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Bioimpedantie: meerwaarde bij de dialyse?

Volume en voedingsstatus

Jeroen Kooman
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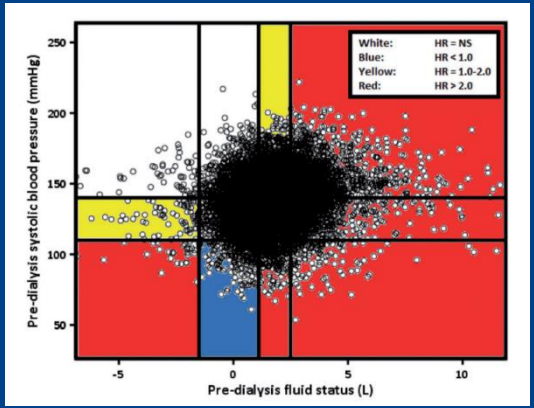

Disclosure belangen spreker

(potentiële) belangenverstrengeling	Geen
Voor bijeenkomst mogelijk relevante relaties met bedrijven	Bedrijfsnamen
• Sponsoring of onderzoeksgeld • Honorarium of andere (financiële) vergoeding • Aandeelhouder • Andere relatie, namelijk …	• geen • geen • geen • onderzoekssamenwerking Fresenius MC binnen MONDO consortium

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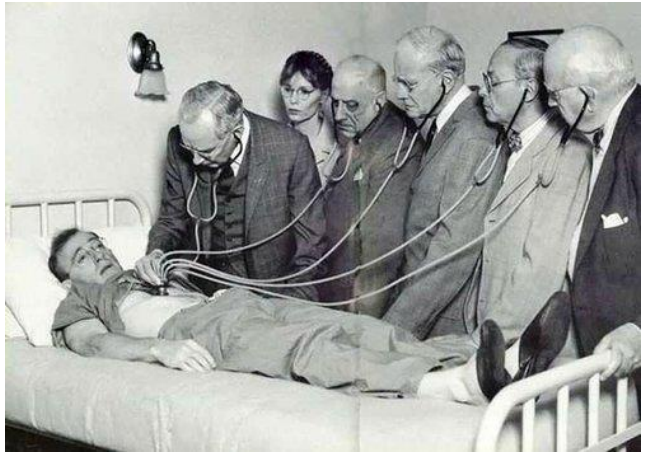
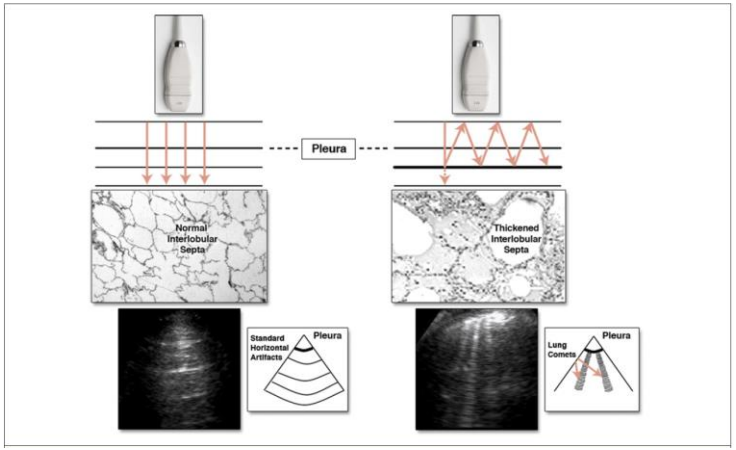
Outline

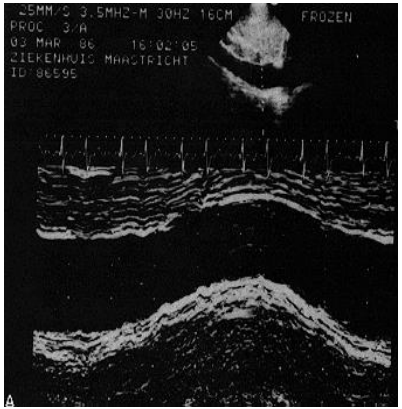
- ✓ KORTE TECHNISCHE INTRODUCTIE
- ✓ “OVERVULLING” (Fluid overload)
  - prognose
  - pathofysiologische interacties
  - interventies
- ✓ LICHAAMSSAMENSTELLING
  - prognose
  - interventies
- ✓ CONCLUSIE

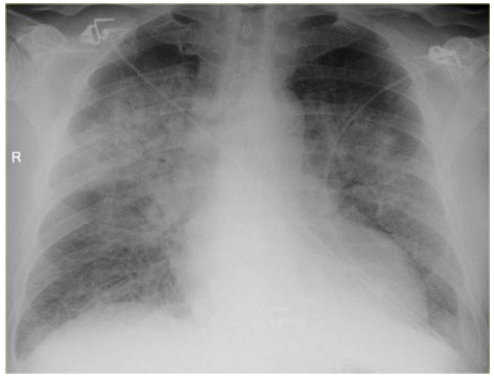
Bepalen volumestatus

- Systemisch
- Orgaan
- Weefsel









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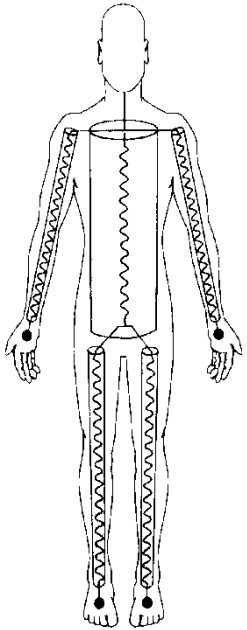
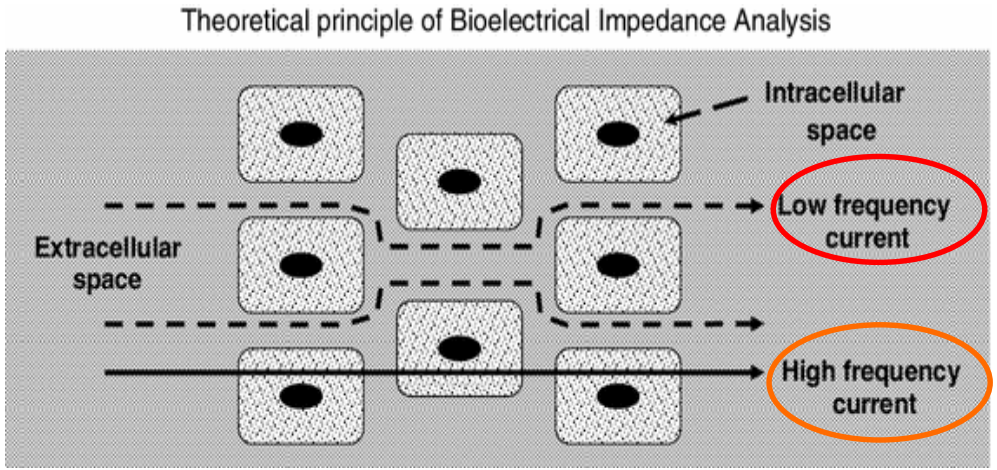
Mallamaci, JACC 2010; Leunissen KI 1993;
http://adelaideemergencyphysicians.com/2015/04/fellowship-physical-examination-tips/





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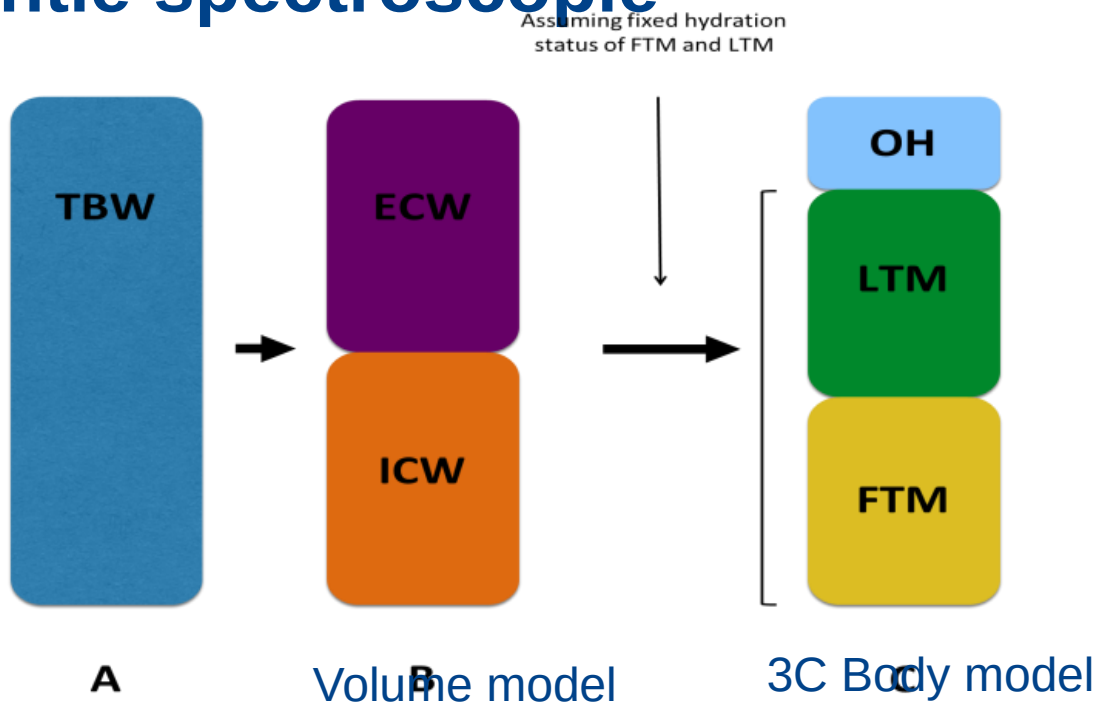
de Lorenzo ; J Appl Physiol 1997 Sugano Clin Exp Nephrol 2014

