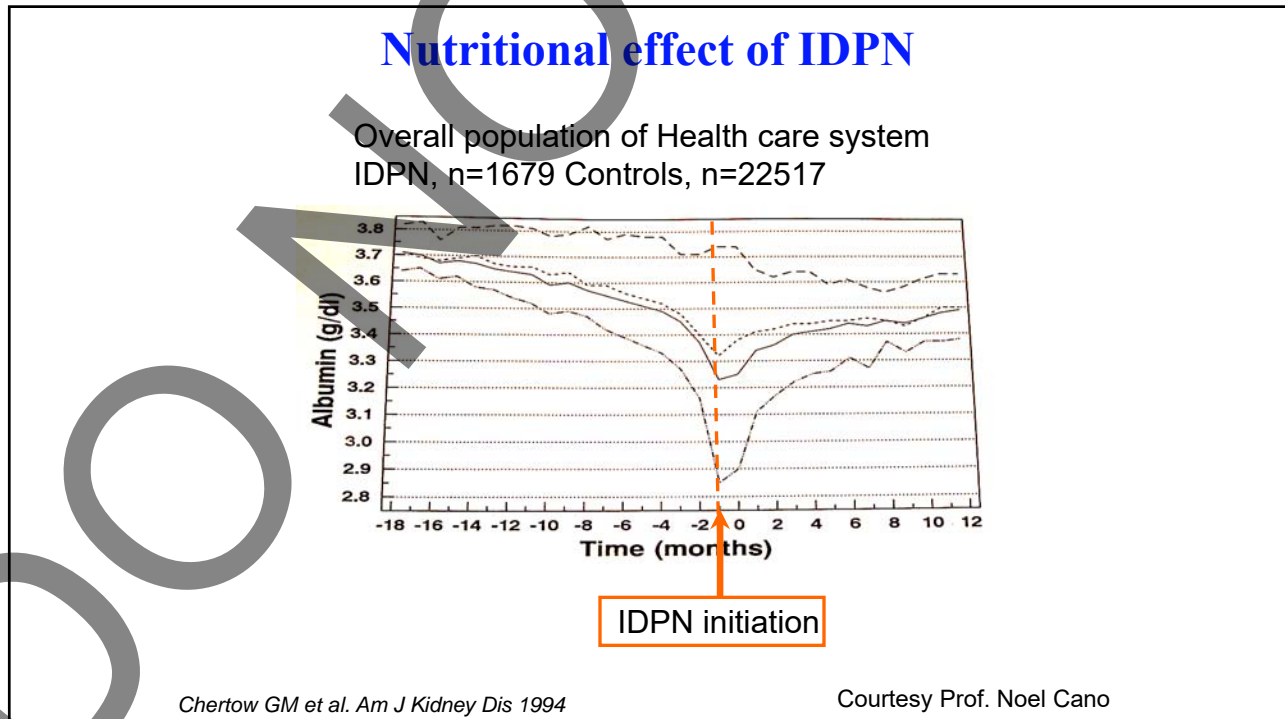
- Infused over entire dialysis treatment
- Volume calculated into fluid removal
- Infused into venous chamber
- Separate pump, equipment, supplies and filters
- IDPN should not be given simultaneously with a blood transfusion or in the same line as IV iron



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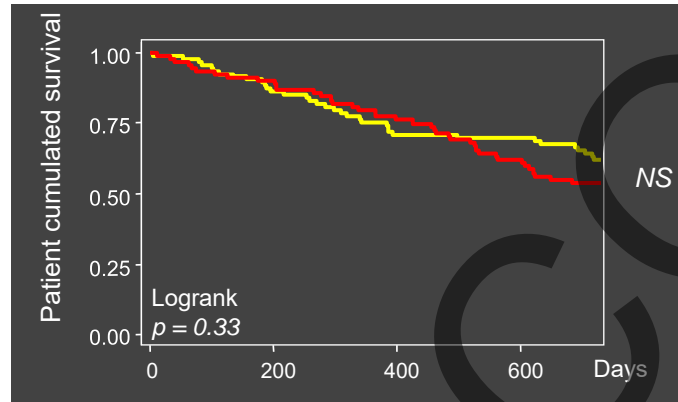


