Comportements alimentaires, Nutrition et BPCO

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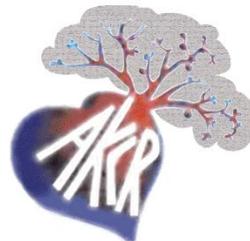*Laboratoire de Bioénergétique*
Fondamentale et Appliquée
Inserm1055

Inserm

Institut national
de la santé et de la recherche médicale

(Photo : J.-Marc Blache/Mission)

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Alpes

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Relations d'intérêts

- **Type d'aides**
  - **Pr. Ch. Pison, déplacements et inscription congrès *via* honoraires comme consultant**
  - **CHUGA, recherche clinique *via* contrat unique DRCI**

- **Essais phase 2, 3 et 4, *5 dernières années,* dispositifs médicaux, diagnostics et thérapeutiques, services à domicile**

  - **Actélion, ALK, Astra Zeneca**
  - **Bayer, Boehringer Ingelheim**
  - **Gilead**
  - **GlaxoSmithKline**
  - **MSD**
  - **Novartis**
  - **Pfizer**
  - **Roche**
  - **Sanofi, Stallergènes**

  - **PneumRx, PulmonX, Nuvaira, Bronchus, Bioparhom**

  - **AGIR@Dom, SOS Oxygène**

Sommaire

- **Comportements alimentaires**

- **Evaluer**

- **Traiter**

- **Perspectives**

Comportements alimentaires & Incidence BPCO

- **Varraso *et al.* Alternate healthy eating index 2010 and risk of chronic obstructive pulmonary disease among US women and men: prospective study. *BMJ 2015;350: 1-11***

- **Nurses'Health Study,** 73 228 femmes, infirmières 30-55 ans, 1976, 11 états EUA FFQ en 1984, 86, 90, 94, 98
- **Health Professional Follow-up Study, 47 026 hommes, 40-75 ans, 1986, EUA FFQ 1986, 90, 94**

- **Questionnaires BPCO** en 1998 et 2000
- **Alternate Healthy Eating Index 2010, AHEI2010, 11 composés, 0-110**
  - 6 « protecteurs » : légumes, fruits, grains entiers, noix, omega-3 à longues chaines (DHEA, EPA), graisses polyinsaturées
  - à dose modérée : alcool
  - 4 à éviter : sodas et jus de fruits, viande rouge et charcuterie, graisses trans, sel
- **Covariables**
âge, activité physique, IMC, calories ingérées, tabagisme, paquets années, ménopause, tabagisme passif, race, consultations, région, niveau éducation

Perspectives
Comportements alimentaires & Incidence BPCO

Table 4| Association between Alternate Healthy Eating Index 2010 (AHEI-2010) and risk of newly diagnosed chronic obstructive pulmonary disease in women (Nurses' Health Study) and men (Health Professionals Follow-up Study), according to smoking status

AHEI-2010	Women			Men			Total			
	No	Person years	Hazard ratio (95% CI)*	No	Person years	Hazard ratio (95% CI)*	No	Hazard ratio (95% CI)*	P value†	I²‡
Ex-smokers										
Lowest fifth§	42	65 259	1.00 (referent)	20	36 519	1.00 (referent)	62	1.00 (referent)		
Second fifth	27	78 161	0.56 (0.34 to 0.91)	12	40 597	0.52 (0.25 to 1.08)	39	0.55 (0.36 to 0.82)	0.89	0.0
Third fifth	50	86 439	0.94 (0.62 to 1.43)	18	42 480	0.83 (0.43 to 1.60)	68	0.91 (0.64 to 1.29)	0.76	0.0
Fourth fifth	28	98 266	0.48 (0.29 to 0.78)	14	44 514	0.60 (0.30 to 1.23)	42	0.52 (0.35 to 0.78)	0.60	0.0
Highest fifth§	35	111 919	0.52 (0.32 to 0.84)	10	46 066	0.44 (0.20 to 0.97)	45	0.50 (0.33 to 0.75)	0.72	0.0
P for trend			0.009			0.09		0.002		
Current smokers										
Lowest fifth§	143	48 618	1.00 (referent)	32	26 174	1.00 (referent)	175	1.00 (referent)		
Second fifth	120	41 638	1.08 (0.85 to 1.39)	12	20 752	0.55 (0.28 to 1.09)	132	0.84 (0.44 to 1.58)	0.07	84.8
Third fifth	91	36 645	0.97 (0.74 to 1.28)	13	19 585	0.73 (0.38 to 1.43)	104	0.93 (0.73 to 1.20)	0.44	0.0
Fourth fifth	64	31 219	0.81 (0.59 to 1.10)	14	17 756	1.03 (0.53 to 2.00)	78	0.84 (0.64 to 1.11)	0.52	0.0
Highest fifth§	39	23 021	0.70 (0.48 to 1.02)	6	16 641	0.64 (0.26 to 1.61)	45	0.69 (0.49 to 0.98)	0.86	0.0
P for trend			0.03			0.64		0.03		

*Multivariable hazard ratios adjusted for age, physical activity, body mass index, total energy intake, pack years of smoking, pack-years² of smoking, secondhand tobacco exposure (only in Nurses' Health Study), race/ethnicity, physician visits, US region, spouse's highest educational attainment (only in Nurses' Health Study), and menopausal status (only in Nurses' Health Study).
†Test for between studies heterogeneity.
‡Degree of heterogeneity between studies expressed as percentage of total variance.
§Lowest fifth corresponds to least healthy diet according to AHEI-2010 diet score; highest fifth corresponds to healthiest diet.

