International Society of Blood Purification
Annual Scientific Meeting
Beijing 9-11th September, 2011
Pre-Congress Course

Nutrition Assessment & Application

Maria Chan

Clinical Lead-Senior Renal Dietitian, Nutrition and Dietetics, The St. George Hospital

Conjoint Associate Lecturer, School of Medicine, University of New South Wales

Sydney, Australia

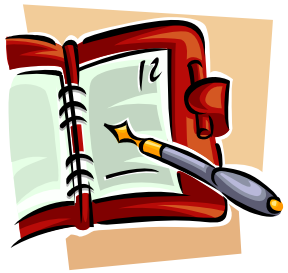
At Baxter Novum, Stockholm
June, 2008

Social Gathering
Baxter Novum, Stockholm
June, 2008

Presentation Overview

Nutrition Assessment:

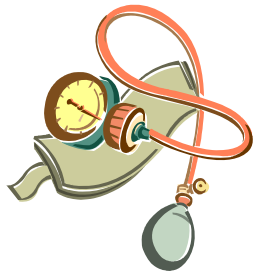
- Why, what, when, and who
- Traditional and new tools
- Application
- Summary



Common Goals of Diet Therapy in CKD

- To maintain optimal nutritional status:
  (Prevent Malnutrition)
  - Reduce protein catabolism
  - Attain Ideal Body Weigh
- To correct abnorm
  - Redu
  -
  - fl
- To pr ications:
  - ↓ C
  - con of HT
  - kidney bone disease(osteodystrophy) – Phosphate/Calcium/Vitamin D management
  - anaemia
- To control symptoms & retard the rate of progression

To improve Quantity and Quality of Life



Multidisciplinary Approach to Nutritional Management

- Responsibility of all team members
- Various roles in different faculties:
  - Screening
  - Diagnosis
  - Intervention/ education
  - Monitoring/evaluation
- Early identification of problems for prevention and timely management
- Quality assurance

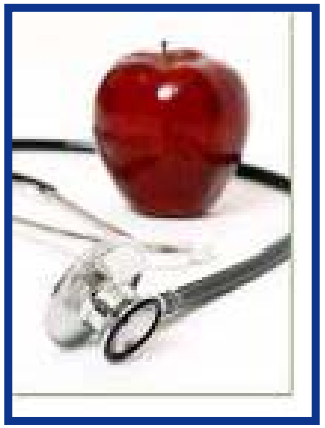
Medical Nutrition Therapy (MNT)
(performed by dietitians)

is a specific application of the Nutrition Care Process in clinical settings that is focused on the management of diseases. MNT involves in-depth individualized nutrition assessment and a duration and frequency of care using the Nutrition Care Process to manage disease.

Nutrition Care process:

- **Nutrition Assessment**
- **Nutrition Diagnosis**
- **Nutrition Intervention**
- **Nutrition Monitoring and Evaluation**

Today's focus



ADA website:
http://www.adaevidencelibrary.com/topic.cfm?cat=3949

Nutritional Assessment

- *A* – Anthropometry (body composition)
- *B* - Biochemistry- blood results
- *C* - Clinical S & S
- *D* - Dietary Intake
- *E* - Exercise/
- F - Functiona
- Others – Glob

- No one technique/ parameter is superior
- Must interpret all results together
- Must use a combination of parameters
- To review current and changes
- Use good clinical judgment

(A) Anthropometry - BMI

Body Mass Index (BMI)

BMI= weight÷height^2 (kg/m^2)

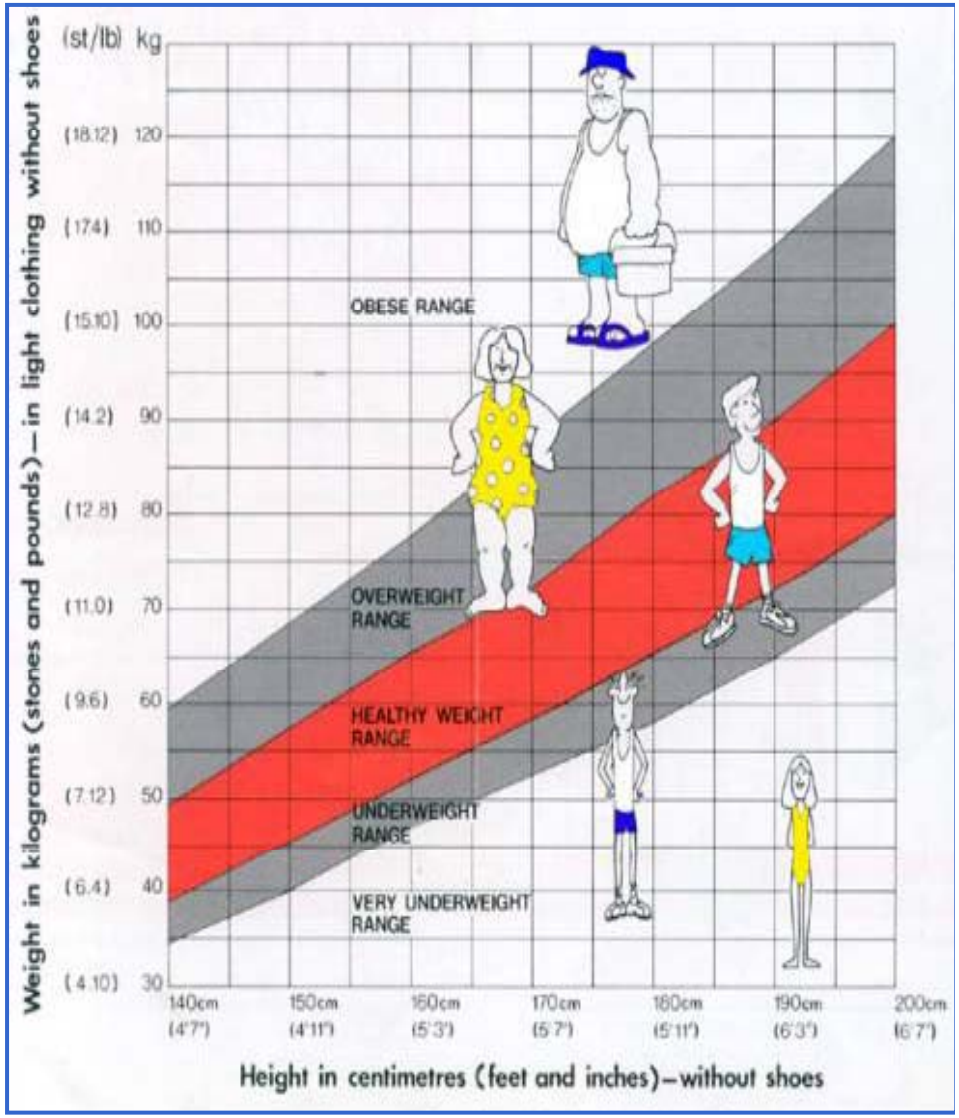
WHO – World Health Organisation International Classification (adult):

< 18.5 kg/m^2	**Underweight**
= 18.5 - 24.9	**Healthy weight range**
= 25.0 - 29.9	**Overweight**
≥ 30.0	**Obesity**

Renal specific:

- [1] **BMI < 23 kg/m^2 – at risk of malnutrition**
- [2] **Ideal range 22- 26 kg/m^2**