Bioimpedantie spectroscopie



Dekker M Blood Purif 2018

Impedance techniques

Increasing error

- *Measure* impedance parameters, e.g. resistance (R in ohm)
- *Estimate* others, e.g. resistance at zero frequency (R_0) in bioimpedance spectroscopy (BIS)
- *Assume* values for coefficients, e.g. resistivity of body water (ρ in ohm.cm)
- *Apply* population means to individuals
- *Predict* body composition using algorithms

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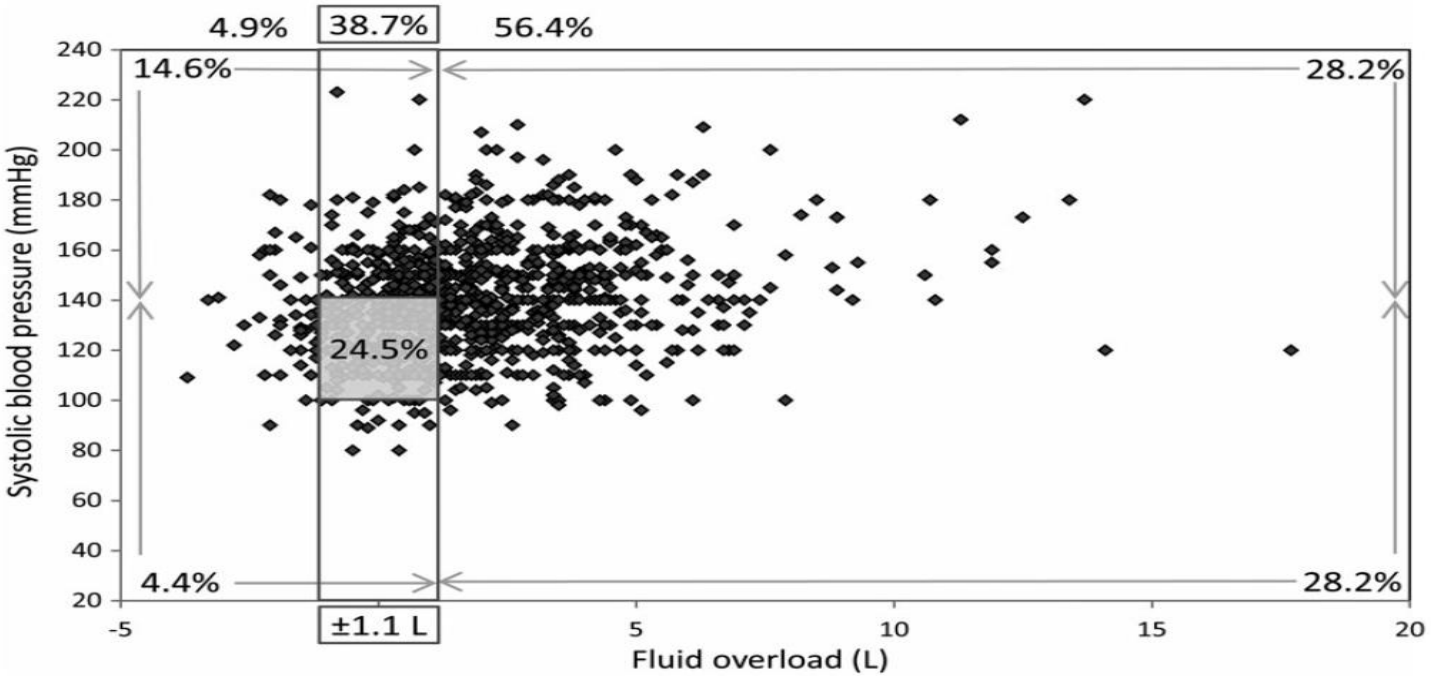
Ward Eur J Clin Nutr 2018: Heymsfield Am J Clin Nutr 1982

Baseline hydration status in incident peritoneal dialysis patients: the initiative of patient outcomes in dialysis (IPOD-PD study)†



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Ronco; NDT 2015

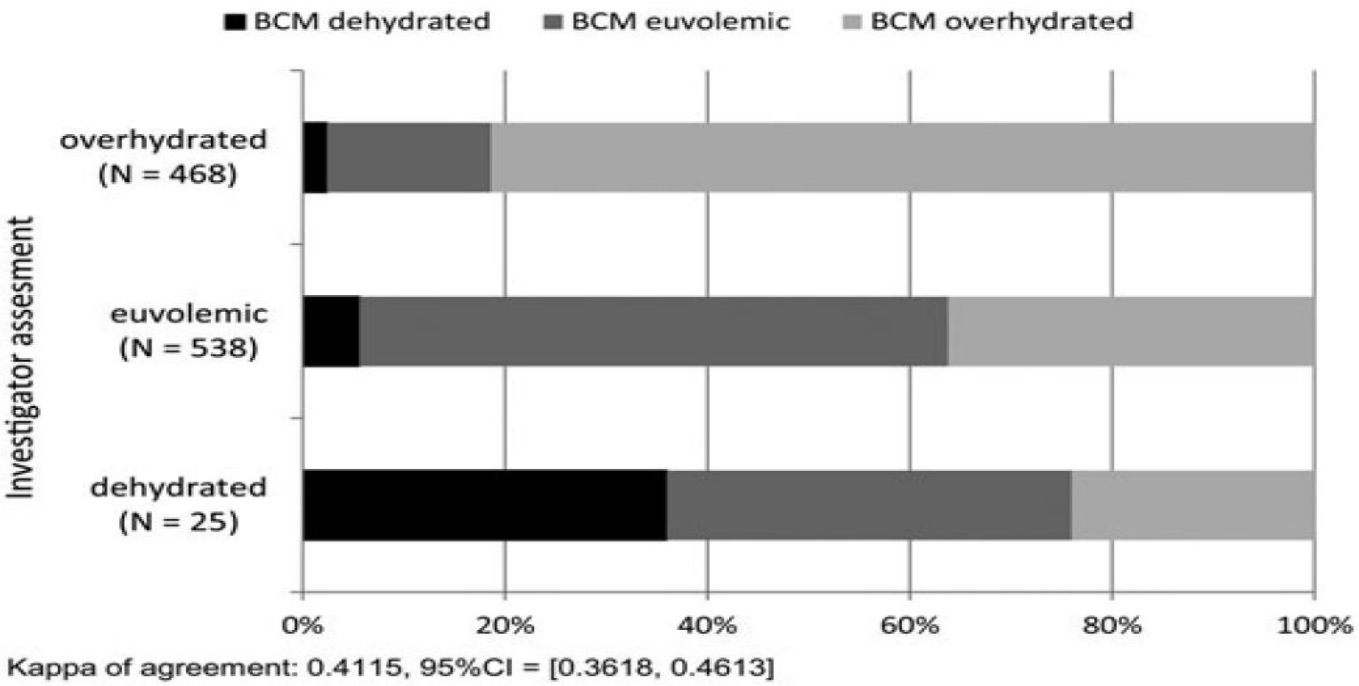

FIGURE 4: Assessment of hydration status with BCM versus clinical assessment by investigator using the physician specific assessment.

