

Voedingstoestand & Dialyse

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Disclosure

(potentiële) belangenverstrengeling	Zie hieronder
Voor bijeenkomst mogelijk relevante relaties met bedrijven	Bedrijfsnamen
• Sponsoring of onderzoeksgeld	• Baxter (BeNeLux)

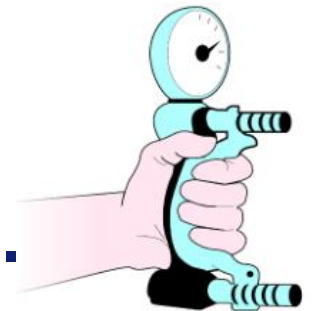
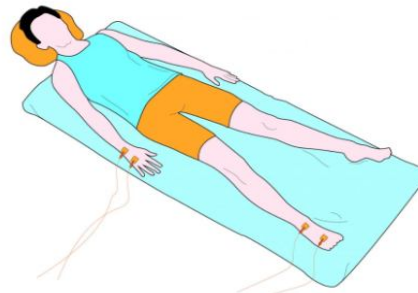


Voedingstoestand

“De conditie van het lichaam als gevolg van enerzijds de inname, absorptie en benutting van voeding, en anderzijds de invloed van ziektefactoren”.

Voedingstoestand bestaat uit 3 domeinen:

- 1) Voedselinname, verbruik en verliezen
- 2) **Lichaamssamenstelling en nutriëntenreserves**
- 3) Functionele parameters





Ondervoeding / verlies van spiermassa

- Protein-Energy wasting (PEW) komt veel voor
 - gemiddeld 40%¹
- Spontane vermindering van eiwit inname²
- Slechte eetlust: 35-70%³
- Vochtbeperking leidt tot verminderde energie inname⁴
- Verlies van aminozuren in het dialysaat^{5, 6}
- Overige factoren die leiden tot spiermassa verlies:
 - acidose, inflammatie, comorbiditeit, gebruik van corticosteroiden en een passieve levensstijl ^{5, 6}.



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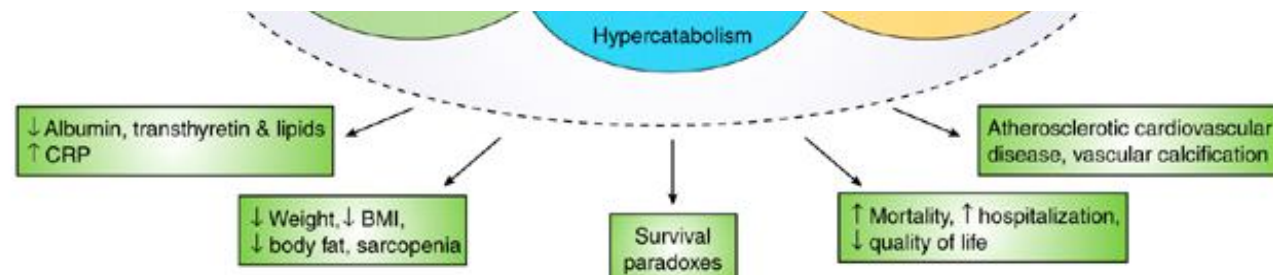


1) Fouque D, *Kidney international*. 2008, 2) Duenhas MR, *European journal of clinical nutrition*. 2003, 3) Bossola M, *Kidney international*. 2006, 4) Sherman RA, *American Journal of Kidney Diseases*. 1995, 5) Ikizler TA, *American Journal of Physiology-Endocrinology And Metabolism*. 2002, 6) Ikizler TA. *Journal of renal nutrition*. 2005

Kidney cachexia or protein-energy wasting in chronic kidney disease: facts and numbers

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¹Centre Hospitalier Lyon-Sud, Univ Lyon, CarMeN, Dept Nephrology, Pierre-Bénite, France, ²Harold Simmons Center for Kidney Disease Research and Epidemiology, Division of Nephrology and Hypertension, University of California, Irvine, School of Medicine, Orange, Irvine, CA, USA



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Mortaliteit bij combinaties van LTI en FTI bij HD