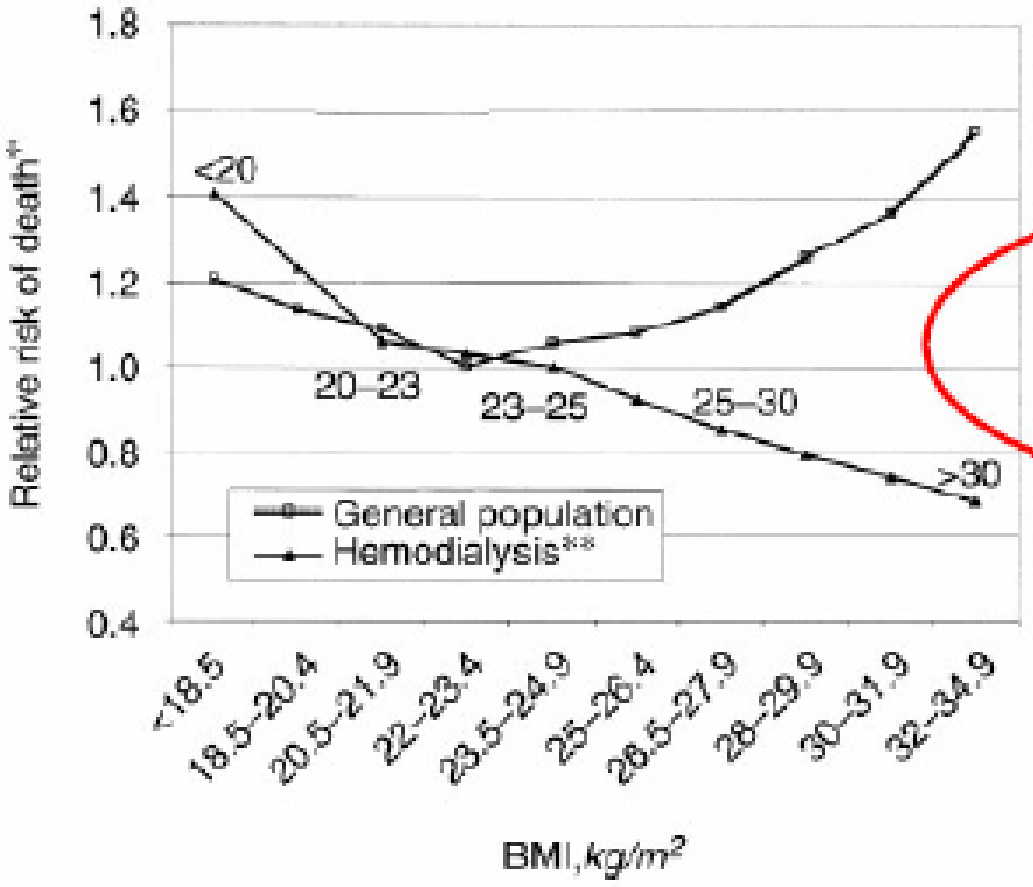
[1] ISRNM definition
[2] DAA (Dietitian Association Guidelines)



Source: Australian Nutrition Foundation

(A) Anthropometry – BMI & HD

Original stimulus



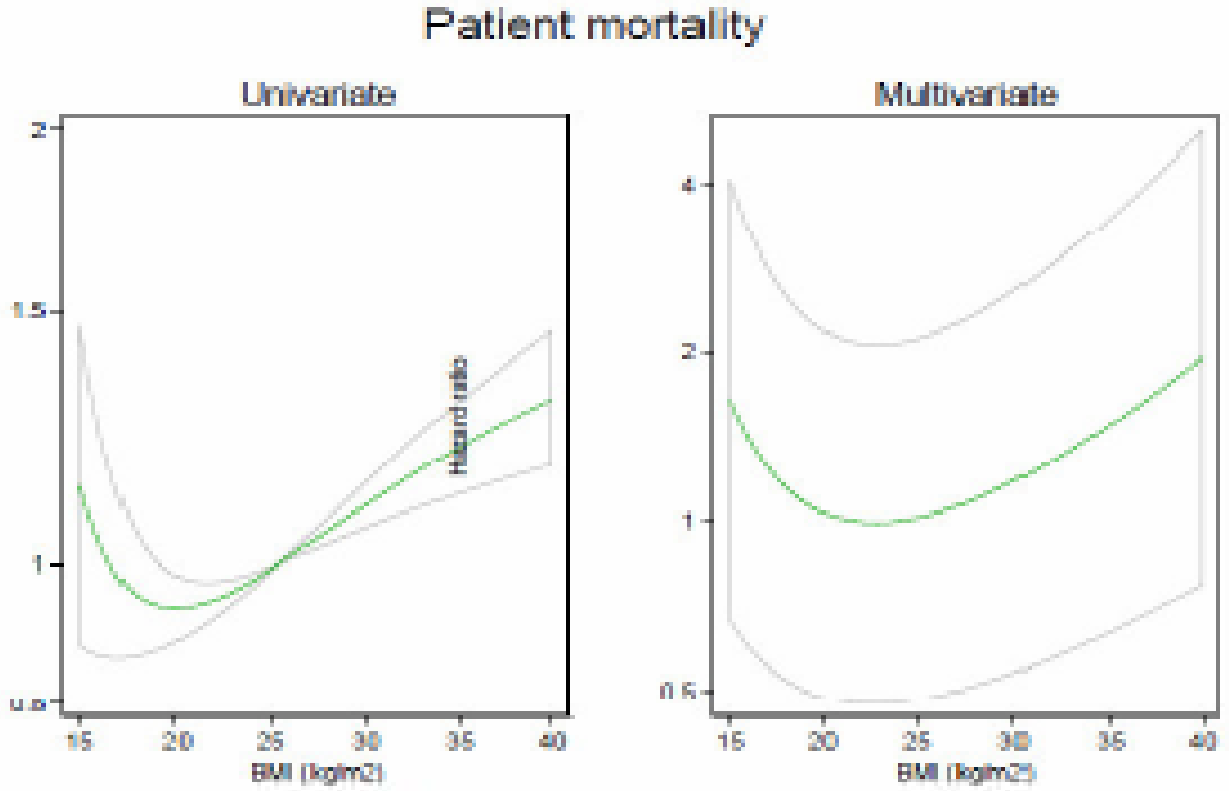
The general population data are adopted from Calle et al, *N Engl J Med* 341:1097-1105, 1991 (combined men and women, healthy, nonsmoker). The hemodialysis data are adopted from Leavey et al, *Nephrol Dial Transplant* 16:2386-2394, 2001 (combined data from the United States and Europe) [26]. *Each population has a different follow-up period: 14 years for the general population versus 4 years for hemodialysis patients. **BMI stratifications are different in two populations: X-axis is based on the original graph of the general population and the original hemodialysis BMI subgroup ranges are printed additionally along the hemodialysis curve.