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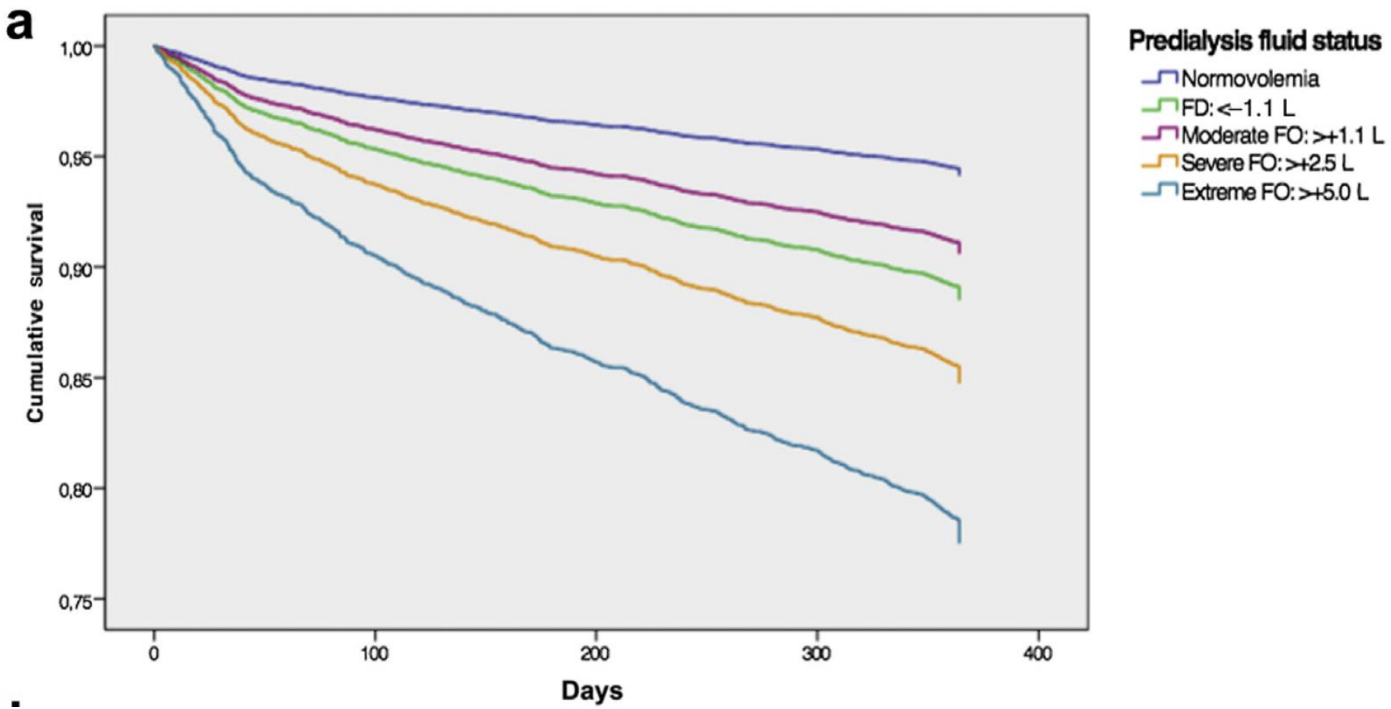
Ronco; NDT 2015

Impact of fluid status and inflammation and their interaction on survival: a study in an international hemodialysis patient cohort



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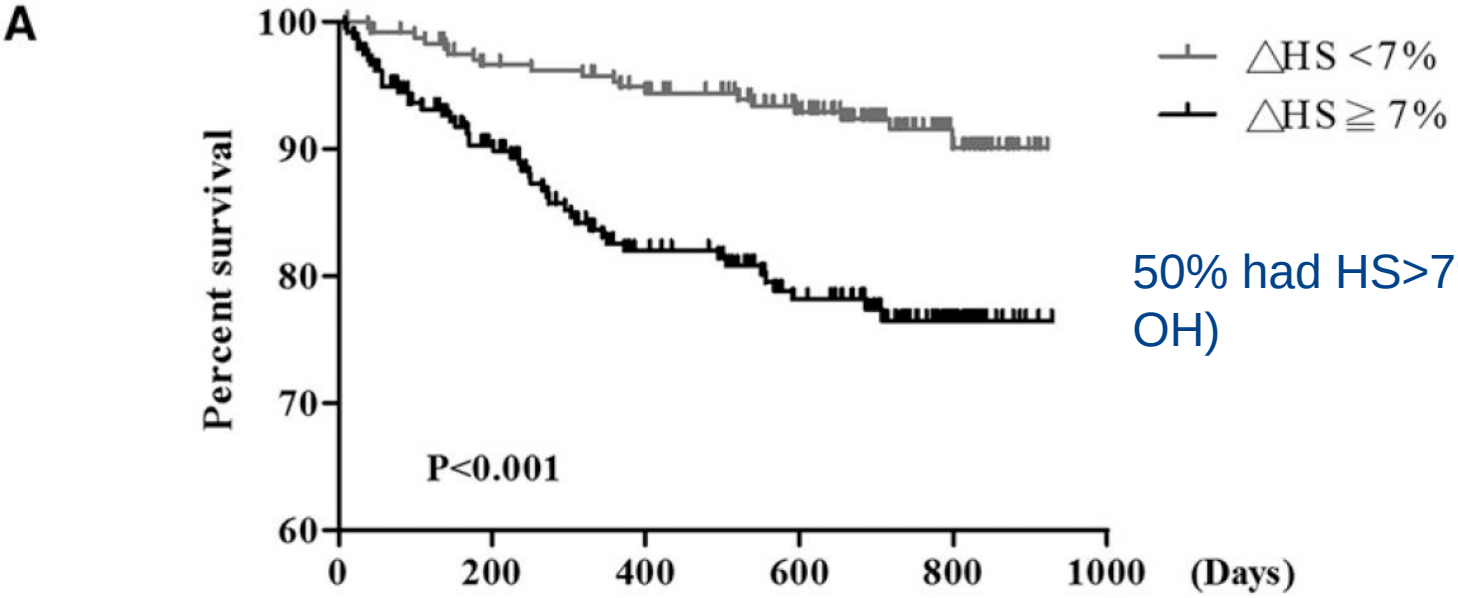
Dekker M; Kidney Int 2017

Association of Fluid Overload with Cardiovascular Morbidity and All-Cause Mortality in Stages 4 and 5 CKD



50% had HS>7% (+1.1l OH)

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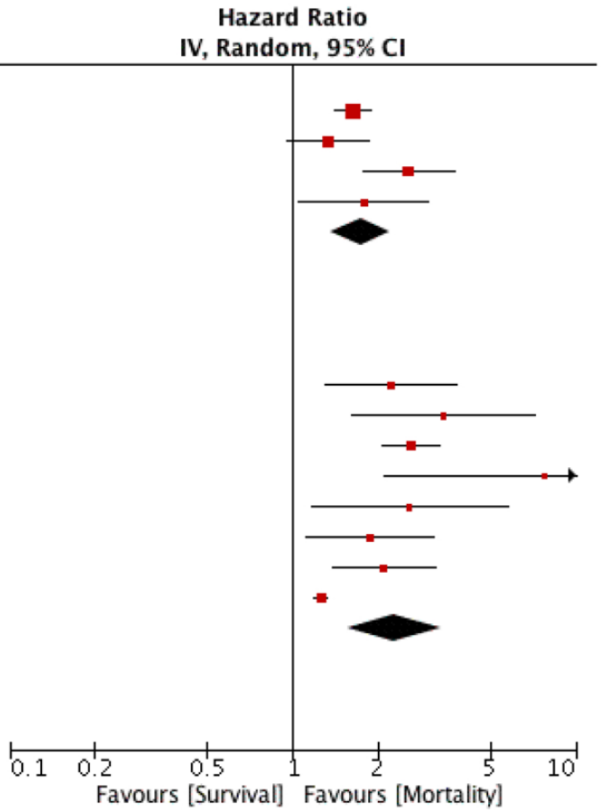
Tsai cJASN 2015

Bioimpedance-defined overhydration predicts survival in end stage kidney failure (ESKF):

Study or Subgroup	Weight	Hazard Ratio IV, Random, 95% CI
3.1.1 Phase Angle (PA) – For every 1 degree decrease in PA		
Beberashvilli 2014a	39.2%	1.64 [1.42, 1.90]
Beberashvilli 2014b	24.8%	1.33 [0.96, 1.85]
Koh 2011	21.8%	2.56 [1.76, 3.73]
Shin 2017	14.3%	1.79 [1.05, 3.03]
Subtotal (95% CI)	**100.0%**	**1.74 [1.37, 2.21]**
Heterogeneity: $Tau^2 = 0.03$; $Chi^2 = 7.03$, df = 3 (P = 0.07); $I^2 = 57\%$		
Test for overall effect: Z = 4.49 (P < 0.00001)		
3.1.2 Overhydration Index – cut off of OH >15%		
Caetano 2016	12.9%	2.22 [1.30, 3.80]
Chazot 2012	10.4%	3.41 [1.62, 7.17]
Dekker 2017	16.3%	2.62 [2.08, 3.30]
Drepper 2016	5.6%	7.82 [2.10, 29.07]
Kim 2015	9.8%	2.58 [1.16, 5.74]
Onofriescu 2015	13.2%	1.87 [1.12, 3.13]
Wizemann 2009	14.4%	2.10 [1.39, 3.18]
Zoccali 2017	17.3%	1.26 [1.19, 1.33]
Subtotal (95% CI)	**100.0%**	**2.28 [1.56, 3.34]**
Heterogeneity: $Tau^2 = 0.22$; $Chi^2 = 62.53$, df = 7 (P < 0.00001); $I^2 = 89\%$		
Test for overall effect: Z = 4.27 (P < 0.0001)		