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## Fines: Patients Survival

Mean cumulative survival: 77% at 1 yr, 58% at 2 yr  
 Death: Control: n = 36, IDPN: n = 40

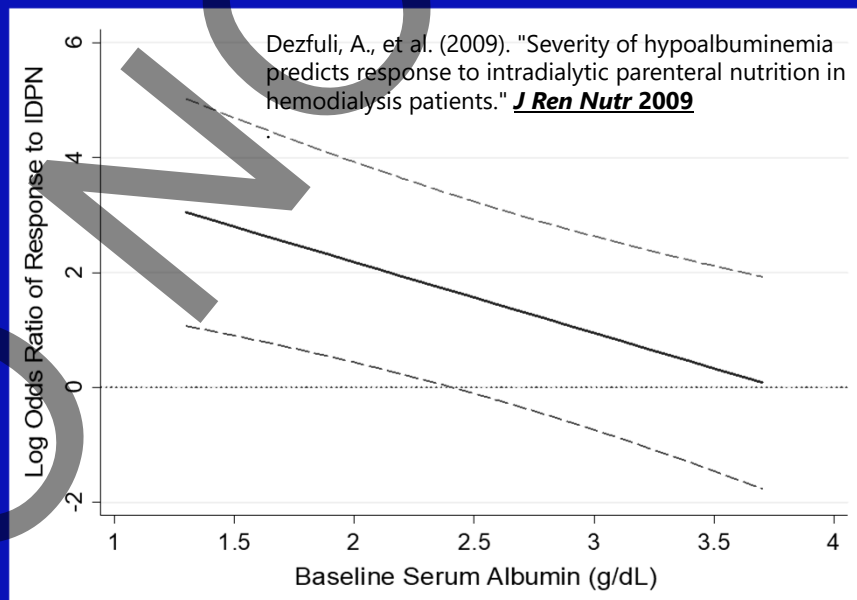