Table 3. Results of Cox proportional-hazards models

Model	Models Adjusted for Age, Vintage, and Sex				Fully Adjusted Models ^a			
	HR	95% LCI	95% UCI	P Value	HR	95% LCI	95% UCI	P Value
Model 1: LTI without FTI								
Low LTI	1.68	1.56	1.80	<0.001	1.53	1.40	1.66	<0.001
Normal LTI (reference)								
High LTI	1.20	1.01	1.41	0.03	1.02	0.84	1.24	0.85
Model 2: FTI without LTI								
Low FTI	1.34	1.24	1.45	<0.001	1.19	1.08	1.31	<0.001
Normal FTI (reference)								
High FTI	1.19	1.01	1.40	0.03	1.23	1.02	1.47	0.03
Model 3: LTI and FTI combined								
Low LTI, low FTI	3.37	2.94	3.87	<0.001	2.51	2.12	2.96	<0.001
Low LTI, normal FTI	1.81	1.67	1.97	<0.001	1.63	1.48	1.81	<0.001
Low LTI, high FTI	1.79	1.47	2.17	<0.001	1.74	1.40	2.17	<0.001
Normal LTI, low FTI	1.57	1.40	1.75	<0.001	1.42	1.25	1.62	<0.001
Normal LTI, normal FTI (reference)								
Normal LTI, high FTI	1.36	0.99	1.89	0.06	1.41	0.99	2.01	0.06
High LTI, low FTI	1.42	1.14	1.76	0.002	0.99	0.75	1.32	0.95
High LTI, normal FTI	1.28	1.00	1.64	0.05	1.31	1.00	1.73	0.05
High LTI, high FTI	1.73	0.56	5.38	0.34	1.91	0.48	7.65	0.36

Outcome was all-cause mortality; predictors were categories of low (<10th percentile) and high (>90th percentile) LTI and FTI, respectively. Models were adjusted for age, vintage, and sex or as otherwise indicated. LTI, lean tissue index; FTI, fat tissue index; reference, normal LTI and FTI (10th–90th percentile of age- and sex-matched healthy population); HR, hazard ratio; 95% LCI, lower 95% confidence interval; 95% UCI, upper 95% confidence interval.

^aAdjusted for age, vintage, sex, geographic region, albumin, hemoglobin, diabetes, and BP.

MONDO (Monitoring Dialysis Outcome) consortium

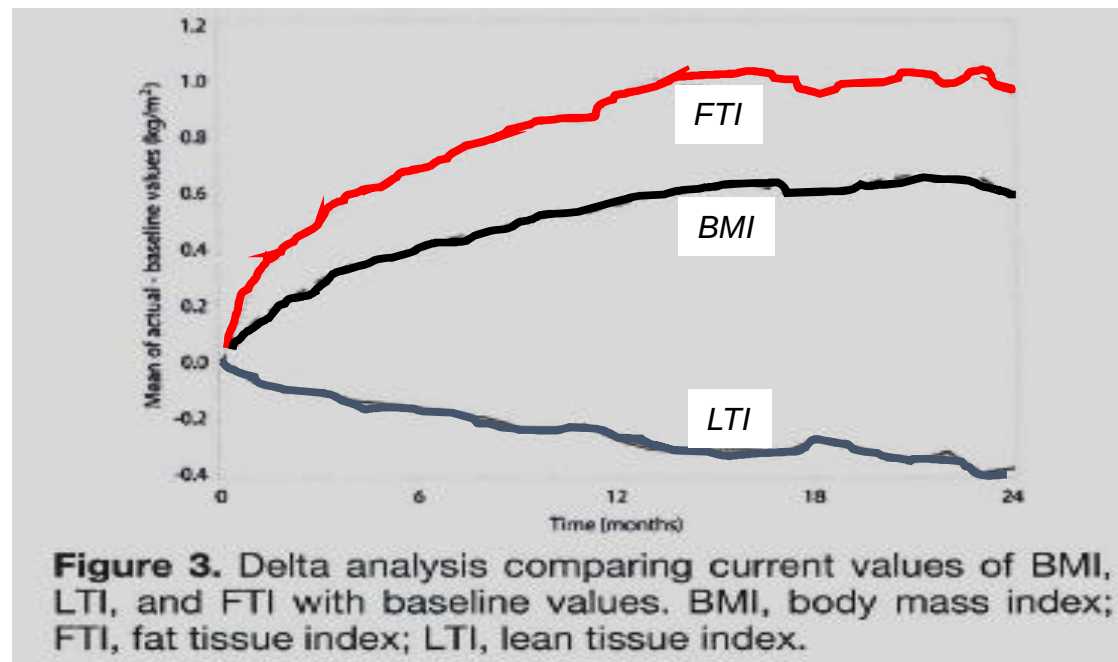
- 37.345 hemodialyse patiënten
- 6 jaar (2006-2012), gem.follow-up 266 dagen