BMI vs mortality, haemodialysis population vs general population

ANZDATA

(A) Anthropometry – BMI & PD

BMI and mortality during PD



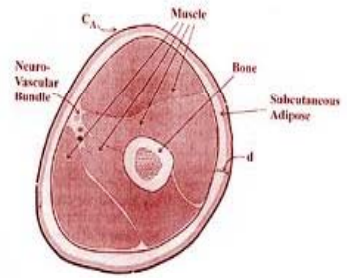
McDonald, Collins, Johnson. J Am Soc Nephrol 2003 14: 2894-901

ANZDATA

(A) Anthropometry- Girth and Skinfolds measurements

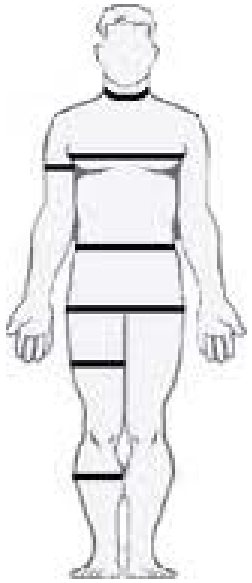
Examples

- **∝ Fat mass (FM)**
  - **Tricep skinfolds (TSF)**
  - **Waist to hip ratios**
  - **Waist circumference (WC)**



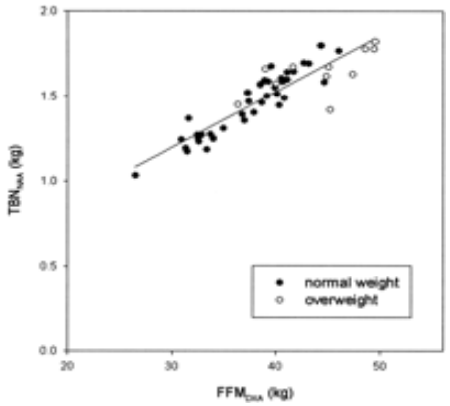
- **∝ Fat free mass (FFM)**
  - **Mid-arm & muscle circumference (MAMC)**

    MAMC=MAC- (TSFx3.14)
  - **Calf circumference**



(A) Anthropometry/ body composition

- **Gold standard**:



- **Total body nitrogen** neutron activation analysis ∝ FFM

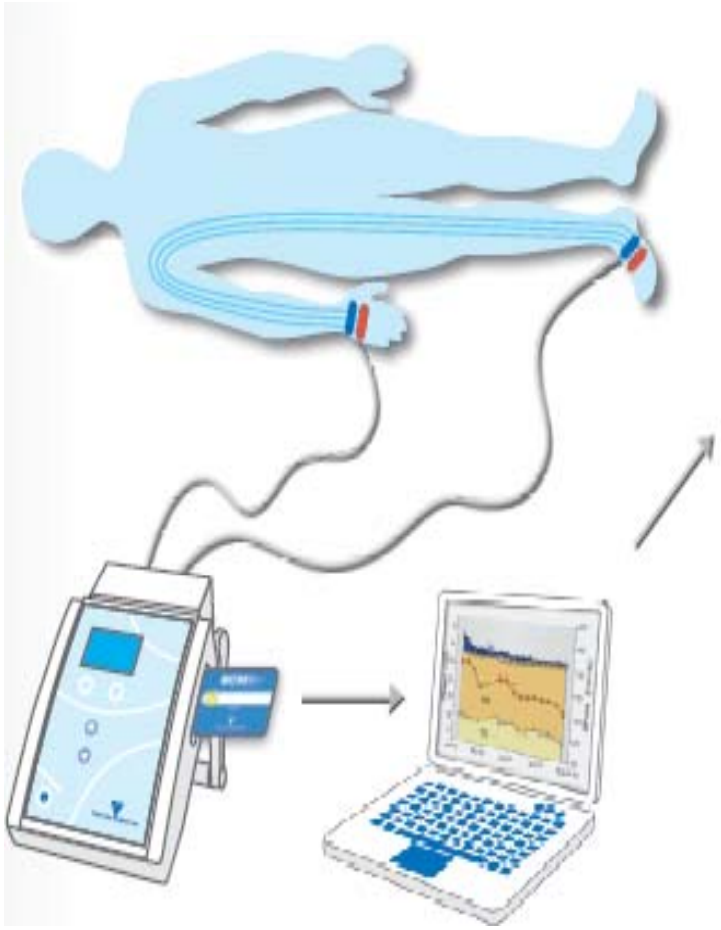
- Expensive
- Not readily available

- **Total potassium counting**: γ rays emitted from 40K (0.012% body weight and all in ICF) ∝ FFM

(A) Anthropometry/ body composition

- **BIA – bio-impedance analysis**
  - **FM**
  - **FFM (muscle and body water)**

- **Body composition Monitor (commercial device)**
  - **FM**
  - **FFM (muscle)**
  - **Oedema**



(B) Biochemistry and blood parameters

B **–Biochemistry (common):**

- **Renal function:** **Creatinine, urea**
- **Body protein:** **serum protein, albumin**
- **Electrolytes:** **K^+, Na^+, Ca^{2+}, PO^-, bicarbonate**
- **Lipids:** **cholesterol, triglycerides**
- **Anaemia management:** **Fe^{2+} Status- Ferritin, Transferrin**
- **Vitamins & Minerals**
- **Inflammation:** **C reactive Protein**

(C) Clinical Signs and Symptoms

C -Clinical S & S:

- Appetite
- Anorexia
- Diarrhoea
- Malabsorption
- Nausea
- Itchiness
- Taste aversion
- Vomiting
- Stress response
- muscle wasting
- Subcutaneous fat loss

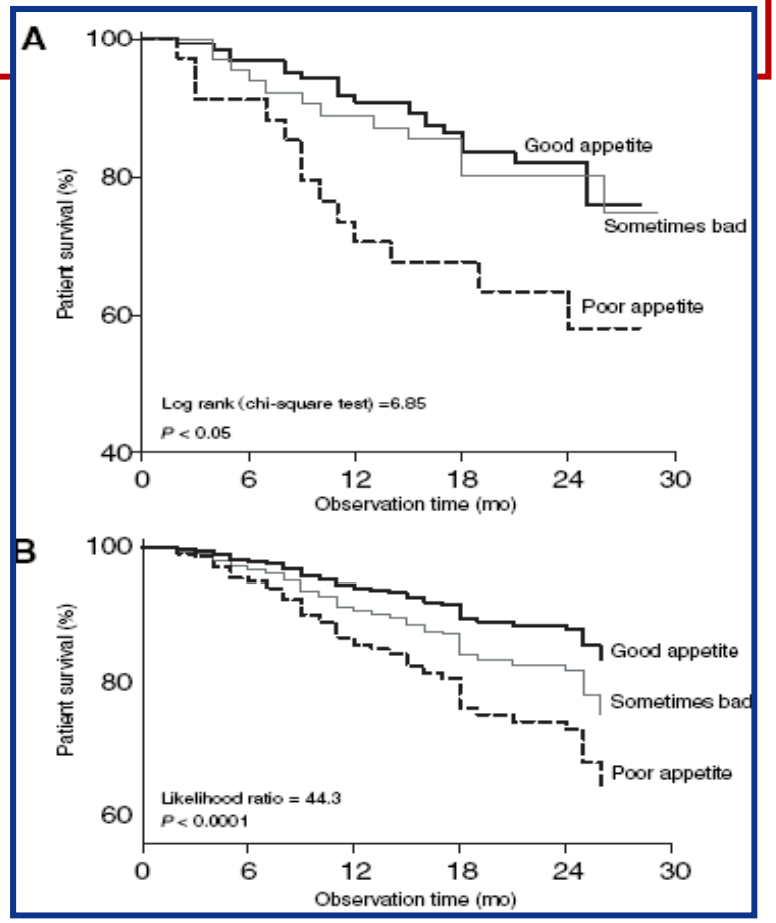
Appetite

Comparison of nutritional and inflammatory markers in dialysis patients with reduced appetite[1–3]

Juan Jesús Carrero, Abdul Rashid Qureshi, Jonas Axelsson, Carla María Avesani, Mohammed E Suliman, Sawako Kato, Peter Bárány, Sunna Snaedal-Jonsdottir, Anders Alvestrand, Olof Heimbürger, Bengt Lindholm, and Peter Stenvinkel

Study design: Cross sectional
Patient: HDx, n=223
Poor appetite, associated with:

- **↑inflammatory markers: IL-6 & CRP**
- **Worse Nutritional Status:**
  - **↓IGF-I**
  - **↓albumin**
  - **↓ Urea & ↓ Creatinine**
  - **↓ Hand Grip Strength (HGS)**



Carrero JJ etal, AJKD 200785: 695-701

(D) Dietary Intake / Drugs

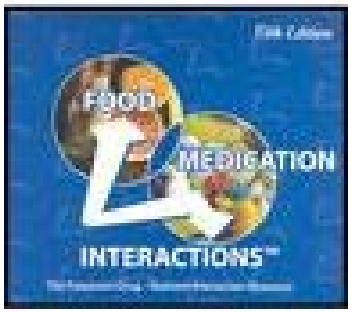
D- Diet Intake Assessment

- **Diet:**
  - **Meeting requirements?**
  - **Qualitative (quality & type)**
  - **Quantitative (amount)**
  - **Food and drinks**

  Methods:
  - **24 hour recall**
  - **3 day food diary**

  Analysis:
  - **Ready reckoner**
  - **Computer analysis**

- **Drug**
  - **Drug- nutrient interaction (e.g binders-Fe^{2+} tablets)**
  - **Effects of drugs on metabolism, appetite e.g. steroids - muscle wasting, ACE-I & high serum K^{+}**



Medications used - ↑ serum K^+

ACE Inhibitors

- Captopril
- Enalapril
- Fosinopril
- Lisinopril
- Quinapril
- Ramipril
- Trandolapril

Angiotensin 2 Blockers (ARB)

- Irbesartan
- Candesartan
- Telmisartan
- Eprosatan
- Losartan

Potassium Sparing Diuretics

- Spironolactone
- Amiloride
- Triamterene

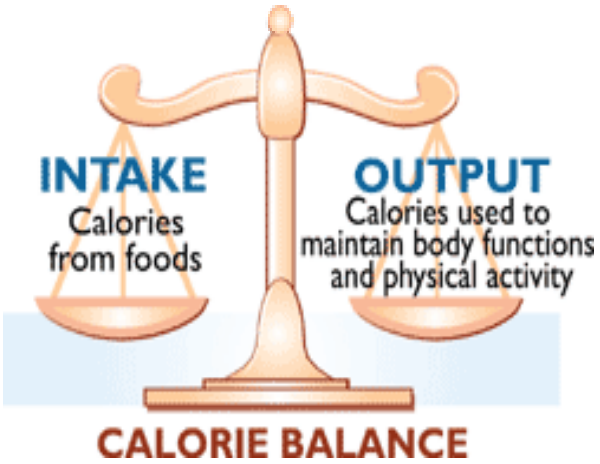
together with reduced renal function:

⇒ ↑↑ serum K^+ (Hyperkaelamia)

(E) Exercise activity /capacity

- ***E*** **- Exercise/Physical Activity**
  - **Exercise capacity low**

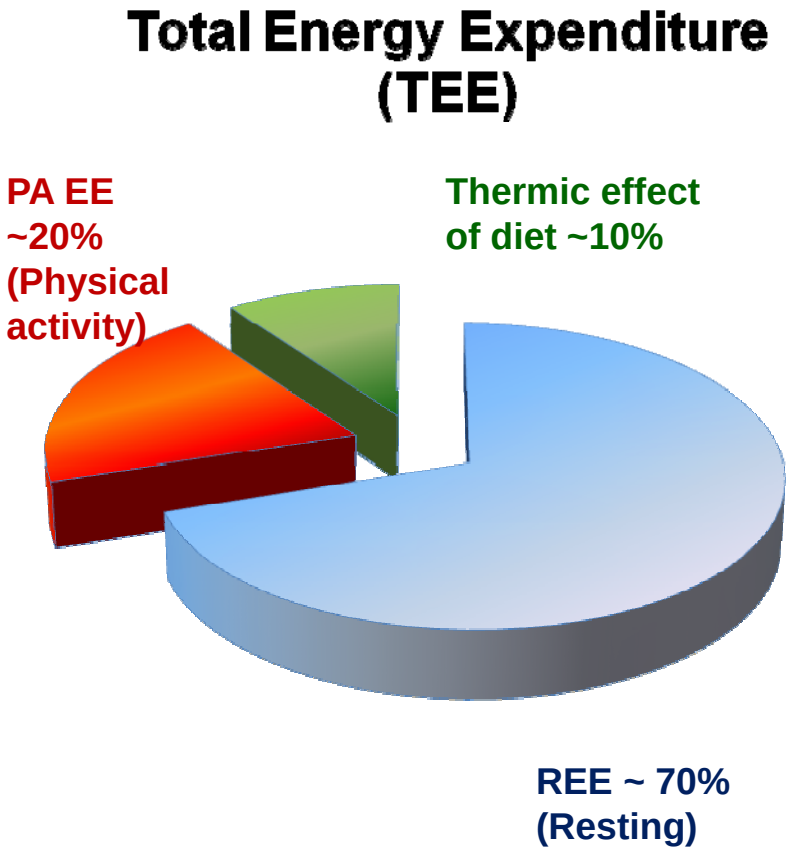
    ⇒ ↓ QOL
  - **Energy balance**
  - **Energy expenditure (EE)**



- **Factors ↑ EE:**
  - **Inflammation**
  - **Intercurrent illnesses**
  - **Dialysis *per se***
- **Factors ↓EE:**
  - **Physical inactivity**
  - **Poor dietary intake (reduced thermic effects)**
  - **Reduced muscle mass**

⇒ varies among individuals

Armband study



✓ Clinical application:
- Diet
- Exercise/Physical activity

(metabolism)

X Gold standard - doubly labeled water, not feasible in renal patients

✓ Needs alternative methods

Chan, M, Avesani, CM; Carrero JJ, Faxen-Irving, G, Stenvinkel, P, Lindholm, B, Heimburger, O

TEE
Armband
portable Sense Wear

Vs

REE
calorimetry

+

Physical EE
modified Paffenbarger PA (questionnaire)

+

Thermic Effect of Diet ~ 10% TEE

Application

Impaired physical activity and active energy expenditure in maintenance hemodialysis patients: an international study.

Carla Maria Avesani, Stanislas Trolonge, Patrik Deléaval, Flavia Baria, Denise Mafra, Gerd Faxén-Irving, Phillipe Chauveau, Daniel Teta, Maria Ayako Kamimura, Lilian Cuppari, Maria Chan, Olof Heimburger, Denis Fouque.