J Am Soc Nephrol 2007

Courtesy Prof. Noel Cano

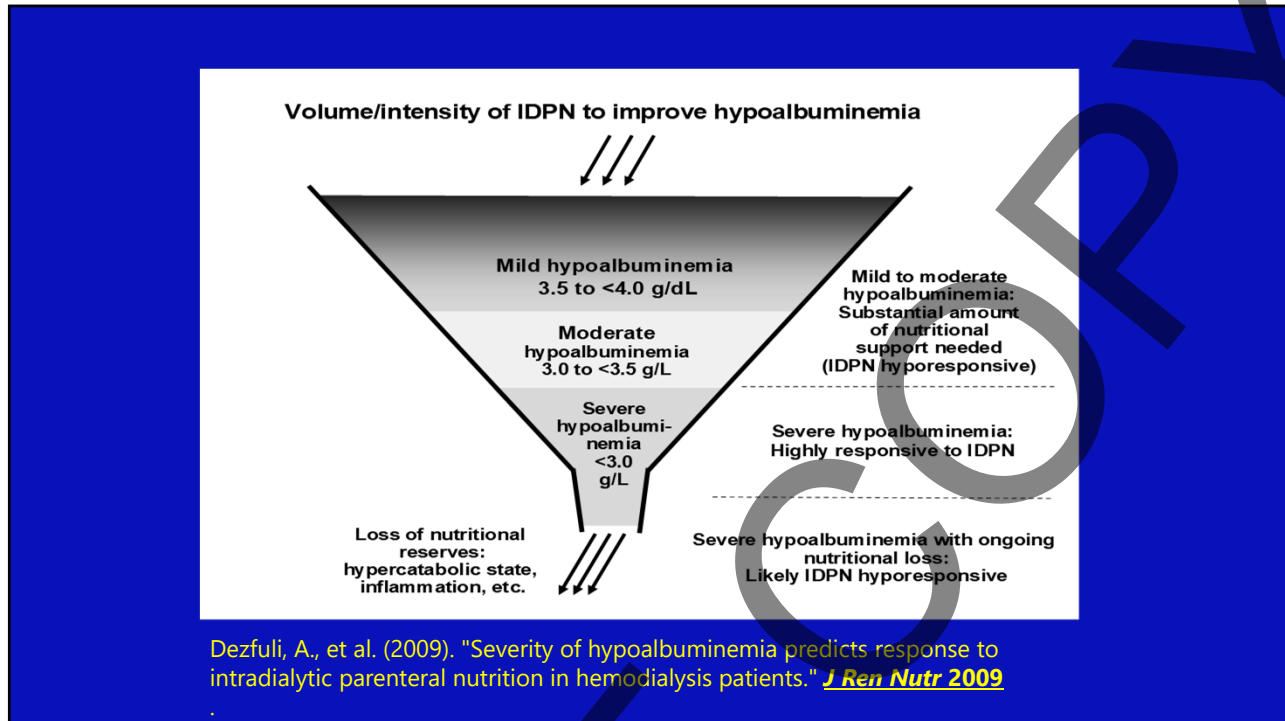


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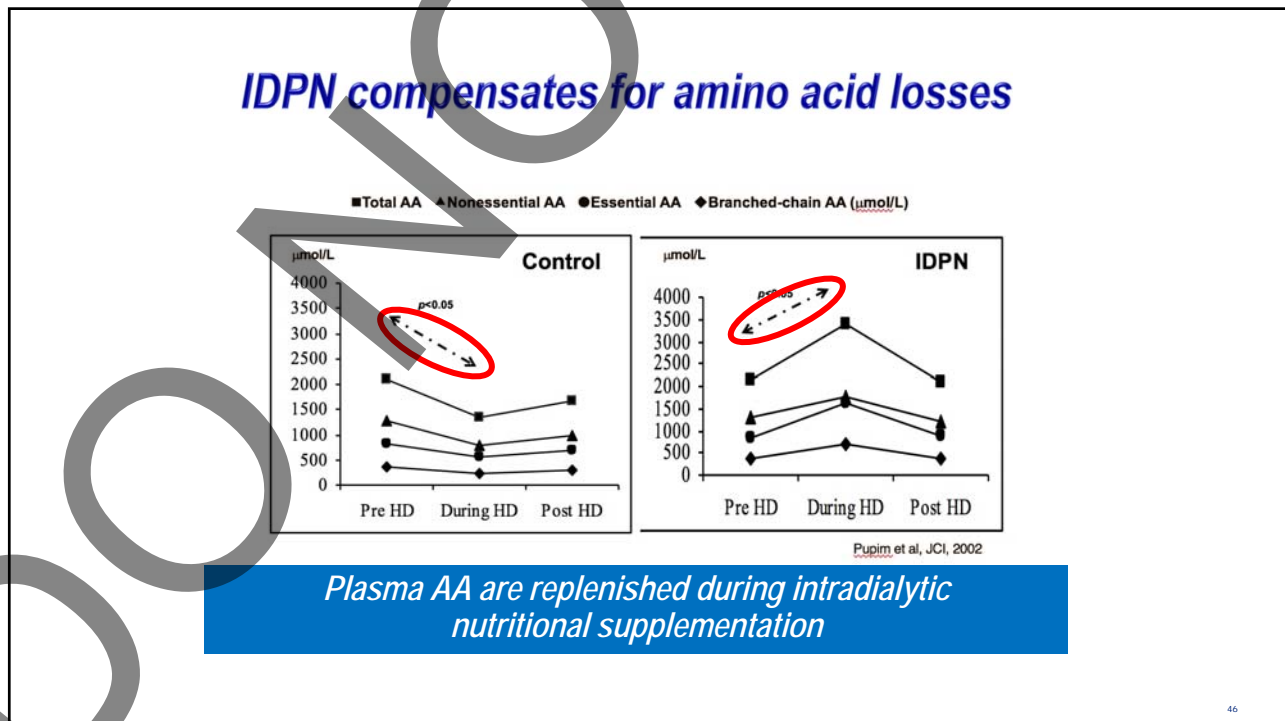