Tabinor Sci Rep 2018

FO en outcome: mechanismen

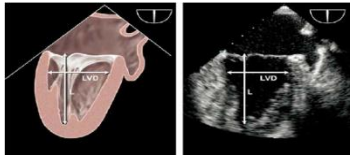
TRADITIONEEL

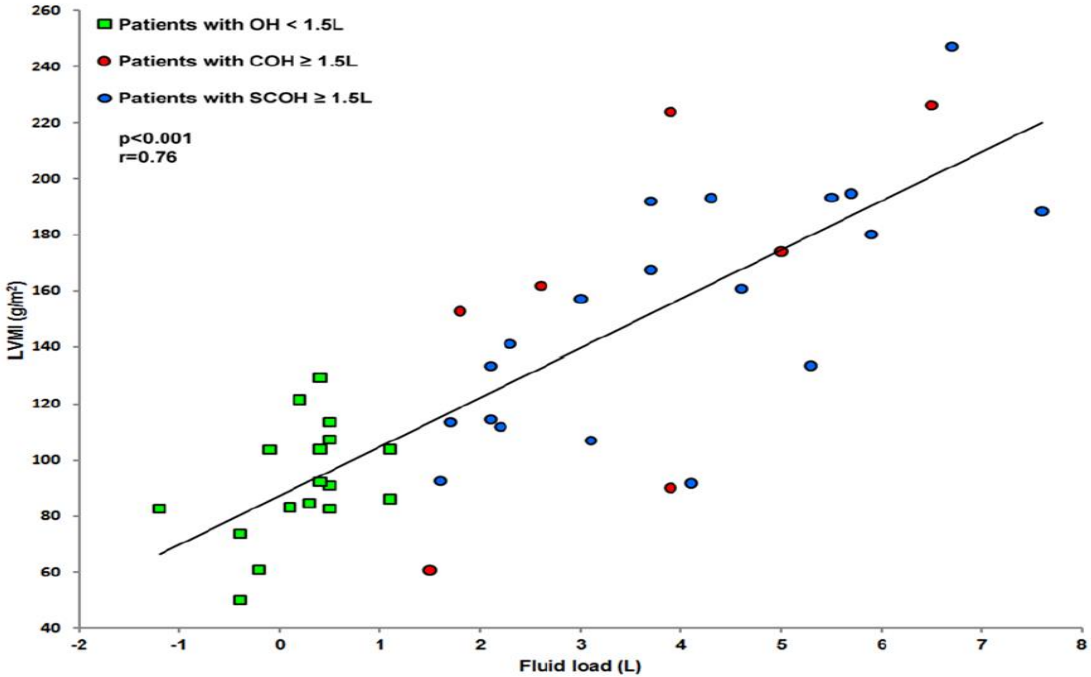
- Hypertensie
- Cardiaal

NIET TRADITIONEEL

- Inflammatie
- Malnutritie
- Diabetes

The impact of sub-clinical over-hydration on left ventricular mass in peritoneal dialysis patients





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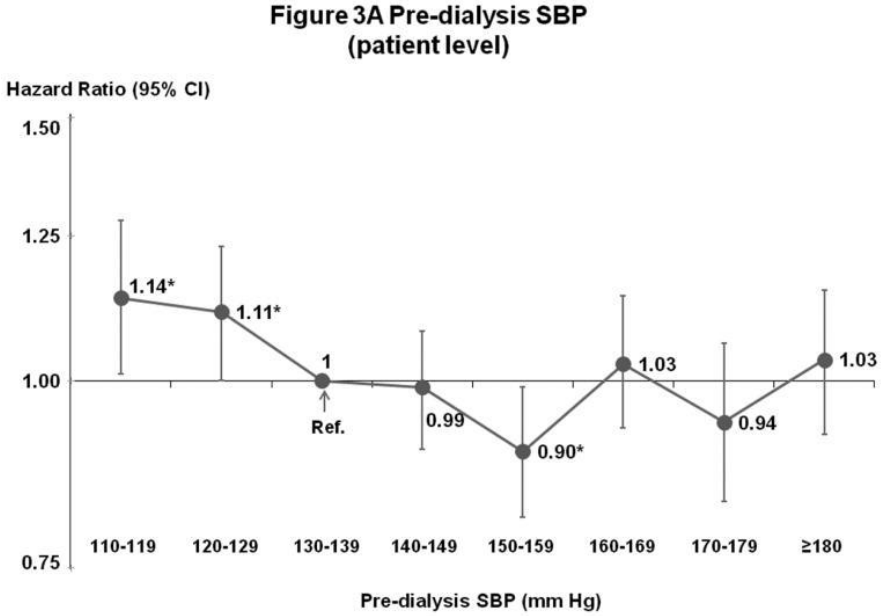
Hassan Int J Clin Exp Med 2015

Blood pressure levels and mortality risk among hemodialysis patients in the Dialysis Outcomes and Practice Patterns Study



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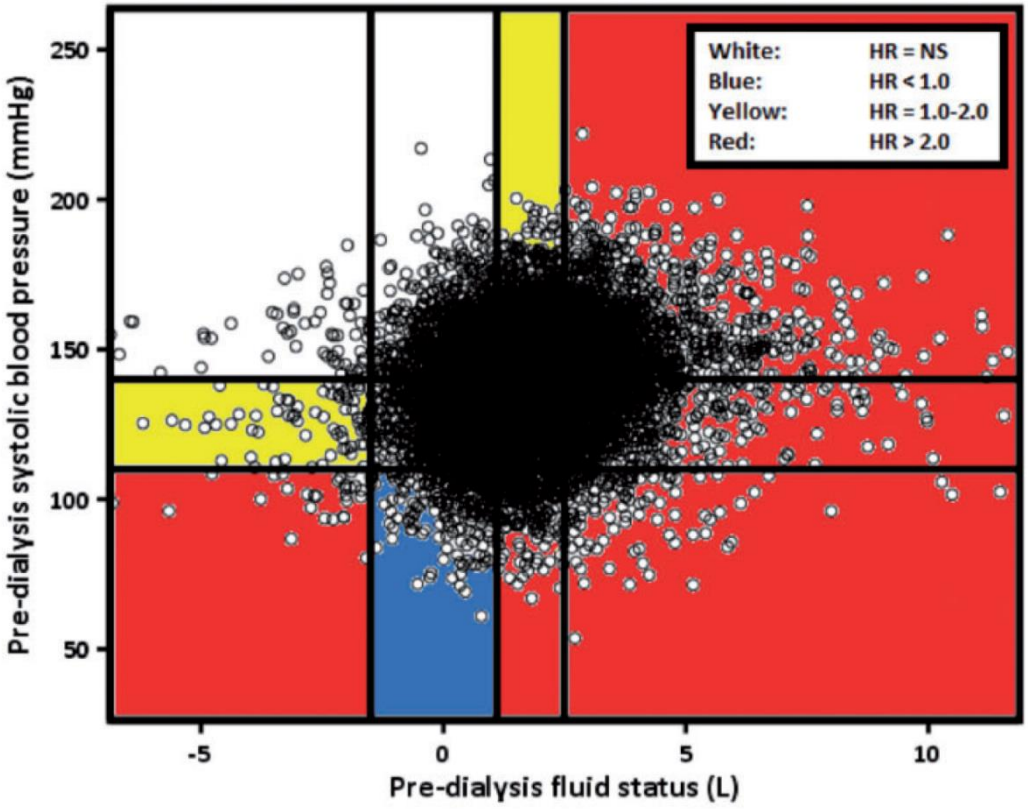
Robinson Kidney Int 2012

Pre-dialysis fluid status, pre-dialysis systolic blood pressure and outcome in prevalent haemodialysis patients: results of an international cohort study on behalf of the MONDO initiative