In press

Whole Room Calorimetry

Total Energy Expenditure:
Resting EE + Physical EE+ Thermal Effect of diet

University of Wollongong

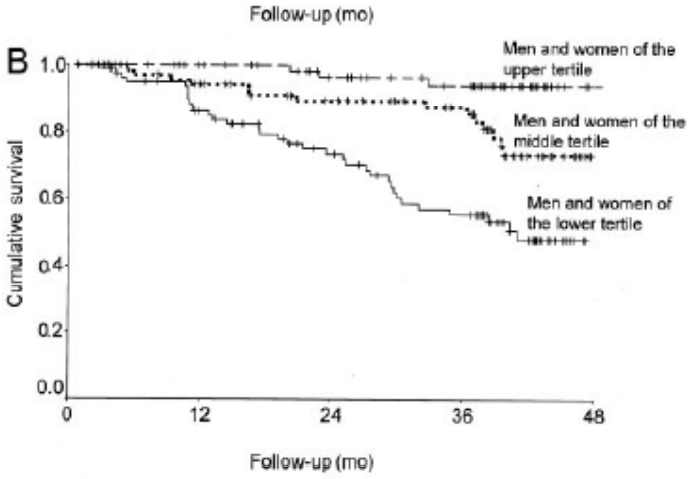
2008 Australia

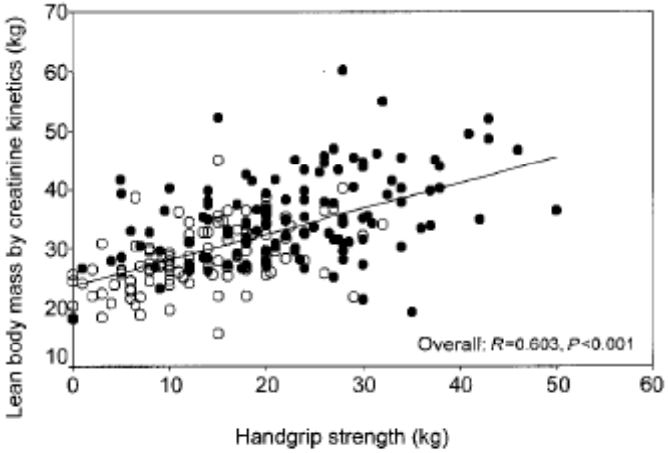
(F) Functional Capacity

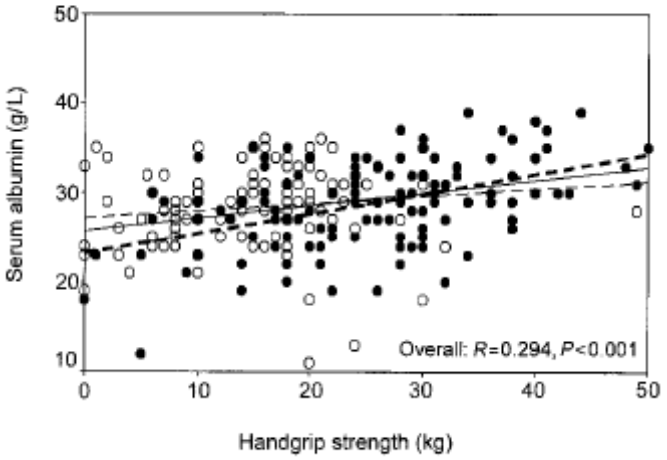
F - functional capacity

Hand grip strength ∝

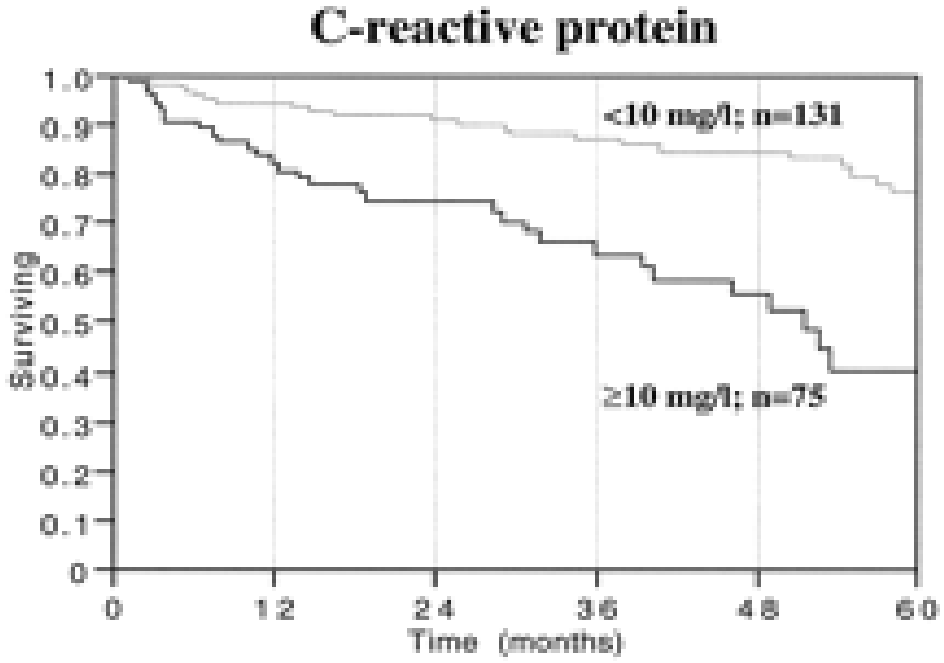
- **Lean muscle mass**
- **Albumin**
- **SGA**