Dezfuli, A., et al. (2009). "Severity of hypoalbuminemia predicts response to intradialytic parenteral nutrition in hemodialysis patients." *J Ren Nutr* 2009

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## **Intradialytic parenteral nutrition (IDPN): Summary**

- *IDPN is a beneficial therapeutic option in hemodialysis patients with PEW*
- *Malnourished pts requiring therapy can be identified by standard nutr assessments (SGA, prealbumin, etc)*
- *IDPN should be started early (not beyond SGA-B - moderate malnutrition) in order to improve nutritional status over longer periods of time and to improve survival in HD*
- *Response to IDPN can be monitored with albumin, prealbumin, hand grip strength, etc*
- *Patients responding to IDPN justify further repetitive treatment episodes.*

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## **Part 8 Meals & Supplements on Dialysis**

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# US Fresenius Study

## Nationwide Study in a Large Dialysis Organization: Can oral nutritional supplement during HD treatment improve survival?

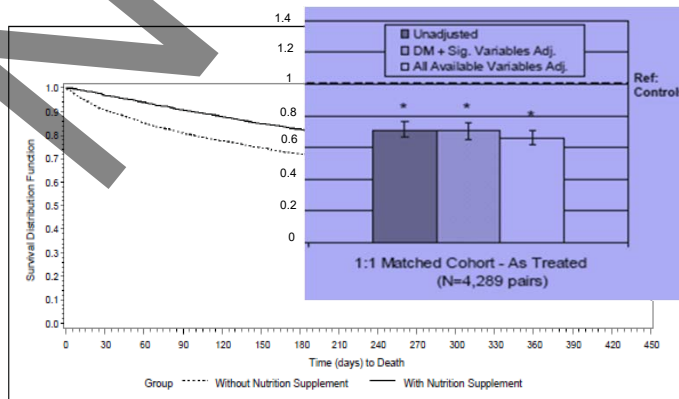
AJKD 2012  
Original Investigation

### Outcomes Associated With Intradialytic Oral Nutritional Supplements in Patients Undergoing Maintenance Hemodialysis: A Quality Improvement Report

Eduardo Lacson Jr, MD, MPH, Weiling Wang, MS,  
Barbara Zebrowski, MS, RD, CSR, LDN, Rebecca Wingard, RN, MSN, CNN, and  
Raymond M. Hakim, MD, PhD

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K-M survival curves comparing patients who received monitored oral supplements to controls  
1:1 "as-treated" matched cohort



US Fresenius Study: Monitored in-centered intradialytic oral nutritional supplements (ONS)

Lacson et al, AJKD 2012

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**Table 2. Pros and cons of in-center (in the dialysis clinic) monitored eating and provision of meals during hemodialysis treatments**

**Pros**

**Impact on nutritional status and clinical outcomes**

- > Meals during HD is practiced routinely in most countries
- > Excellent survival in most countries where practiced
- > No major unfavorable outcomes reported in most studies

**Mitigates/corrects intra- and post-dialysis catabolic effects**

- > HD Rx exerts catabolic effects that can be avoided
- > Muscle wasting may be mitigated
- > Effectively increases the frequency of daily meals

**Better control of dietary phosphorus**

- > In-center meals and supplements can be monitored
- > In-center meals may improve adherence to diet
- > Intake of phosphorus binder can be monitored
- > Improved patient education can be achieved

**Increased adherence with hemodialysis**

- > Increases the likelihood of attending HD treatments
- > May mitigate the likelihood of HD treatment interruptions
- > Enhances communication between patient and staff

**Improved patient satisfaction**

- > In-center meals may make patients more comfortable
- > Improved quality of life by means of in-center meals
- > Relatively low costs of meals on HD
- > The costs of providing in-center meals is affordable
- > Dialysis organizations can adapt this in for their own needs