→ Hogere LTI i.c.m. normale / hoge FTI vermindert risico op overlijden

Marcelli et al, 2015. Body composition and survival in dialysis patients: results from an international cohort study

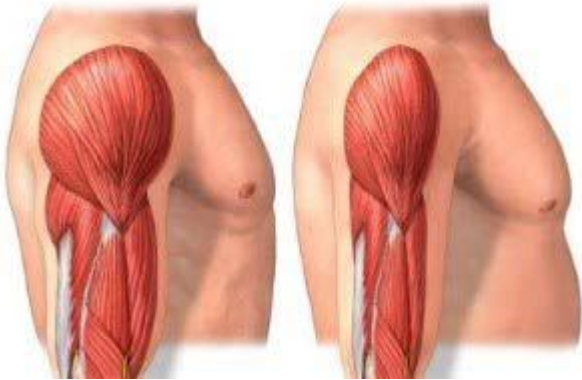
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Veranderingen in lichaamssamenstelling bij HD



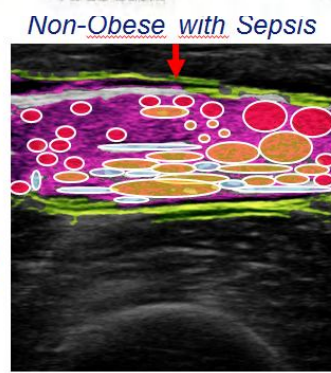
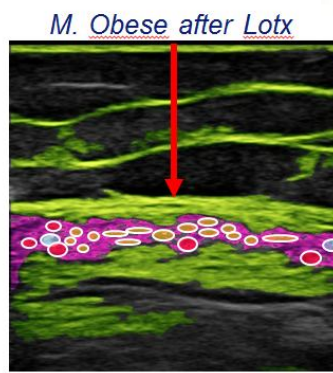
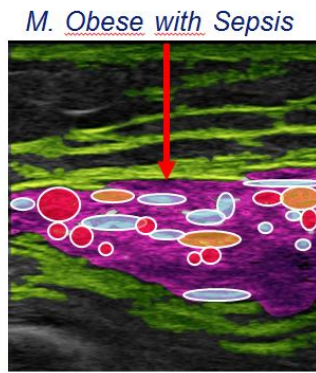
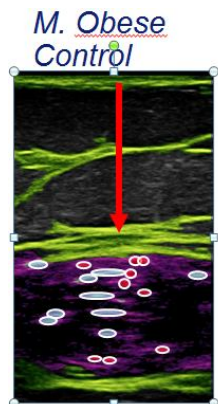
Marcelli et al, 2016. Longitudinal Changes in Body Composition in Patients After Initiation of Hemodialysis Therapy: Results From an International Cohort

#Musclesmatter



Normal

Chronic
wasting
disease



- %IMAT
- %IM Tissue Interface interactions
- Connective Tissue



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Methoden voor meten lichaamssamenstelling

1) Directe methoden

- Kadaver analyse
- In vivo neutronen activatie analyse (IVNAA)

2) Indirecte methoden (gebaseerd op directe methoden)