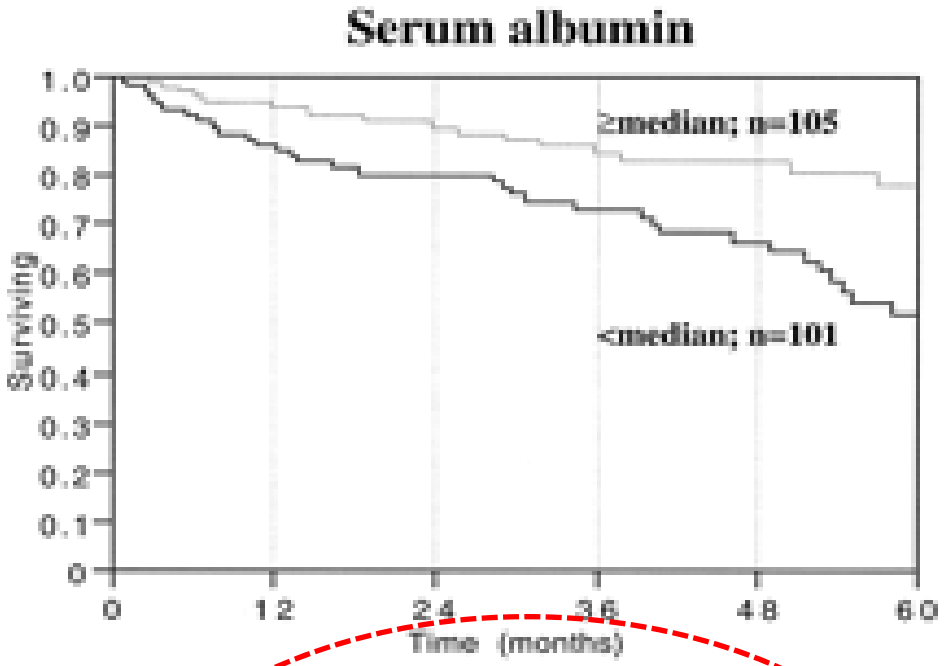


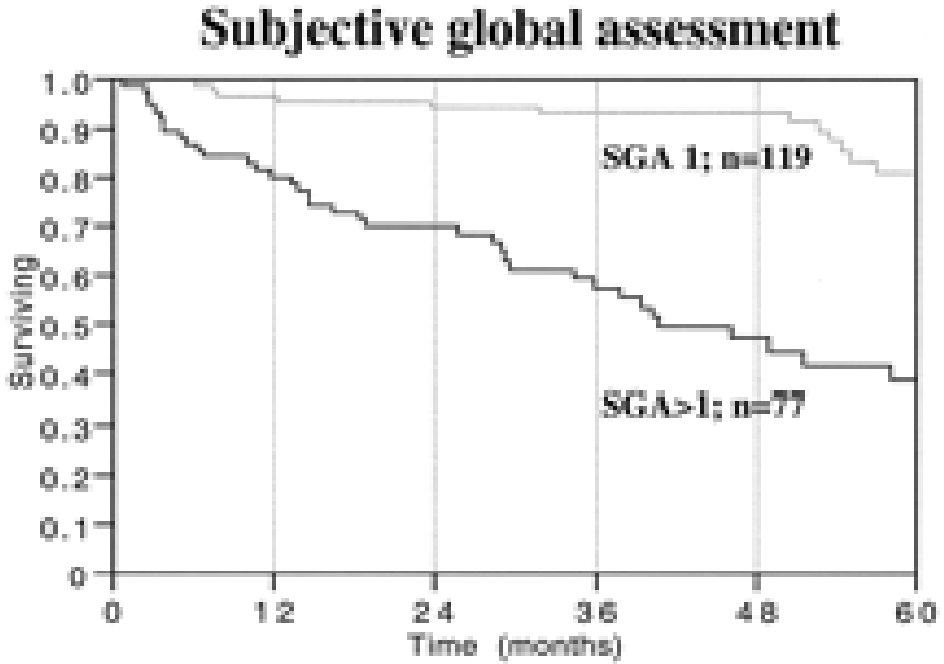


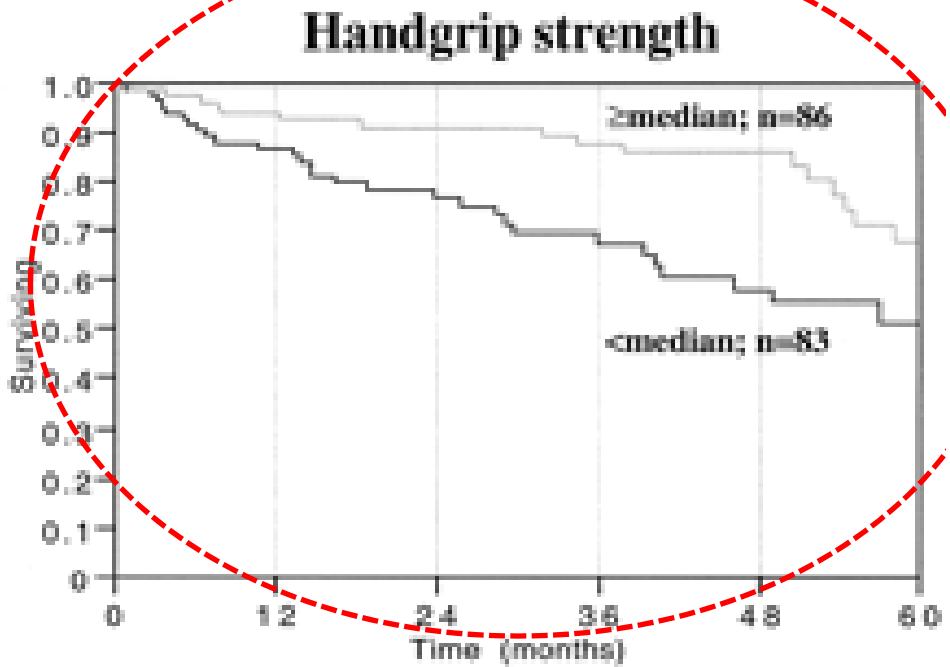


Wang et.al AJCN 2005









Nutritional parameters at commencement of dialysis & survival

Stenvinkel, P et.al 2002

Nephrol Dial Transplant (2011) 26: 1354–1360
doi: 10.1093/ndt/gfq487
Advance Access publication 13 August 2010

Use of handgrip strength in the assessment of the muscle function of chronic kidney disease patients on dialysis: a systematic review

Viviane O. Leal[1], Denise Mafra[1,2], Denis Fouque[3] and Luiz A. Anjos[1,4]

[1]Medical Science Post Graduate Program, Fluminense Federal University (UFF), Niterói, Brazil, [2]Clinical Nutrition Department, Nutrition Faculty, Fluminense Federal University (UFF), Niterói, Brazil, [3]Department of Nephrology, Hôpital E. Herriot, Univ. Lyon, Lyon, France and [4]Social Nutrition Department, Nutrition Faculty, Fluminense Federal University (UFF), Niterói, Brazil

Correspondence and offprint requests to: Viviane de Oliveira Leal; E-mail: vivianeoleal@yahoo.com.br

Subjective Global Assessment (SGA)

3 point scale:

A - Well nourished

B - Mildly to moderately malnourished

C - Severely malnourished

(there are other versions)

Subjective Global Assessment Scoring Sheet

Patient Name:_____ Patient ID:_____ Date:_____

Part 1: Medical History

SGA Score

	A	B	C
1. Weight Change			
A. Overall change in past 6 months: _____ kgs.			
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 liquid _____ starvation			
3. Gastrointestinal Symptoms (persisting for >2 weeks)			
___none _____nausea diarrhea _____ anorexia			
_____vomiting___			
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:	SGA Score: Normal	Mild	Moderate	Severe
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

Prevalence and Prognostic Significance of Malnutrition in Chronic Renal Insufficiency

Jane A. Lawson, BSc, Ross Lazarus, MD,† and John J. Kelly, MD‡*

Table 2. Physical, Biochemical, and Hematologic Characteristics of CRI Patients as Classified by SGA Nutritional Status

Characteristic	SGA A	SGA B/C
N (%)	36 (72)	14 (28)†
Male (%)	21 (58)	7 (50)
Age (yr)	69.4 (65.5, 73.4)	69.1 (62.9, 75.4)
Weight (kg)	79.2 (73.9, 84.5)	59.2 (53.0, 65.3)‡
Height (m)	1.65 (1.62, 1.68)	1.61 (1.56, 1.67)
BMI (kg/m^2)	29.0 (27.3, 30.7)	22.7 (20.7, 24.7)‡
MAC (cm)	30.7 (28.9, 32.4)	24.3 (22.3, 26.3)‡
Fat-free mass (kg)	51.3 (47.4, 55.3)	40.9 (33.7, 48.1)*
Waist:hip ratio	0.94 (0.91, 1.00)	0.93 (0.88, 0.97)
C_{CRT} ($mL/min/1.73\ m^2$)	36.5 (30.2, 42.7)	18.9 (13.3, 24.5)‡
GFR ($mL/min/1.73\ m^2$)	28.5 (24.4, 32.8)	20.7 (17.6, 23.8)*
Cr (mg/dL)	2.6 (2.1, 3.0)	3.2 (2.3, 4.1)
Albumin (g/L)	40.9 (39.2, 42.5)	39.1 (35.9, 42.2)
Urea (mmol/L)	19.1 (14.1, 24.1)	17.1 (14.2, 19.9)
HCO_3 (mmol/L)	24.4 (22.9, 25.9)	25.5 (23.3, 27.8)
WBC ($1 \times 10^9/L$)	6.63 (6.05, 7.21)	7.51 (6.16, 8.87)
Lymphocytes ($1 \times 10^9/L$)	1.47 (1.24, 1.70)	1.56 (1.32, 1.80)
Hb (g/L)	123.0 (114.0, 132.0)	122.4 (113.1, 131.6)

Note. Results were expressed as mean ± 95% confidence intervals. CRI patients, n = 50.
Abbreviations: Cr, creatinine; WBC, white cell count; Hb, hemoglobin.
*$P < .01$.
†$P < .01$.
‡$P < .001$.