**Cons**

**Low blood pressure and labile circulation during food ingestion**

- > blood pressure may be lowered during and after eating due to splanchnic circulation expansion even with new dialysis treatment and techniques
- > Hypotensive episode may lead to shortening dialysis Rx or less efficient fluid removal
- > Risk of aspiration and other respiratory complications
- > Risk of choking is likely higher in patients with a history of neurologic disorders, swallowing problems or other disabilities

**Infectious control and hygiene issues**

- > Even in sitting position aspiration may happen in patient who cannot feed themselves at home
- > Fecal-oral transmission of infection including hepatitis A possible
- > Food crumbs may lead to infestation
- > Risk if ingestion of rotten food and food poisoning is possible
- > Meal tray delivery and storage may pose additional hygiene challenges

**Burden on dialysis staff and logistics constraints**

- > Overworked dialysis staff face with additional responsibilities
- > Providing nutrition may not be regarded as an a justifiable part of patient care in dialysis clinics

**Only a fraction of required meals are provided**

- > Thrice-weekly meals account for 15% of all meals
- > The evidence that catabolic effect of HD can be mitigated or reversed by intradialytic nutrition is not convincing

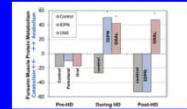
**Added expenses to dialysis treatment**

- > The costs of meals during dialysis may be small but still not negligible
- > If costs of meals are factored in by the insurance company or in the bundling equation, this may be at the cost of other more critical treatment components and medications

Kalantar-Zadeh K, Ikizler TA. *J Ren Nutr.* 2013 May; 23(3): 157-63



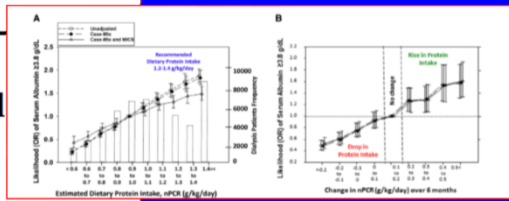
**ISRNM Consensus Paper  
JREN 2017**



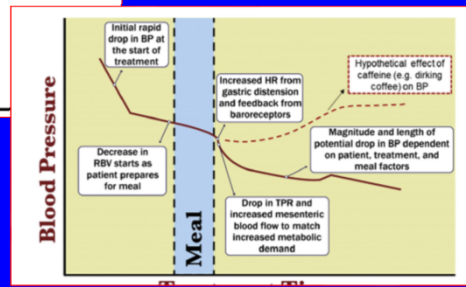
REVIEW ARTICLE

**GPB Eating During Hemodialysis Treatment: A Consensus Statement From the International Society of Renal Nutrition and Metabolism**

Brandon M. Kistler, PhD, RD,\* Debbie Benner, MA, RD, CSR,†  
 Jerrilynn D. Burrowes, PhD, RD, CDN,‡ Katrina L. Campbell, RD, PhD,§  
 Denis Fouque, MD, PhD,¶ Giacomo Garibotto, MD,\*\* Joel D. Kopple, MD,†††§§  
 Csaba P. Kovessy, MD,¶¶ Connie M. Rhee, MD, MSc,\*\*\* Alison Steiber, R.D, PhD,†††  
 Pieter Stenvinkel, MD, PhD,††† Pieter ter Wee, MD,§§§ Daniel Teta, MD,¶¶¶  
 Angela Y. M. Wang, MD,\*\*\*\* and Kamyar Kalantar-Zadeh, MD, MPH, PhD\*\*\*\*



Whereas larger multicenter randomized trials are needed, **meals and supplements during hemodialysis should be considered as a part of the standard-of-care practice for patients without contraindications.**



Kistler... Kalantar-Zadeh. *J Ren Nutr.* 2017

### Essen waehrend Hemodialyse (meals during hemodialysis)



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### Essen waehrend Hemodialyse (meals during hemodialysis)



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**Essen waehrend Hemodialyse  
(meals during hemodialysis)**



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**Essen waehrend Hemodialyse  
(meals during hemodialysis)**



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### Essen waehrend Hemodialyse (meals during hemodialysis)