n=8883



Dekker NDT 2018

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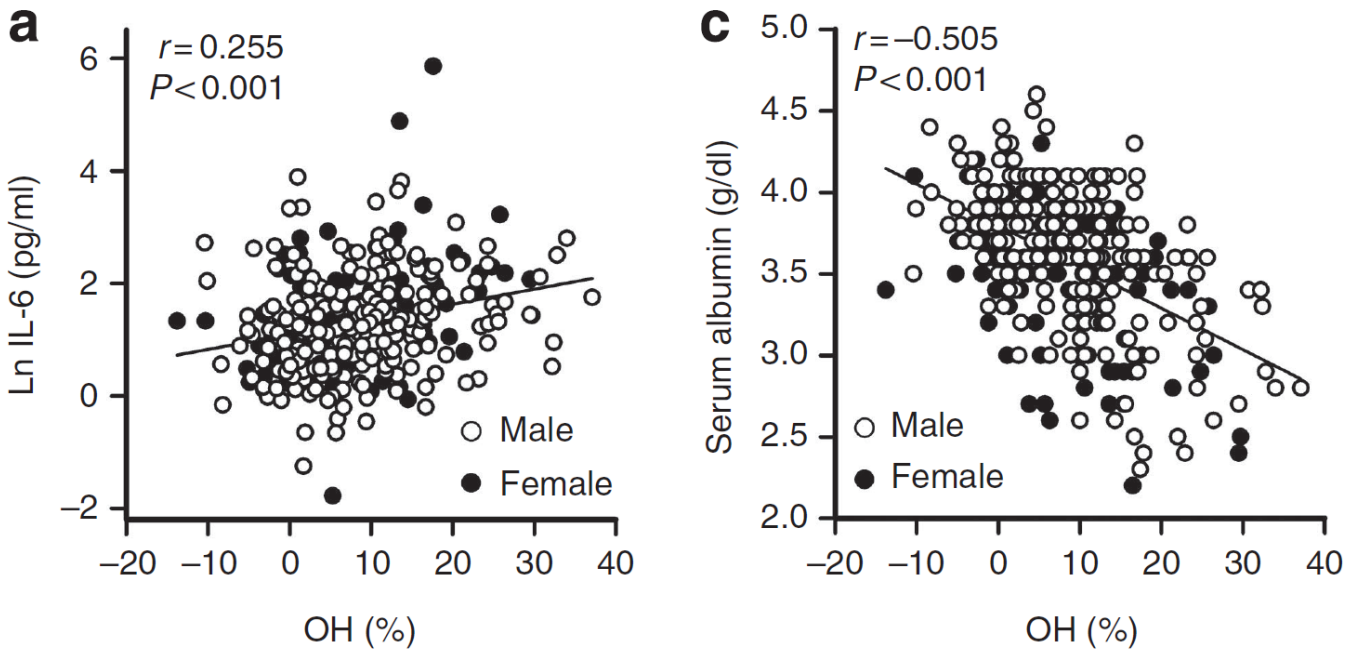
FO en inflammatie



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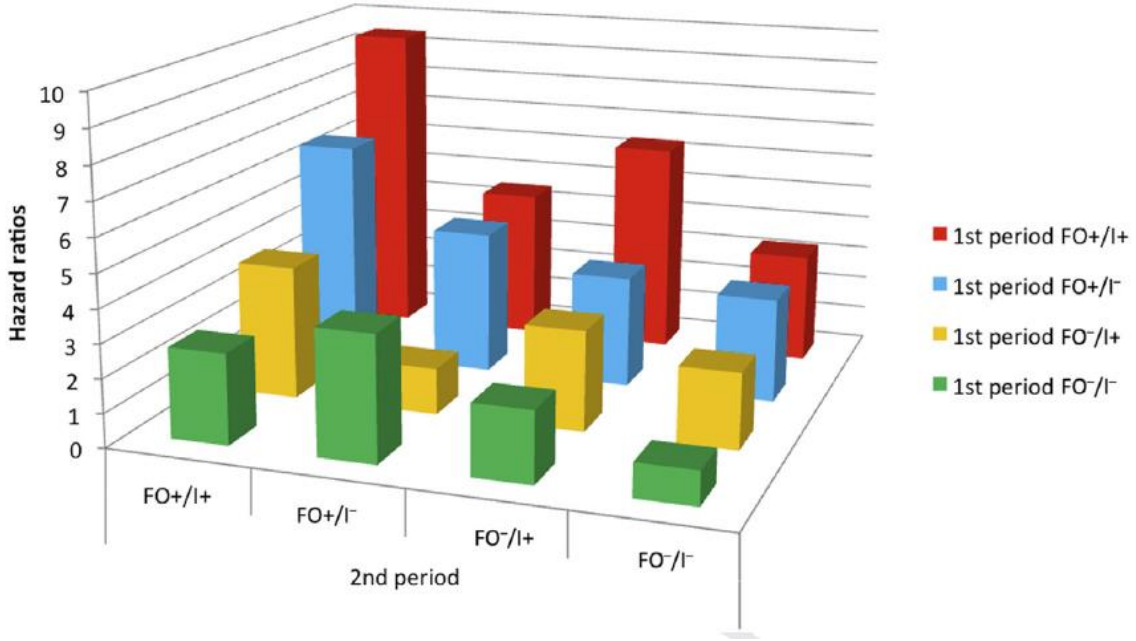
Hung Kidney Int 2014

Impact of fluid status and inflammation and their interaction on survival: a study in an international hemodialysis patient cohort



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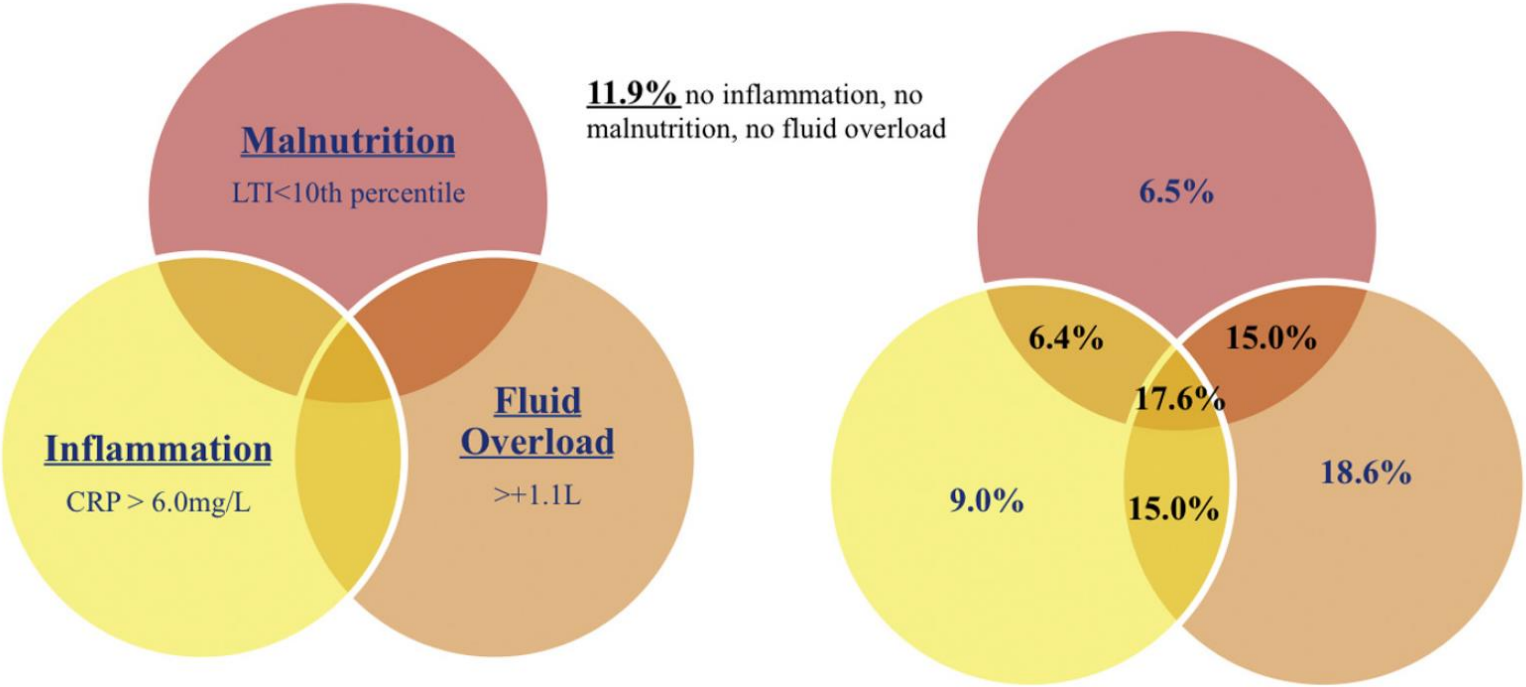
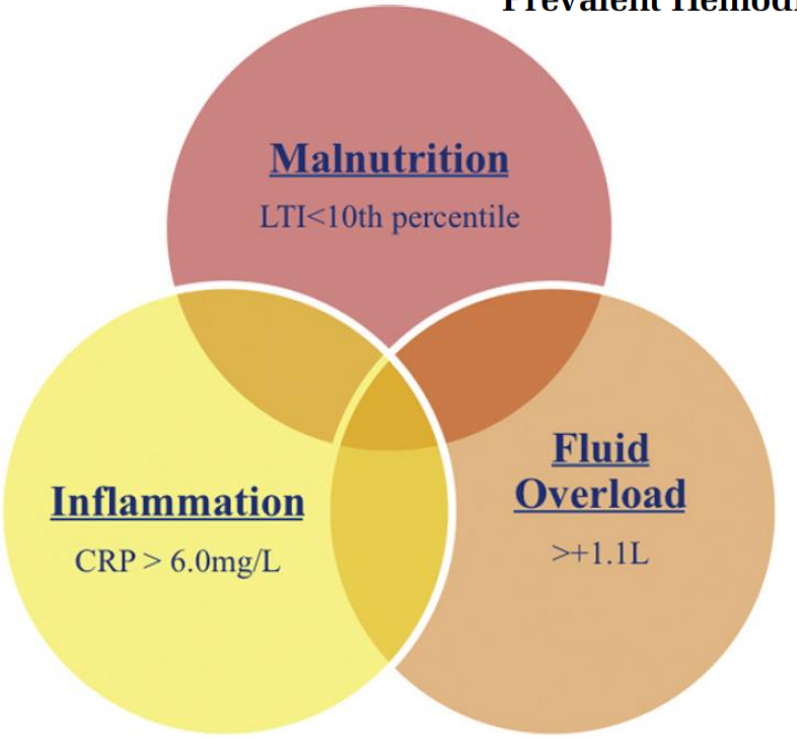
Dekker Kidney Int 2017