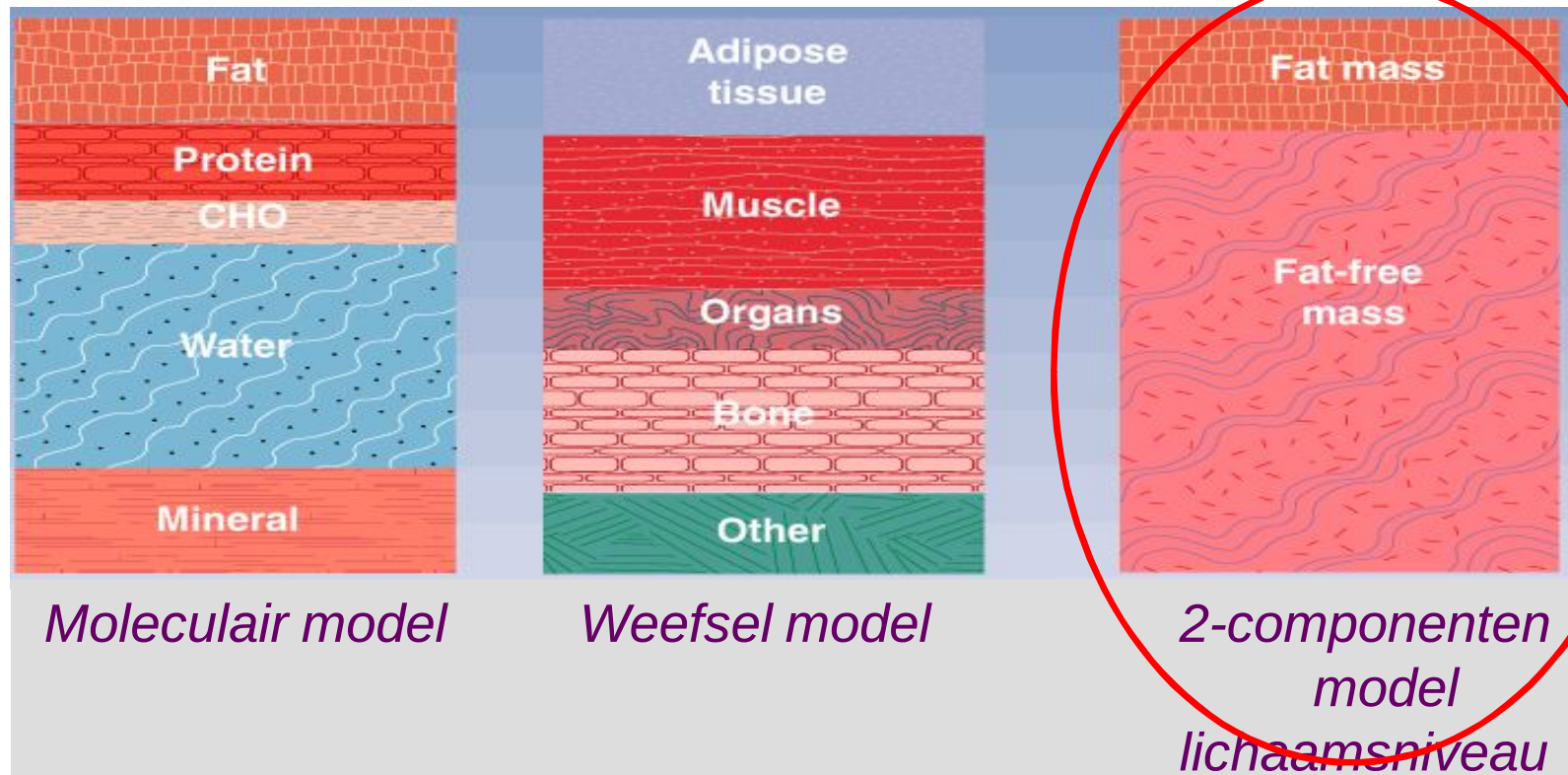
- Dual energy x-ray absorptiometry (DEXA)
- Densitometrie
- MRI- en CT-scan

3) Dubbel indirecte methoden (gebaseerd op indirecte methoden)

- Creatinine Kinetic Modeling (CKM)
- Huidplooien
- Omtrekmaten
- Bio-elektrische impedantie