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### Essen waehrend Hemodialyse (meals during hemodialysis)



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**Essen waehrend Hemodialyse  
(meals during hemodialysis)**



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**Essen waehrend Hemodialyse  
(meals during hemodialysis)**



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## Essen waehrend Hemodialyse Eating During Dialysis, Wurzburg, Germany



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### Effect of high-protein meals during hemodialysis combined with lanthanum carbonate in hypoalbuminemic dialysis patients: findings from the FrEDI randomized controlled trial

Nephrol Dial Transplant (2017) 32, 1-11  
doi: 10.1093/ndt/gfw323



Effect of high-protein meals during hemodialysis combined with lanthanum carbonate in hypoalbuminemic dialysis patients: findings from the FrEDI randomized controlled trial

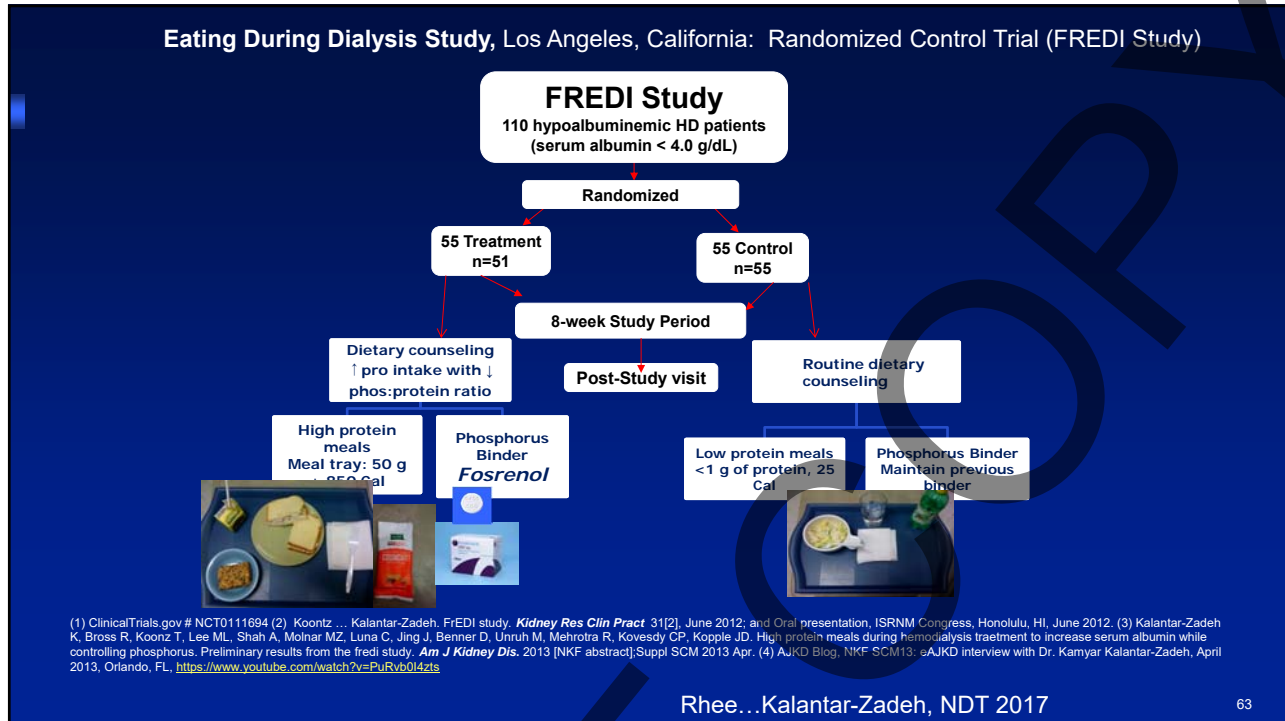
Connie M. Rhee<sup>1</sup>, Amy S. You<sup>1</sup>, Tara Koontz Parsons<sup>2</sup>, Amanda R. Tortorici<sup>1</sup>, Rachelle Bross<sup>2</sup>, David E. St-Jules<sup>3</sup>, Jennie Jing<sup>1</sup>, Martin L. Lee<sup>4</sup>, Debbie Benner<sup>5</sup>, Csaba P. Kovesdy<sup>6,7</sup>, Rajnish Mehrotra<sup>8</sup>, Joel D. Kopple<sup>9,10</sup> and Kamyar Kalantar-Zadeh<sup>1,2,4</sup>