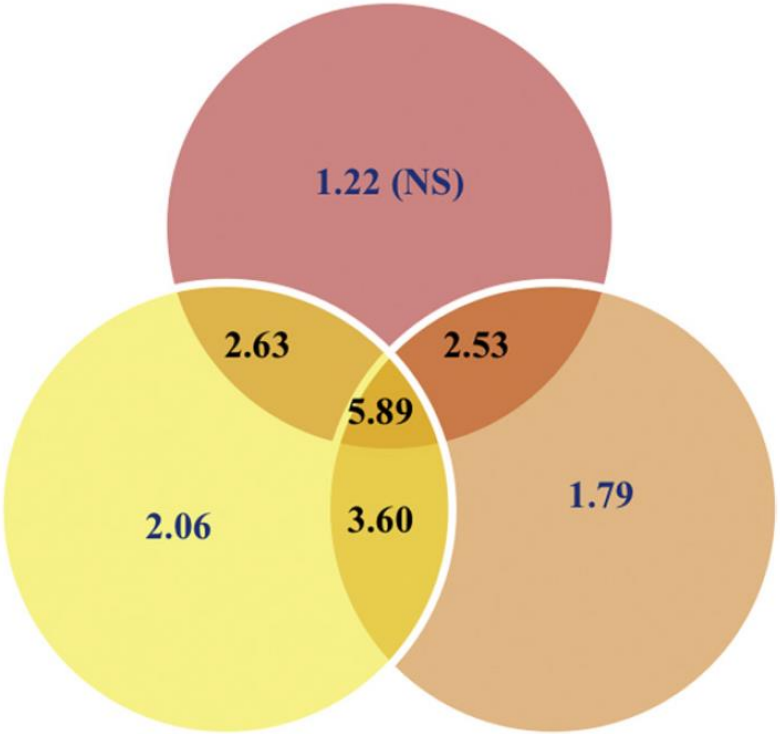
Interactions Between Malnutrition, Inflammation, and Fluid Overload and Their Associations With Survival in Prevalent Hemodialysis Patients



Dekker M; J Ren Nutr 2018

Interactions Between Malnutrition, Inflammation, and Fluid Overload and Their Associations With Survival in Prevalent Hemodialysis Patients





Dekker M; J Ren Nutr 2018

“Guided fluid management”

Bioimpedance-Guided Fluid Management in Hemodialysis Patients

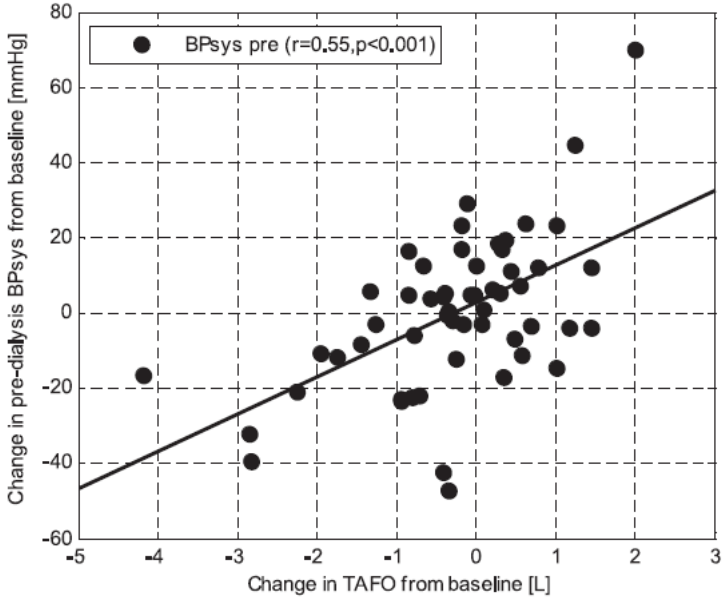


Figure 4. | Change in predialysis systolic BP (BPsys) over change in TAFO between baseline and study end.

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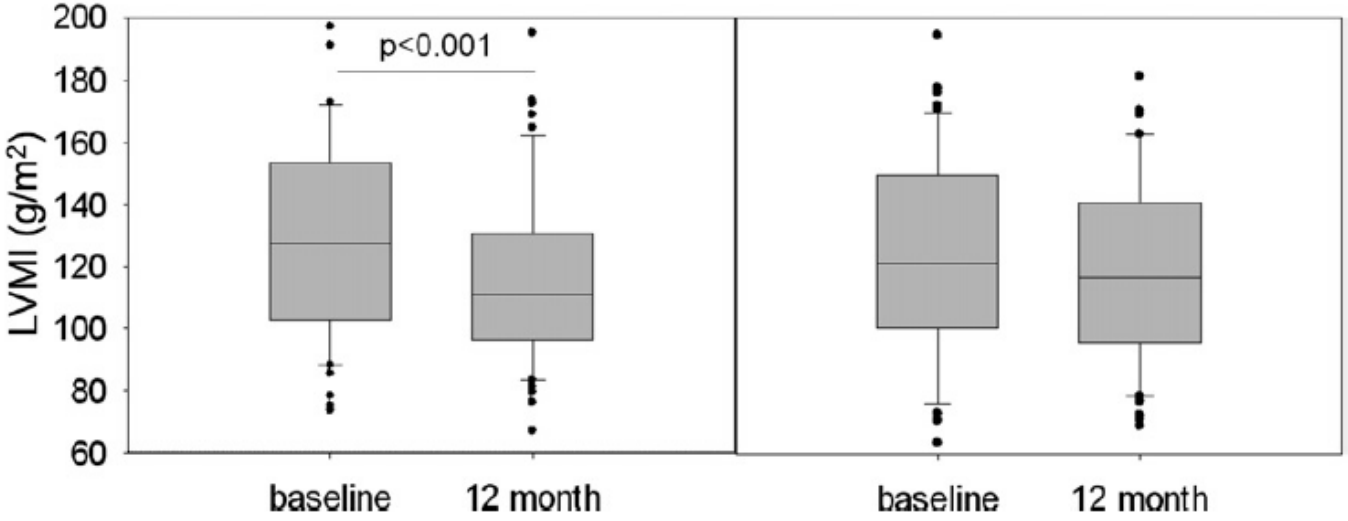
Moissl cJASN 2013

Effect of Fluid Management Guided by Bioimpedance Spectroscopy on Cardiovascular Parameters in Hemodialysis Patients: A Randomized Controlled Trial



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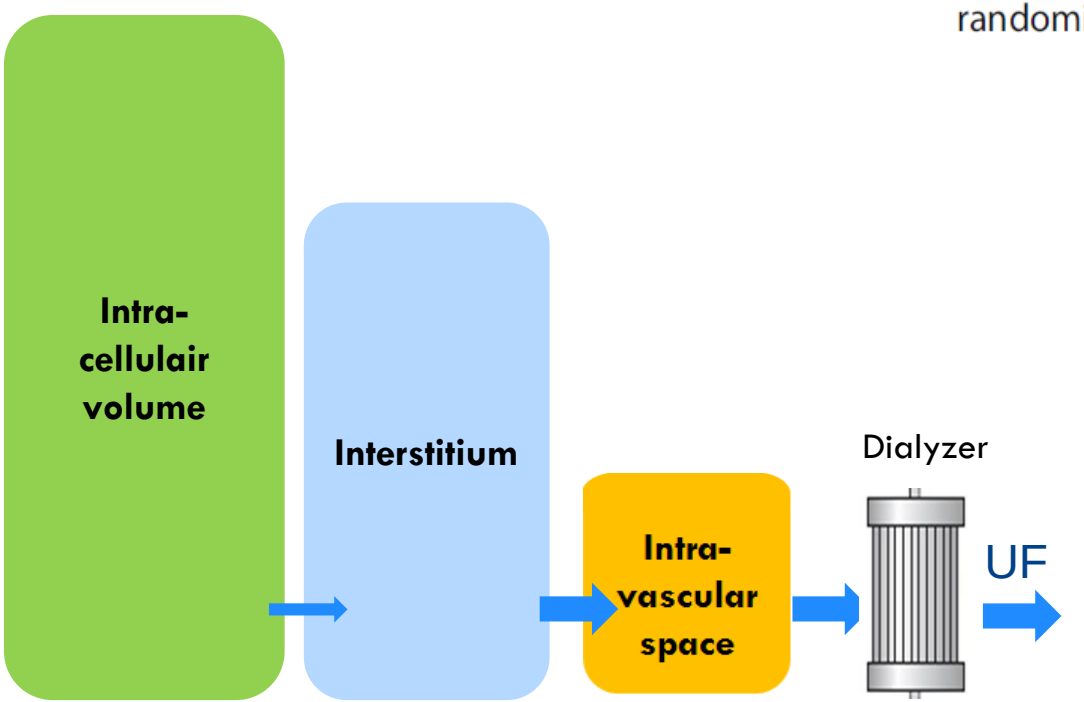
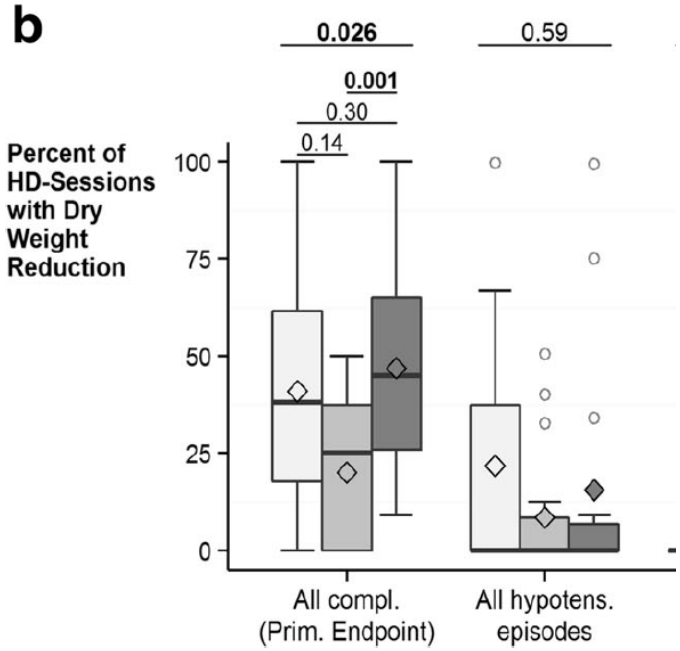
Hur AJKD 2016