Bepalen van lichaamssamenstelling

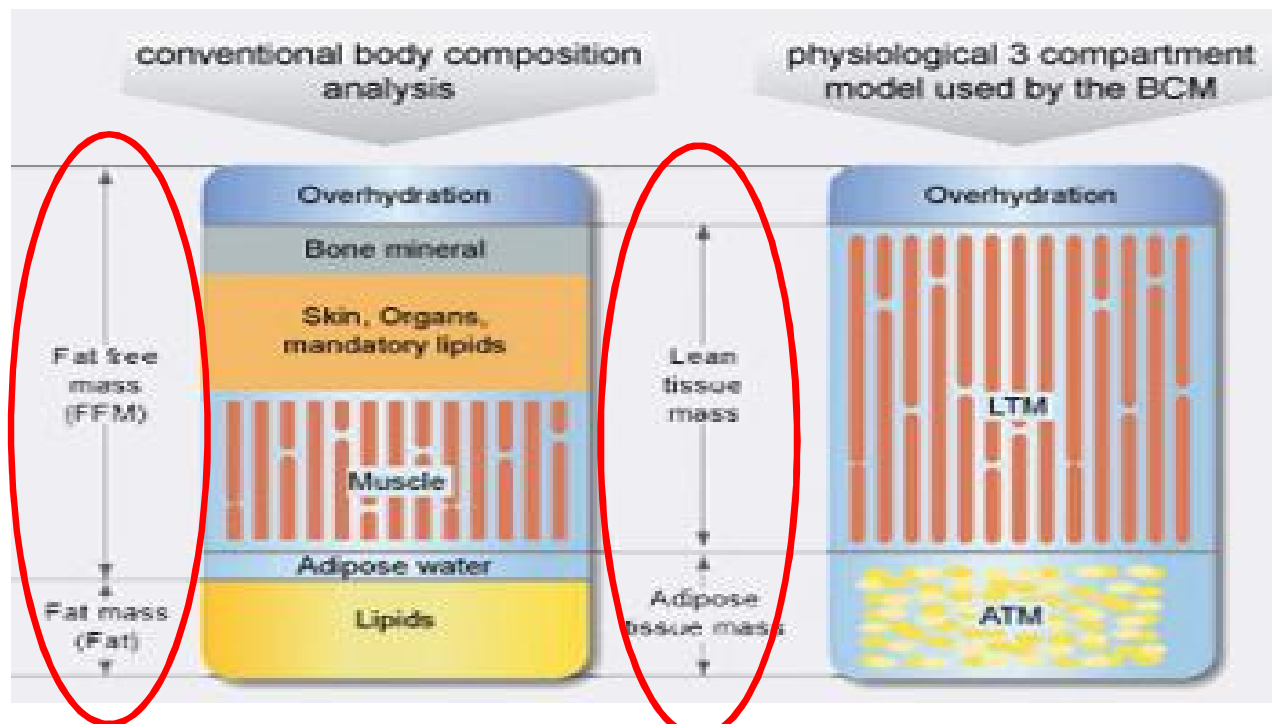


Earthman, 2015. *Body Composition Tools for Assessment of Adult Malnutrition at the Bedside: A Tutorial on Research Considerations and Clinical Applications.*

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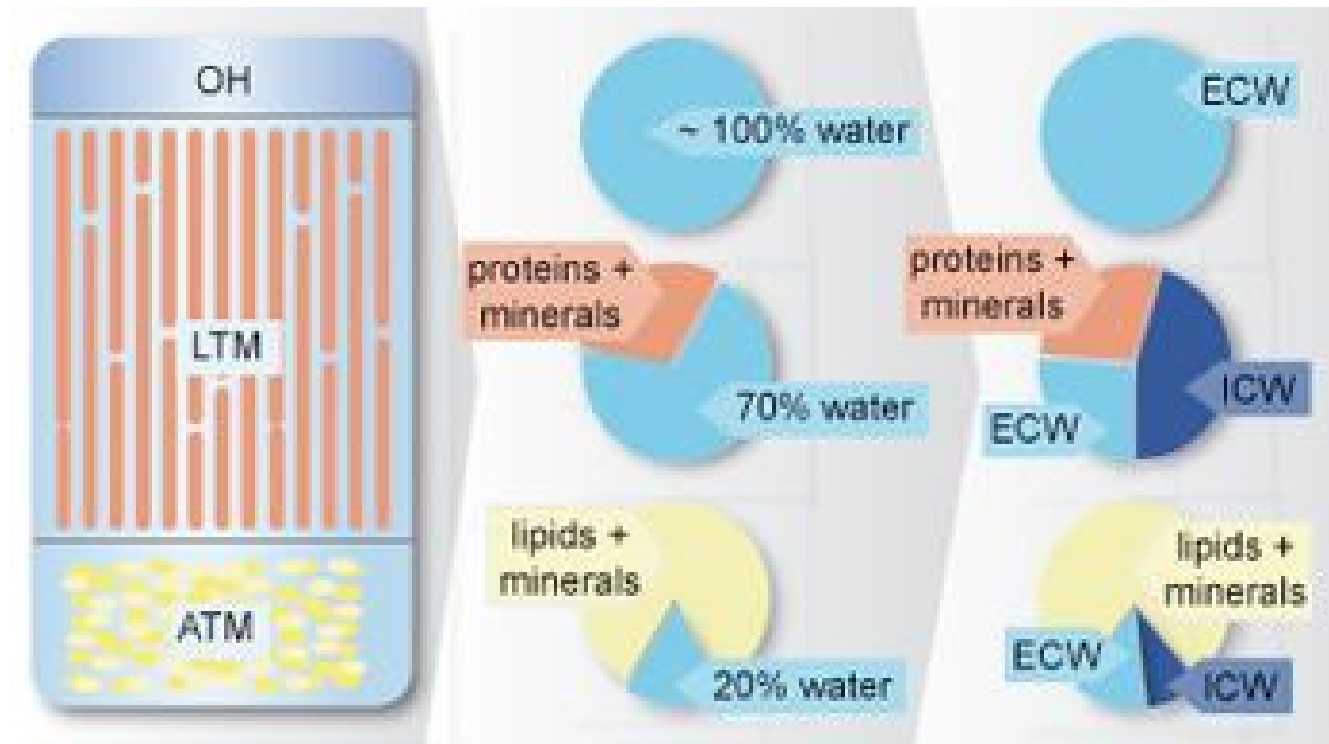
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Lichaamsniveau: 2 (5)- en 3-componenten model