Connie M. Rhee, Amy S. You, Tara Koontz Parsons, Amanda R. Tortorici, Rachelle Bross, David E. St-Jules, Jennie Jing, Martin L. Lee, Debbie Benner, Csaba P. Kovesdy, Rajnish Mehrotra, Joel D. Kopple and Kamyar Kalantar-Zadeh.

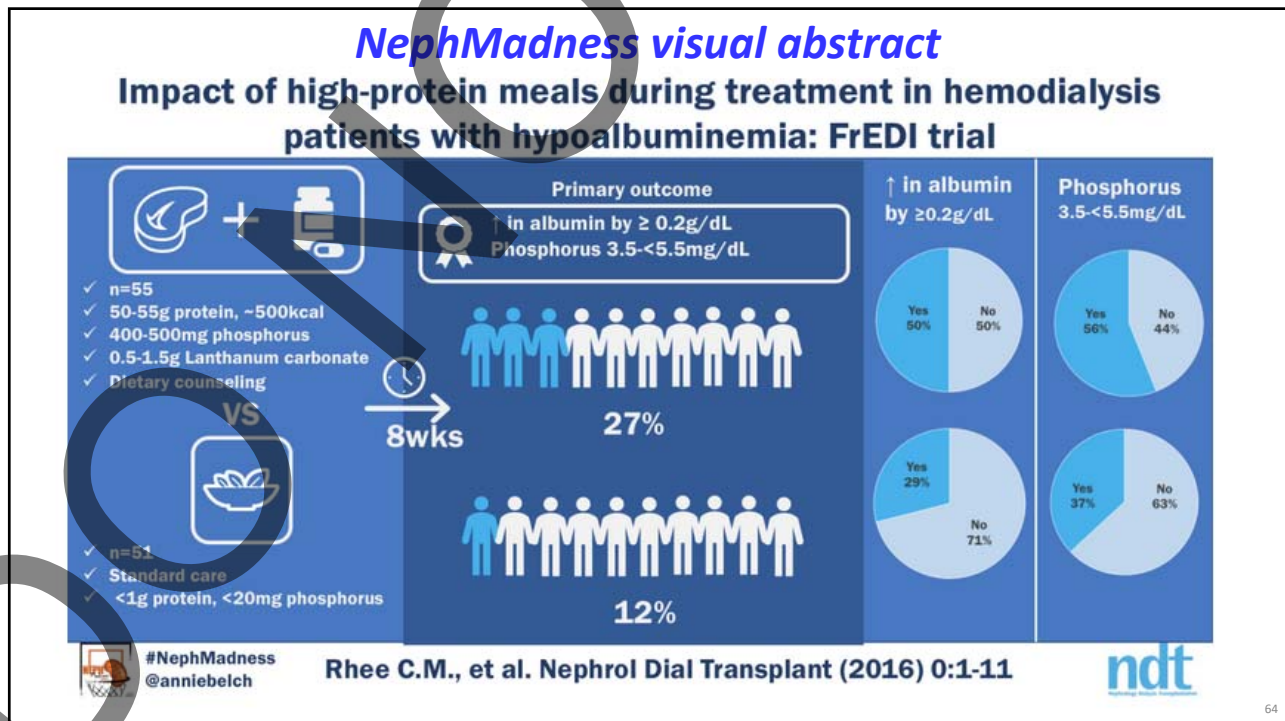
***Nephrol Dial Transplant (2017)***

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MEETING NEWS

American Society of Nephrology  
Annual Meeting

Healio Jobs.com

## Higher serum albumin, potassium seen in patients who ate during dialysis

December 9, 2019

+ ADD TOPIC TO EMAIL ALERTS

COMMENT

WASHINGTON — Data presented here from the Patterns Study indicated that patients who ate during treatments had higher serum albumin, higher potassium levels compared to patients who dialyzed at other times of the day.