Blood volume-monitored regulation of ultrafiltration to decrease the dry weight in fluid-overloaded hemodialysis patients: a randomized controlled trial





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Antlanger BMC Nephrol 2017; Zhang H 2018

Kunnen we normovolemie bereiken in alle patienten? En is het wenselijk?

- BELEMMERENDE FACTOREN

✓ Intermitterende behandeling
✓ Non-transferrable fluid?: hypoalbuminemie, malnutritie, inflammatie
✓ Hartfalen

- CONSEQUENTIES VAN AGRESSIEVE ULTRAFILTRATIE

✓ Weefsel ischemie
✓ Verlies van RRF?

Chart 1 Criteria proposed by the International Society of Renal Nutrition and Metabolism expert panel to classify the nutritional status of CKD patients[10]

3 uit 4 criteria

Body weight and fat (body mass)

- BMI < 23 kg/m²;
- Body fat percentage < 10%;
- Unintentional weight loss over time: 5% over 3 months or 10% over 6 months.*

Muscle mass

- Mid-arm muscle circumference: reduction > 10% in relation to 50th percentile of NHANES II;
- Reduced muscle mass: 5% over 3 months or 10% over 6 months.*

Serum chemistry

- Serum albumin < 3.8 g/dL (method: Bromocresol Green);
- Serum cholesterol < 100 mg/dL;
- Serum prealbumin (transthyretin) < 30 mg/mL.*

Dietary intake

- Unintentional low dietary protein intake < 0.8 g/kg/day for 2 months for dialysis patients;*
- Unintentional low dietary energy intake < 25 kcal/kg/day for 2 months.*

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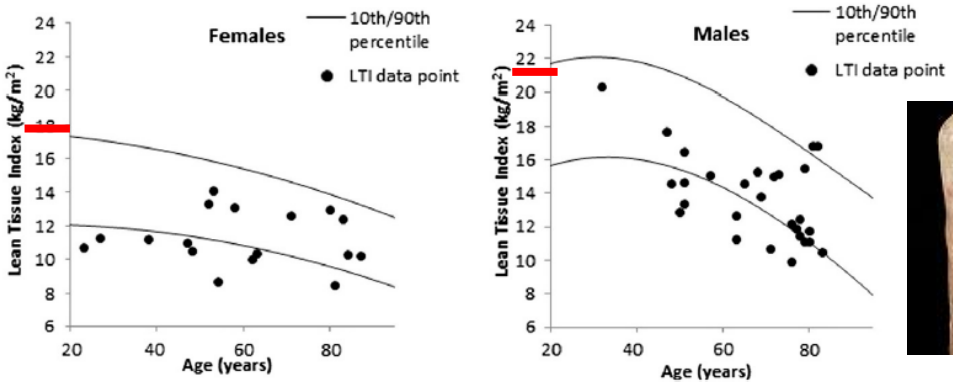
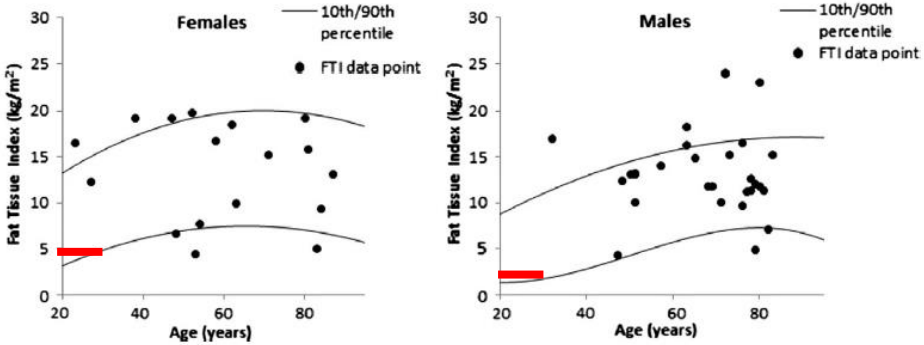
Fouque KI 2008; Vegine J Brasis Nephrol 2011

“Sarcopenic obesity”

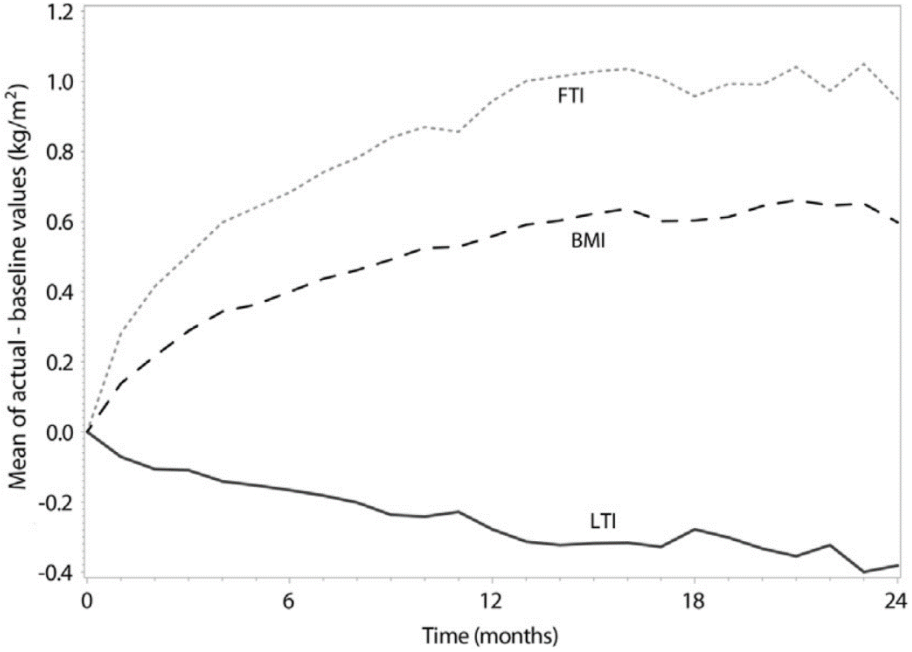




Broers J Ren Nutr 2015

Maastri

Longitudinal Changes in Body Composition in Patients After Initiation of Hemodialysis Therapy: Results From an International Cohort



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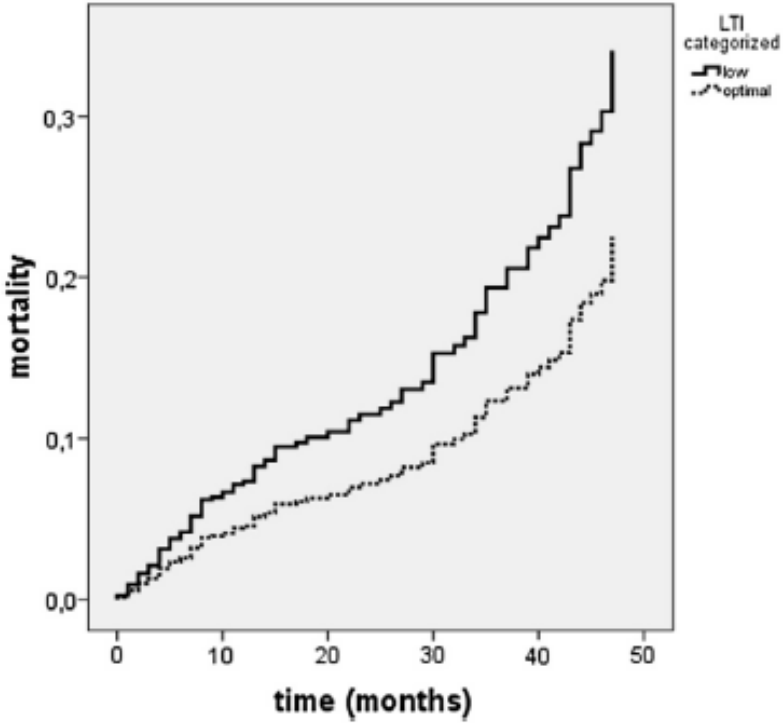
Marcelli J Ren Nutr 2016