Lawson et.al. JREN 2001

Table 4. Outcome After 12 Months of Follow-up, Expressed as Number (%)

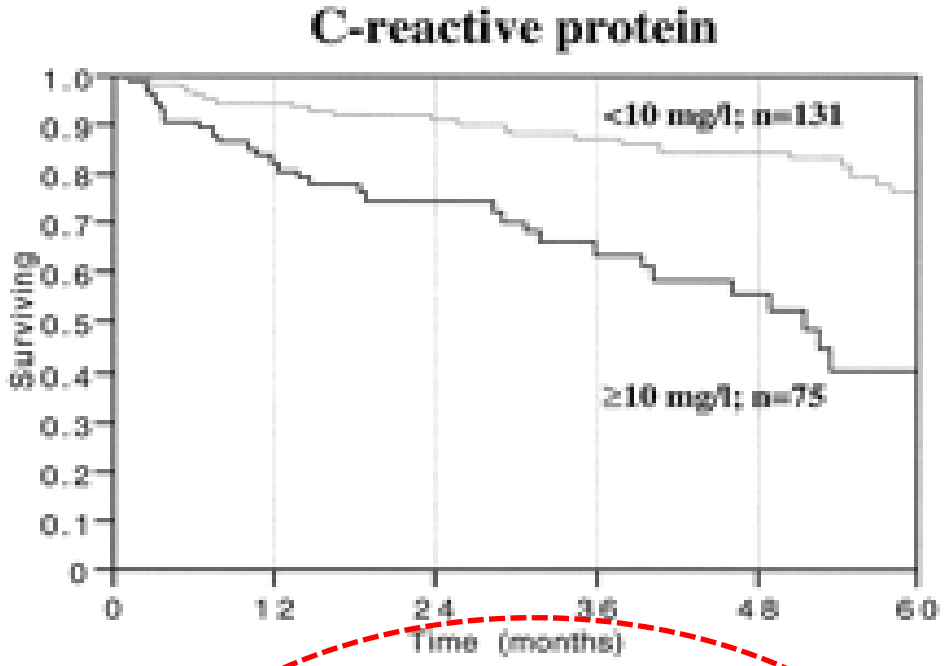
N (%)	SGA (A)	SGA (B/C)
No. of patients who died	1 (2.7)	3 (21.4)*
Death/ESRF (C_{CRT} < 10 mL/min/1.73 m^2)	4 (11.1)	8 (50.0)*
C_{CRT} < 10 mL/min/1.73 m^2	3 (9.3)	6 (42.4)*
Likelihood of hospital admission (%)	37	79†
Average length of stay (days)	6.2 ± 6	11.2 ± 9
Likelihood of elective admission (%)	23	21
Likelihood of acute admission (%)	23	79†
Average length of stay for urgent admissions (days)	9.1 ± 6.9	11.8 ± 8.6

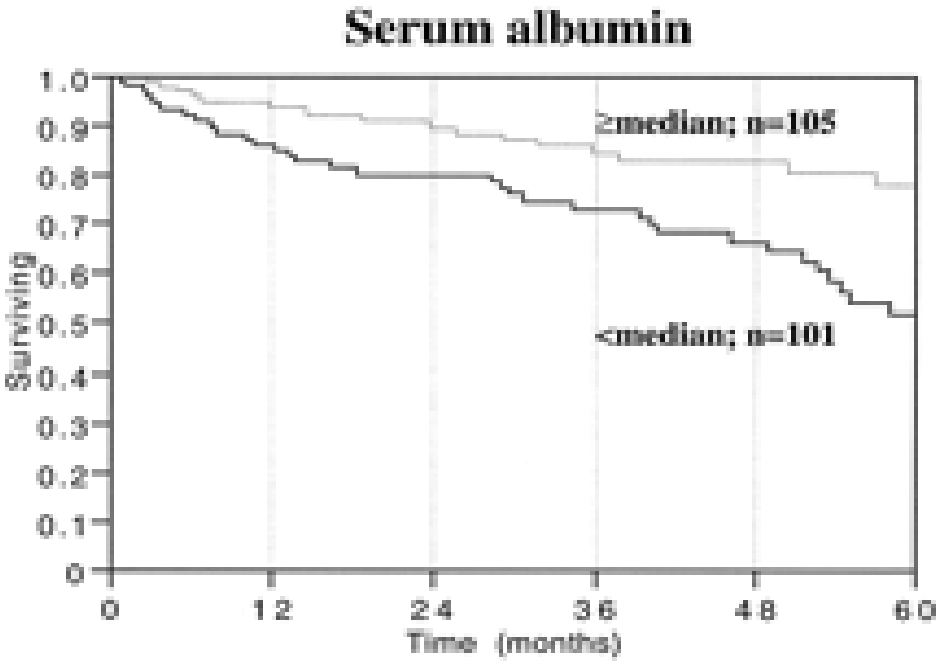
*P < .05 % SGA (B/C) *v* % SGA (A).
†P < .001 % SGA (B/C) *v* % SGA (A).

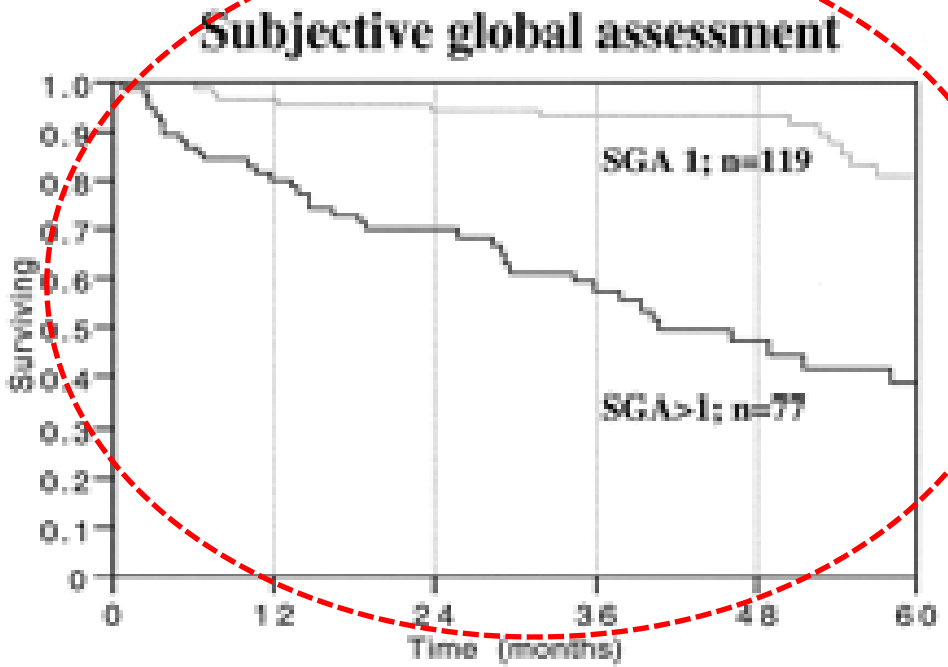
Significant difference:
- Death
- Hospitalisation