“Providing nutrition during [hemodialysis] HD is a common practice, but remains controversial,” said Mark E. Neumann, MD, of the University of California Irvine School of Medicine, along with colleagues and additional authors. “This has led to different dialysis unit nutrition policies. Therefore, we sought to compare outcomes between policies on food intake during treatment.”

Using phase 5 of the Dialysis Outcomes and Practice Patterns Study, the authors and colleagues looked at the relationship between serum albumin, potassium and BMI and compared outcomes to clinic policies related to

“These [results] were expected, but this is the first study that corroborates and confirms the hypothesis, especially on better serum albumin,” Kamyar Kalantar-Zadeh, MD, of the University of California Irvine School of Medicine, and a co-author on the study, told Healio Nephrology. “Sadly, dialysis units in the U.S. do not provide food, and indeed in some of these units food during dialysis is prohibited.”

The authors wrote that further study is needed to determine if factors such as quality of life, hospitalizations, and mortality were impacted by eating during dialysis. —by Mark E. Neumann

Reference:  
Kistler B, et al. Abstract TH-PO598. Presented at: ASN Kidney Week; Nov. 7-10, 2019; Washington, D.C.

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**Table 2. Pros and cons of in-center (in the dialysis clinic) monitored eating and provision of meals during hemodialysis treatments**

### Pros

#### Impact on nutritional status and clinical outcomes

- > Meals during HD is practiced routinely in many industrialized nations including Europe and South East Asia
- > Excellent survival in most countries where meals are served during HD
- > No major unfavorable outcomes reported in countries offering meals during HD

#### Mitigates/corrects intra- and post-dialysis catabolism

- > HD Rx exerts catabolic effects that can be avoided by eating during HD
- > Muscle wasting may be mitigated
- > Effectively increases the frequency of daily meal intakes

#### Better control of dietary phosphorus, potassium, salt and fluid

- > In-center meals and supplements can be more optimally prepared for the specific needs of CKD patients
- > In-center meals may improve adherence to restricted salt and fluid intake
- > Intake of phosphorus binder can be monitored
- > Improved patient education can be achieved by simultaneous interaction with dietitian and nephrologist while eating

#### Increased adherence with hemodialysis treatment

- > Increases the likelihood of attending HD treatment
- > May mitigate the likelihood of HD treatment shortening by hungry patients
- > Enhances communication between patients and dietitians and other clinic staff

#### Improved patient satisfaction and quality of life

- > In-center meals may make patients more content with dialysis treatment life style
- > Improved quality of life by means of in-center meal may improve survival
- Relatively low costs of meals on HD
- > The costs of providing in-center meals is a small fraction of expensive medications used in ESRD
- > Dialysis organizations can adapt this in form of efficient and economical approaches

Kalantar-Zadeh K, Ikizler TA. *J Ren Nutr.* 2013 May;23(3):157-63

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**Table 2. Pros and cons of in-center (in the dialysis clinic) monitored eating and provision of meals during hemodialysis treatments**

### Cons

#### Low blood pressure and labile circulation during food ingestion

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Kalantar-Zadeh K, Ikizler TA. *J Ren Nutr.* 2013 May;23(3):157-63

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## Part 9 Conclusions

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## Summary and conclusions

- Nutritional management of CKD should be revived in 2020 and beyond to add to the armamentarium of the MANAGEMENT of CKD
- Different dietary approaches are needed for different stages and different formats of CKD.
- IDPN is safe and recommended when serum albumin is  $<3.5$  mg/dL along with other nutritional risks.
- Meals on dialysis are safe and practiced frequently in other countries.
- FREDI Study shows that safety and efficacy of meals during dialysis in US dialysis units.

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## Acknowledgement

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- Danh Nguyen, PhD
- Allen Nissenson, MD,
- Steven Brunelli, MD, MS

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