Body Composition Monitor Assessing Malnutrition in the Hemodialysis Population Independently Predicts Mortality



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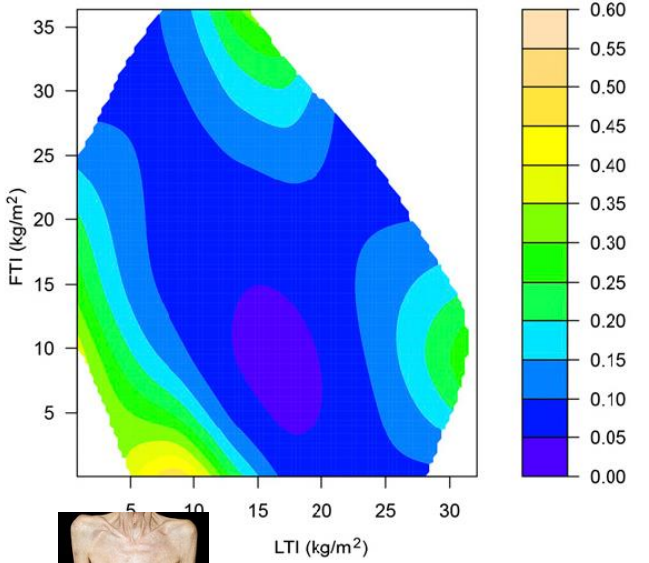
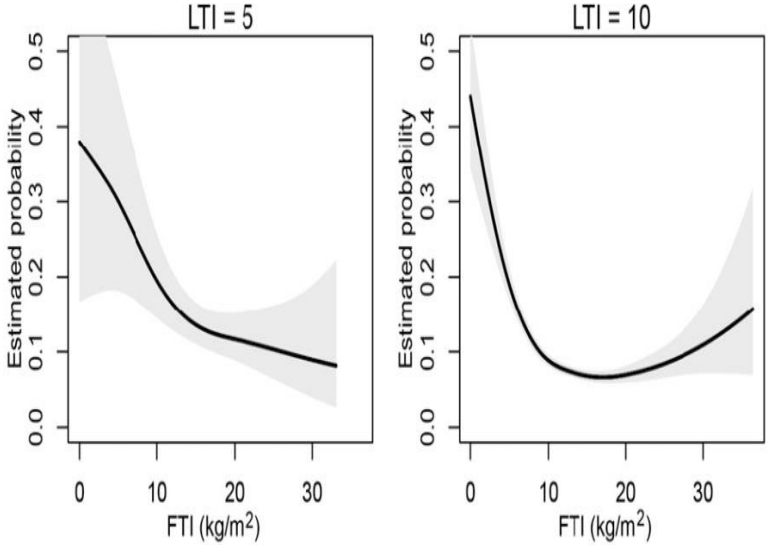
Rosenberger J Ren Nutr 2014

Body Composition and Survival in Dialysis Patients: Results from an International Cohort Study





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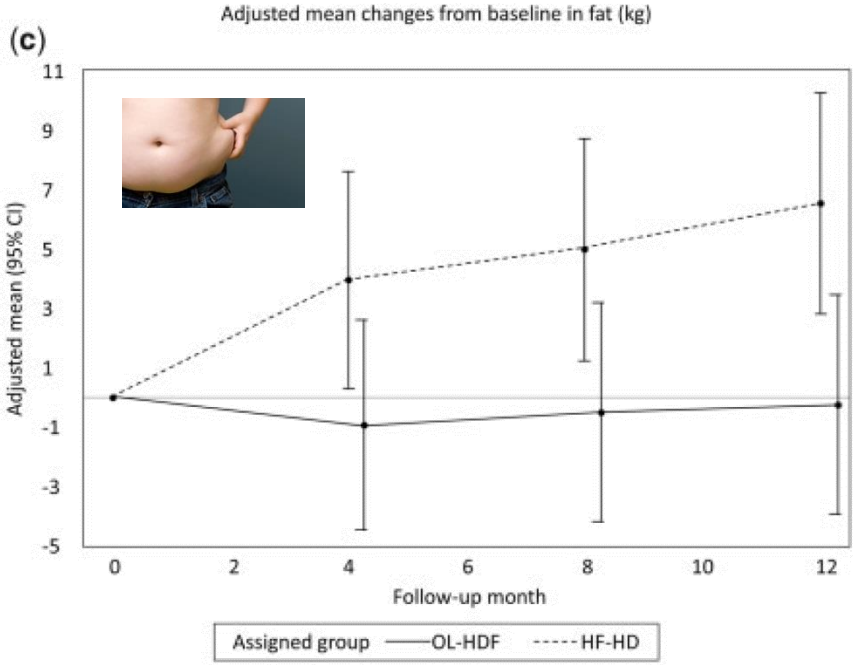
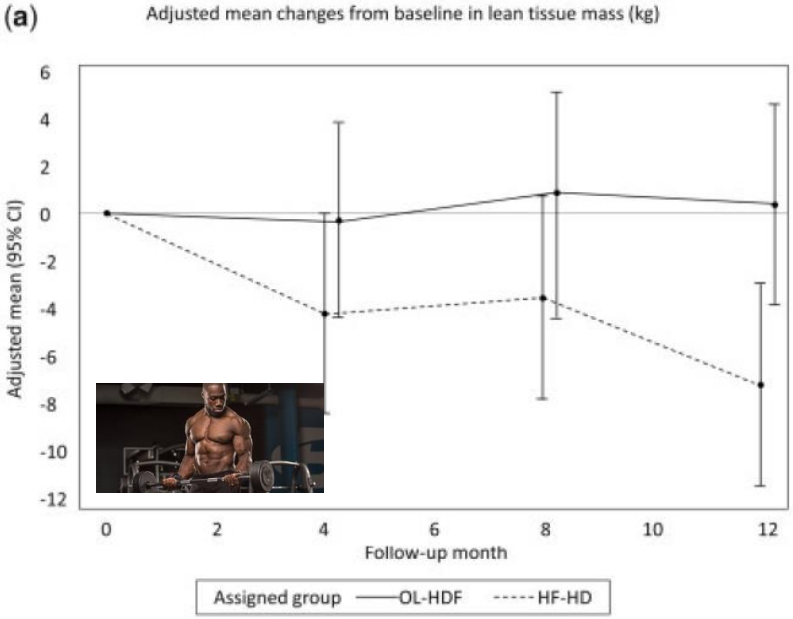
Marcelli Clin JASN 2015

n=37335

The effect of high-volume online haemodiafiltration on nutritional status and body composition: the ProtEin Stores prEservaTion (PESET) study





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Molina NDT 2018

Conclusie 1

- BIS meet de elektrische eigenschappen van weefsels, van waaruit volumes en vervolgens lichaamssamenstelling worden berekend
- Berekeningen zijn gebaseerd op verschillende aannames
- Relatief kleine variaties in volumestatus hebben een sterke, onafhankelijke, relatie met mortaliteit:
- BIS is op populatieniveau een sterke risicopredictor

Conclusie 2

- Interventietrials (FO) lieten een verbetering in LVM en RR zien
- Geen data in oudere patienten met multimorbiditeit
- Volume overbelasting clustert met ondervoeding en/of inflammatie
- Een afname in lean tissue mass (zeker in relatie met een afname in vetmassa) is geassocieerd met een verhoogde mortaliteit
- Er zijn nog weinig BIS-gestuurde interventietrials op voedingsgebied

Wat betekent dit voor kliniek?

- ✓ *BIS is een risicostratificator, het verhoogt de “clinical awareness” en kan relevante informatie toe aan het klinische beslissingsproces door informatie over meerdere dimensies*

- ✓ *Gemakkelijk te integreren in de klinische praktijk, maar nog niet opgenomen in guidelines*

- ✓ *Het instellen van het streefgewicht op “absolute” targets is niet gevalideerd in een oudere, multimorbide patientengroep*

- ✓ *Het zal niet altijd mogelijk, en misschien ook niet wenselijk zijn, om normovolemie in alle patienten te willen bereiken: klinische inschatting en monitoring blijft noodzakelijk*

- ✓ *Bioimpedantie kan een bijdrage leveren aan het screenen op voedingsproblematiek bij de dialysepatient*