<http://www.bcm-fresenius.com/21.htm>

Samenstelling OH, LTM en ATM



<http://www.bcm-fresenius.com/21.htm>

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Belang van de juiste impedantiefrequentie

SF-BIA: weerstand beïnvloed door ECW

MF-BIA: van 3 - 8 frequenties, ook beïnvloed door ECW

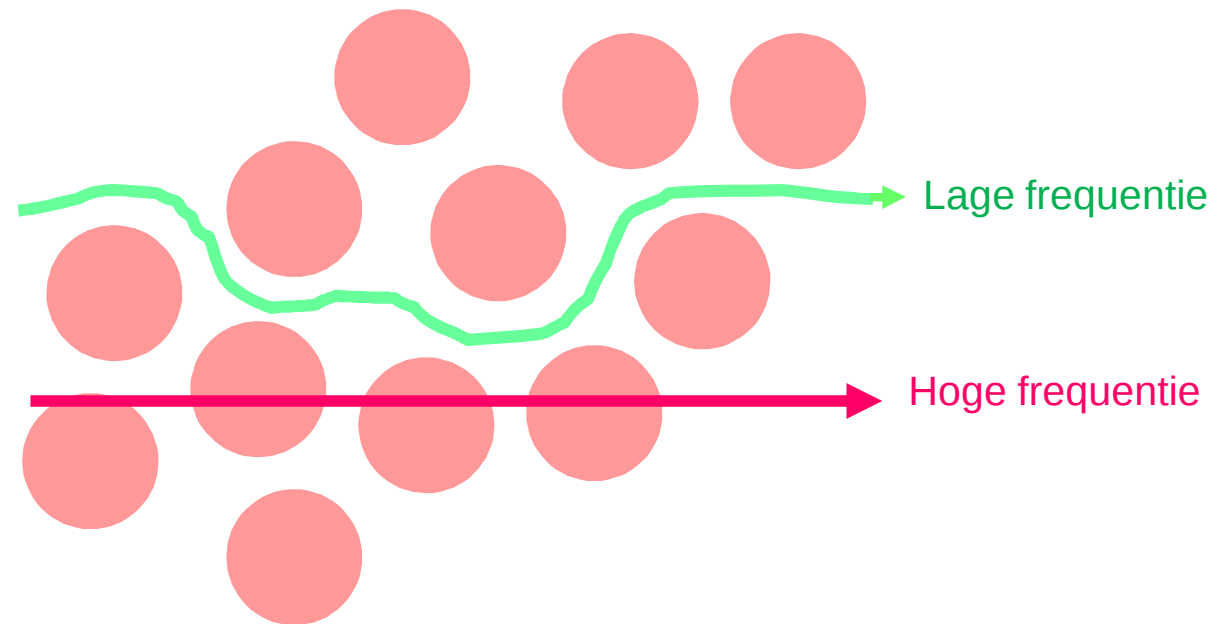
Lineaire regressie voor VVM, TBW, ICW en ECW

BIS: breed spectrum van frequenties, tot aan 50 frequenties 5 - 1000 kHz

- fysiologische modellen en mix van frequenties (Cole-Cole plot en de Hanai formule) → bepaling ECW en ICW voor overige parameters



Meting van vocht bij bio-elektrische impedantie



Weerstand bij lage frequentie: maat voor ECW

Weerstand bij hoge frequentie: maat voor TBW

Bio Impedantie Spectroscopie (BIS)

Table 1. Overview of the available validation data (n >1,000) for the combination of whole-body spectroscopy technology and the physiologic tissue model described