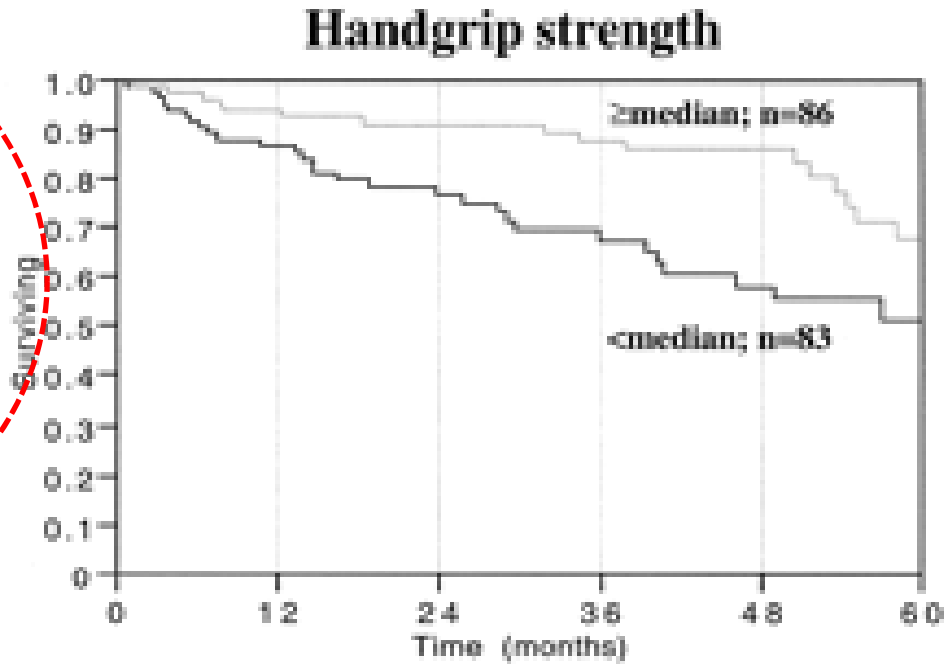
Conclusions:
SGA provides a useful means of assessing nutritional status and is helpful in identifying patients with at increased risk of morbidity and mortality in the setting of chronic renal insufficiency

Lawson et.al. JREN 2001









Nutritional parameters at commencement of dialysis & survival

Stenvinkel, P et.al 2002

Nutritional Status and Its Relationship to Quality of Life in a Sample of Chronic Hemodialysis Patients

*R. A. Laws, BSc, MSc (NutrDiet),**
L. C. Tapsell, PhD, MHPEd, DipNutrDiet, BSc APD,†
and J. Kelly, MBBS, FRACP, MD‡

Objective: To assess the relationship between nutritional status and quality of life in a sample of chronic hemodialysis patients.

Design: Cross-sectional study.

Setting: Haemodialysis Units of St Vincent's and St George Hospitals, Sydney, Australia.

Patients: Sixty-four patients participated in the nutritional assessment, of which 53 completed the quality of life questionnaire.

The impact of nutrition intervention on quality of life in pre-dialysis chronic kidney disease patients

Katrina Louise Campbell [a,*], Susan Ash [a], Judith Dorothea Bauer [b]

[a] Institute of Health and Biomedical Innovation, Queensland University of Technology, Brisbane, Qld, Australia
[b] Wesley Research Institute, The Wesley Hospital, Auchenflower,

Campbell K et.al. Clinic Nutrition, Vol 57 2008 pp537-544

Outcome measures:

- Patient Generated Subjective Global Assessment): PG -SGA
- Quality of life (by Kidney Disease Quality of Life): SF-36

Table 3 Change in Subjective Global Assessment ratings for intervention and standard care group's *n* (%) over the 12-week treatment period, in a sample of pre-dialysis CKD patients

Change in SGA[a]	Intervention ($n = 23$)	Standard care ($n = 24$)
Deteriorated	0 (0)	4 (16.7)
No change	18 (78.2)	20 (83.3)
Improved	5 (21.7)	0 (0)

SGA, Subjective Global Assessment.
[a] Difference in change in SGA was statistically significant $\chi^2(2) = 12.76$ ($p < 0.01$).

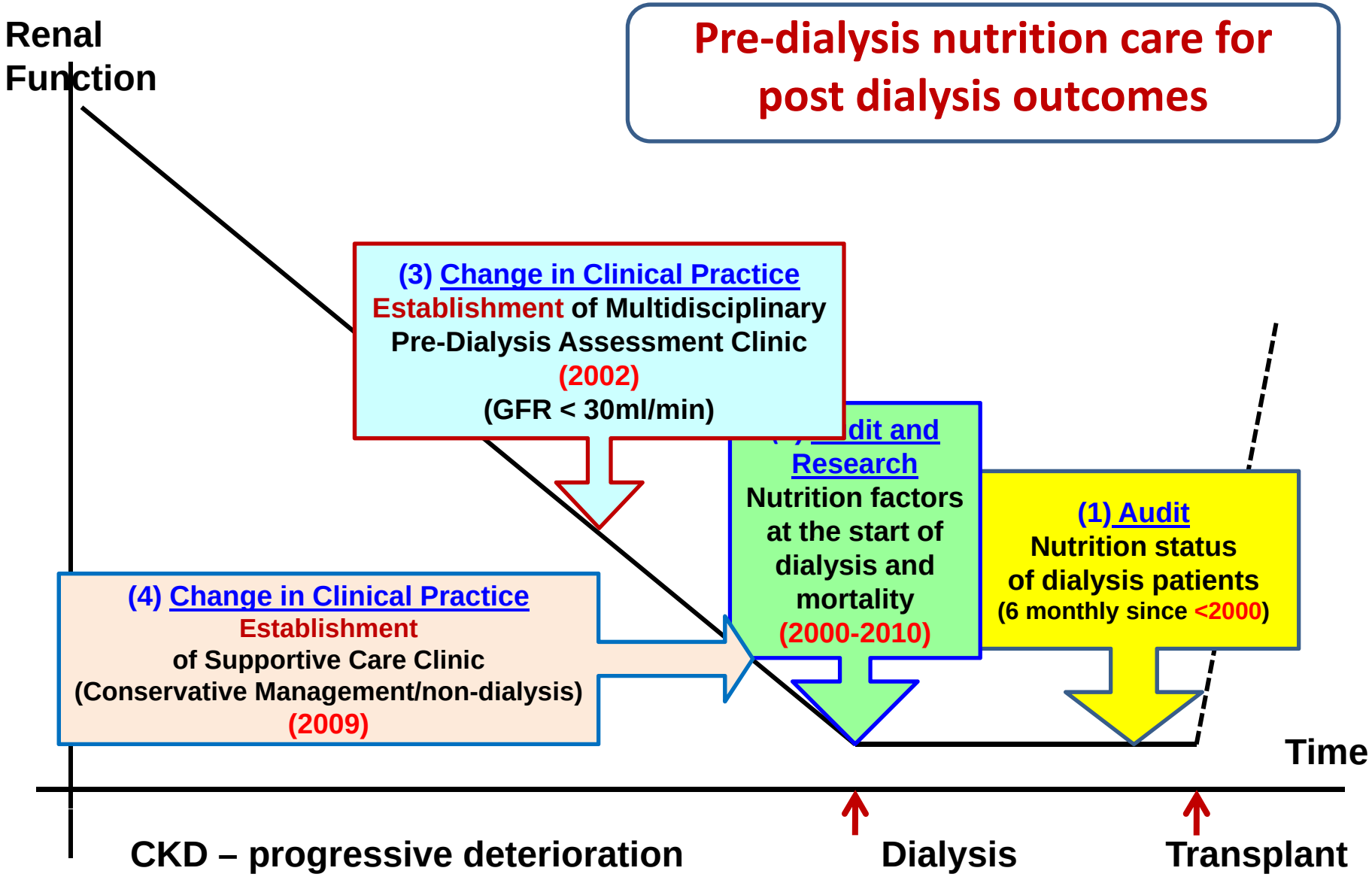
Conclusions:

Quality of life is related to nutritional status in pre-dialysis patients. Providing individualised nutritional counselling improves many components of quality of life, compared with standard nutrition care, in the stage prior to dialysis treatment

Study of SGH 2000-2011

Overview

Pre-dialysis nutrition care for post dialysis outcomes



ChanM, Unpublished data

Summary –nutrition assessment

- Must use a combination of parameters
- Use good clinical judgment
- Assess and monitor status:
  - Current
  - Changes over time
- Quality assurance

Quantity and Quality of life

Thank You