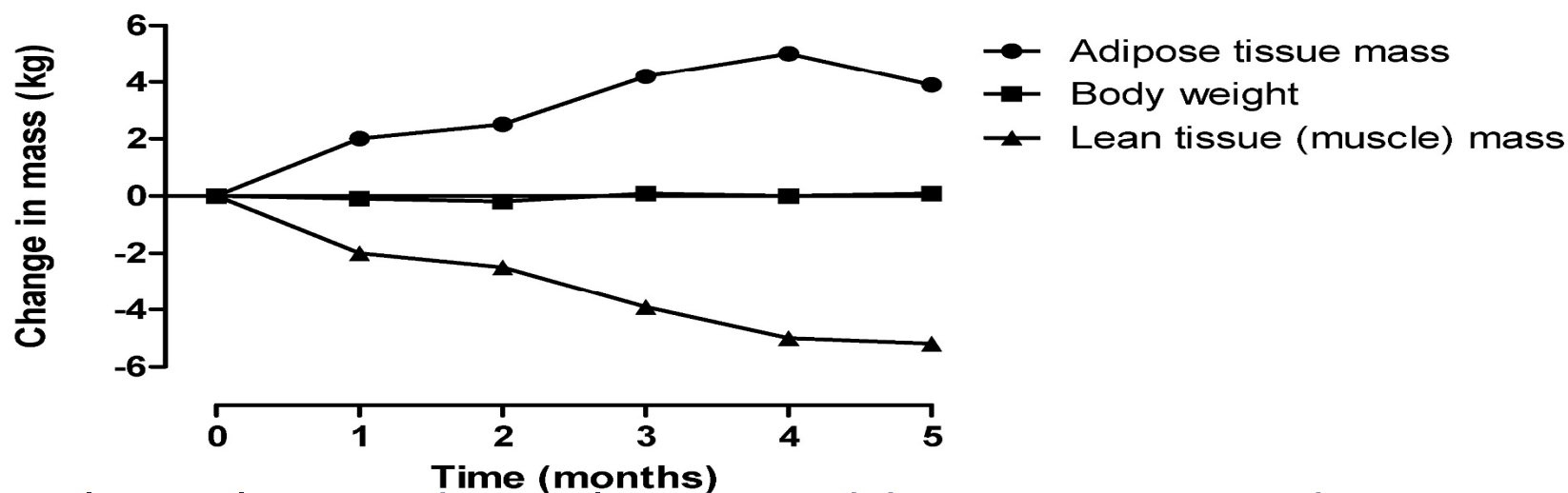
	Gold standard method	Number	R ²	Mean ± SD	Reference
ECW	bromide	120 healthy subjects 32 HD patients	0.76	-0.1 ± 1.8 litres	32
ICW	total body potassium		0.78	0.2 ± 2.3 litres	
TBW	deuterium		0.88	-0.2 ± 2.3 litres	
	tritium	42 healthy subjects	0.94	-1.06 ± 1.9 litres	
Fat	dual-energy X-ray absorptiometry	41 HD patients 19 liver patients 130 cancer patients 321 healthy subjects	0.82	-1.1 ± 4.2 kg	15
	air displacement plethysmography	25 HD patients 19 liver patients 141 healthy subjects	0.84	1.0 ± 4.1 kg	
FFM	4-compartment modelling [33]	25 HD patients 141 healthy subjects	0.9	SEE = 3.4% -0.2 ± 3.5 kg	16
	dual-energy X-ray absorptiometry	22 HD patients 222 healthy subjects	0.89	-0.9 ± 3.7 kg	
Fluid overload	clinical assessment	370 HD patients	n.a.	-0.23 ± 1.51 litres	17
	ultrafiltration volume	55 HD patients	R = 0.76	0.015 ± 0.8 litres	19

HD = Haemodialysis; ICW = intracellular water volume; TBW = total body water; FFM = fat-free mass; SEE = standard error of the estimate.

Chamney PW, et al: Am J Clin Nutr 2007; 85: 80-89.

Resultaten

Change in body weight, adipose tissue mass and lean tissue (muscle) mass



Delta analyse van het verloop in gewicht, vetmassa en spiermassa

Visser et. al, unpublished data

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Resultaten

Variables	Baseline	20 weeks	Difference in time		
				%	p-value
Body Weight (kg)	76,7 [71,9, 81,6]	76,2 [71,4, 81,1]	-0,5 [-1,0, 0,1]	-0,6	0.090
Lean tissue mass (kg)	37.7 [34.7, 40.6]	31.3 [28.2, 34.3]	-6.4 [-8.1, -4.8]	-17.1	<0.001
Adipose tissue mass (kg)	37.6 [32.6, 42.5]	42.1 [37.1, 47.07]	+4.5 [2.7, 6.2]	11.9	<0.001
Phase angle °	4.35 [4.04, 4.66]	4.21 [3.89, 4.53]	-0.14 [-0.28, -0.01]	-3.2	0.066
Handgrip strength (kg)	22.5 [19.8, 25.2]	20.6 [17.8, 23.3]	-1.9 [-3.1, -0.7]	-8.6	0.002
Albumin (g/L)	37.9 [36.6, 39.2]	37.1 [35.7, 38.4]	-0.8 [-2.0, 0.3]	-2.2	0.142
CRP (mg/L)	10.9 [7.6, 14.3]	9.6 [6.0, 13.21]	-1.3 [-5.5, 2.8]	-12.3	0.527



Visser et. al, unpublished data



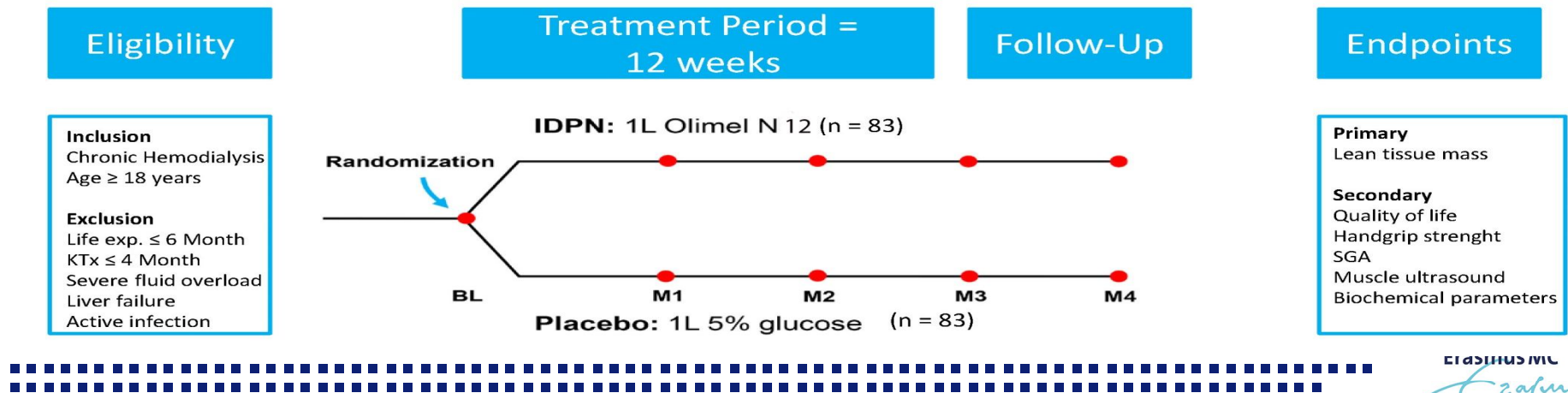
Wat nu?

Beperken / voorkomen van spiermassa verlies?!



IDPN-Study

- Het effect van IDPN op de spiermassa van hemodialysis patients.
- Subjectief / reguliere zorg = positieve ervaringen
 - Meer energie, voelen zich beter, SG omhoog
- In de literatuur geen eenduidigheid over het effect → RCT
- Pilot (N=5): preventie van spiermassa verlies met een factor > 2.5 (2.4 kg vs 6.5 kg)





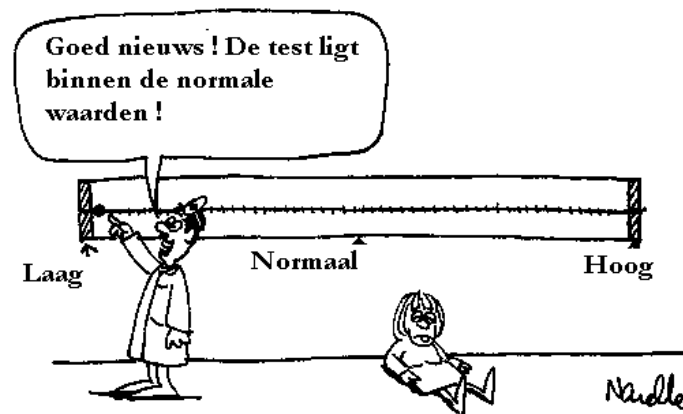
Sub studies – vervolgstudies

- AA-IDPN: verlies van AA
- VO2Max metingen (inspanningstest)
- gelabelde AA
- Bio energetic profile (mitochondrial function)
- REE en RQ tijdens dialyse
- Total protein-turnover



Take home message

- Nutritional Assessment binnen nierziekten is van groot belang
- Welk apparaat / welke frequenties is essentieel
- Vocht component is essentieel om te onderscheiden
- Uiteindelijk geven de metingen veel meer inzicht voor diëtist, arts en patient





Vragen ?

Bedankt voor de aandacht!