Compression of Morbidity 1980–2011: A Focused Review of Paradigms and Progress

hier

Morbidity onset

Present morbidity

Birth

Death
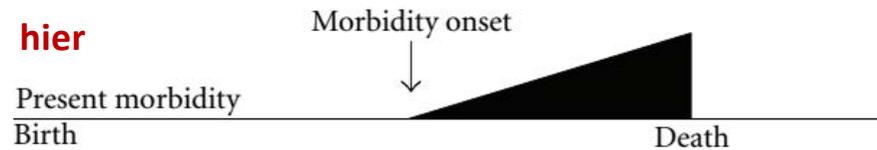
↓ évolution des maladies chroniques

Fries J, J Aging Res 2011

Courtoisie du Pr. Yves Boirie

"Comorbidome" de la BPCO
--- expression des comorbidities avec >10% de prévalence

Divo M, AJRCCM 2012

Courtoisie du Pr. Yves Boirie

Epidémiologie

Cano, *Eur Respir J.* 2002

744 IRC
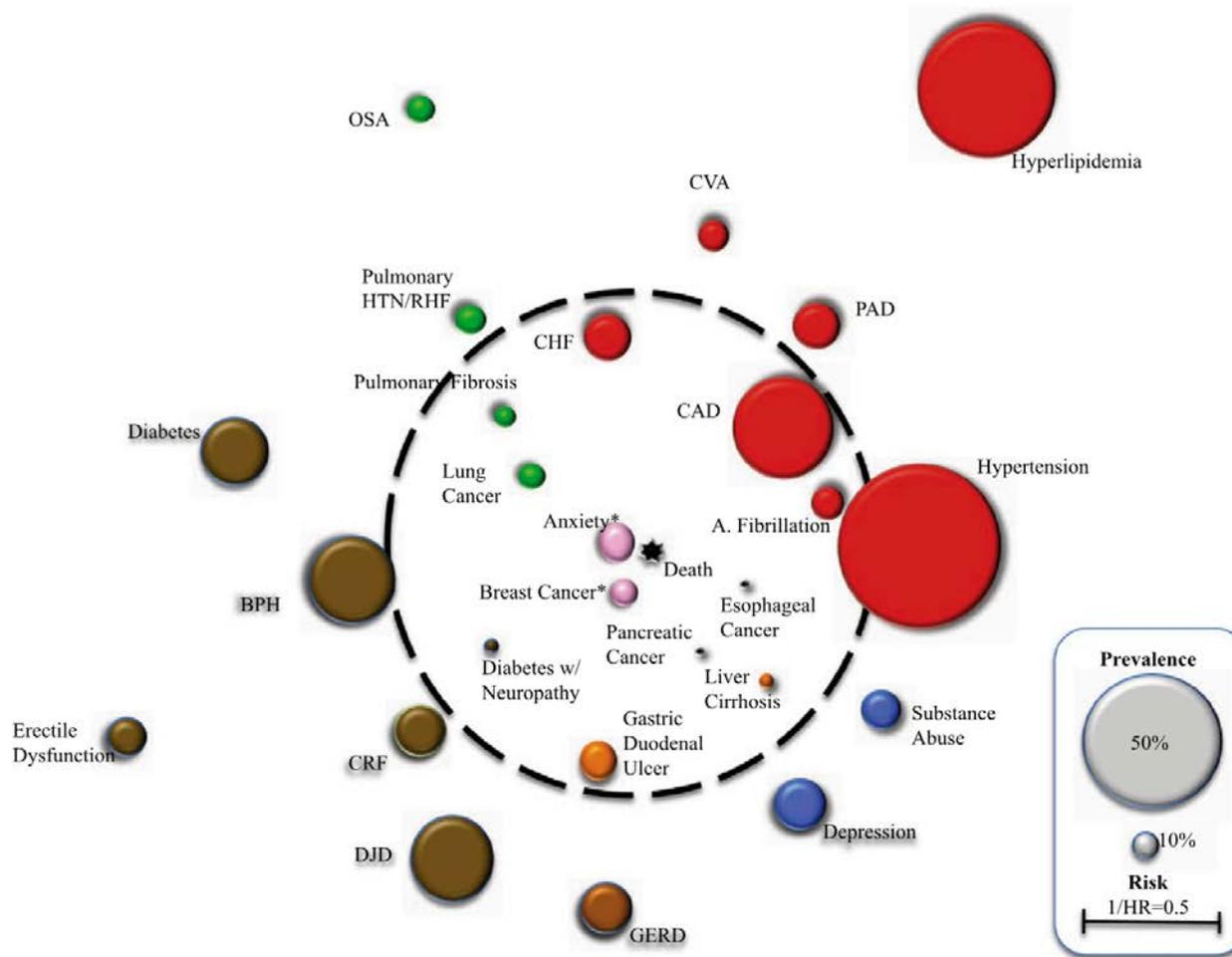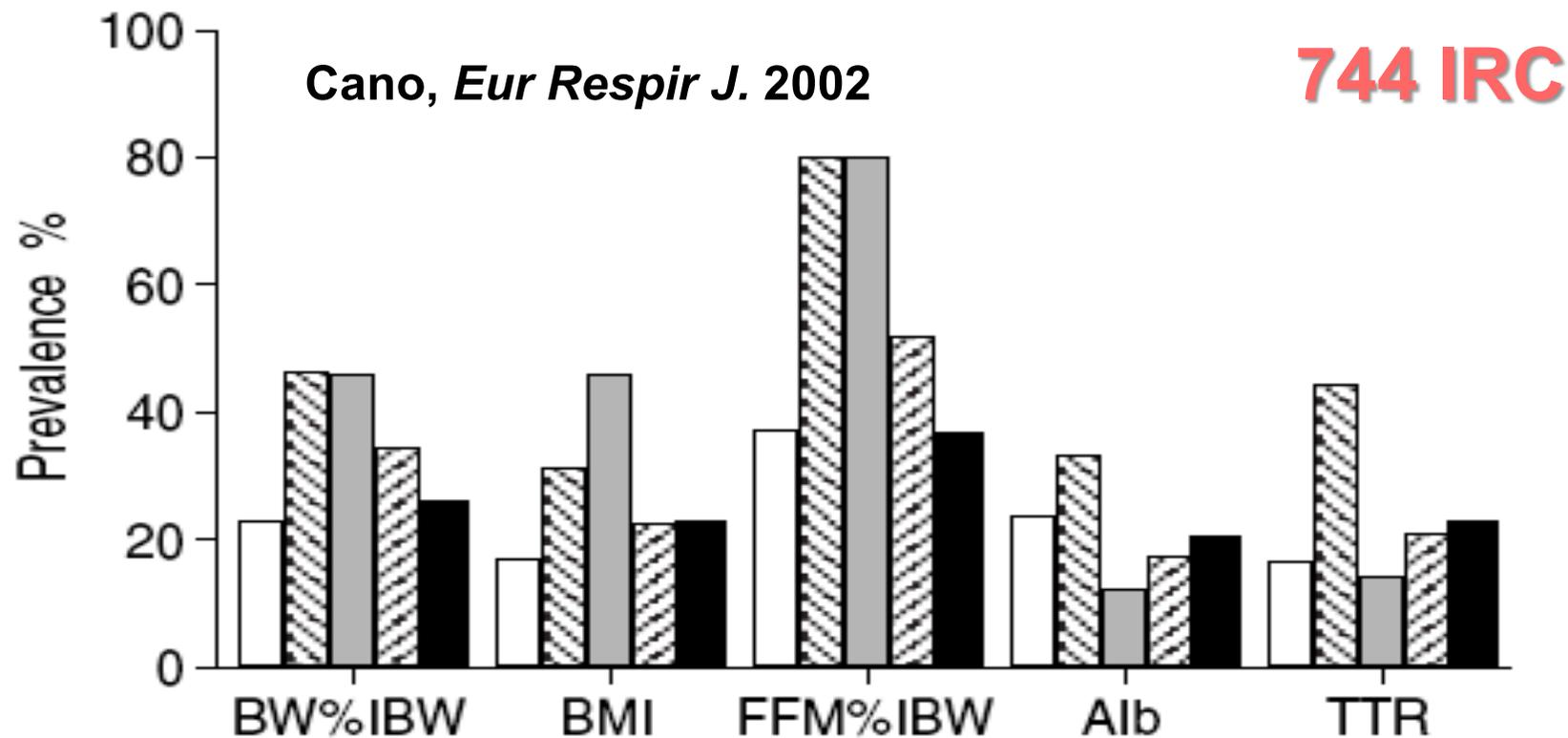
Fig. 1.– Percentage of malnourished patients as defined by per cent of ideal body weight (BW%IBW) <90%, body mass index (BMI) <20, fat-free mass expressed as a per cent of the ideal body weight (FFM%IBW) <63% in females and 67% in males, serum albumin (Alb) <35 g·L^{-1} or serum transthyretin (TTR) <200 mg·L^{-1}, according to the disease. □: chronic obstructive pulmonary disease; ▨: bronchiectasis; ▦: neuromuscular diseases; ▨: restrictive disorders; ■: mixed respiratory failure.

Epidémiologie
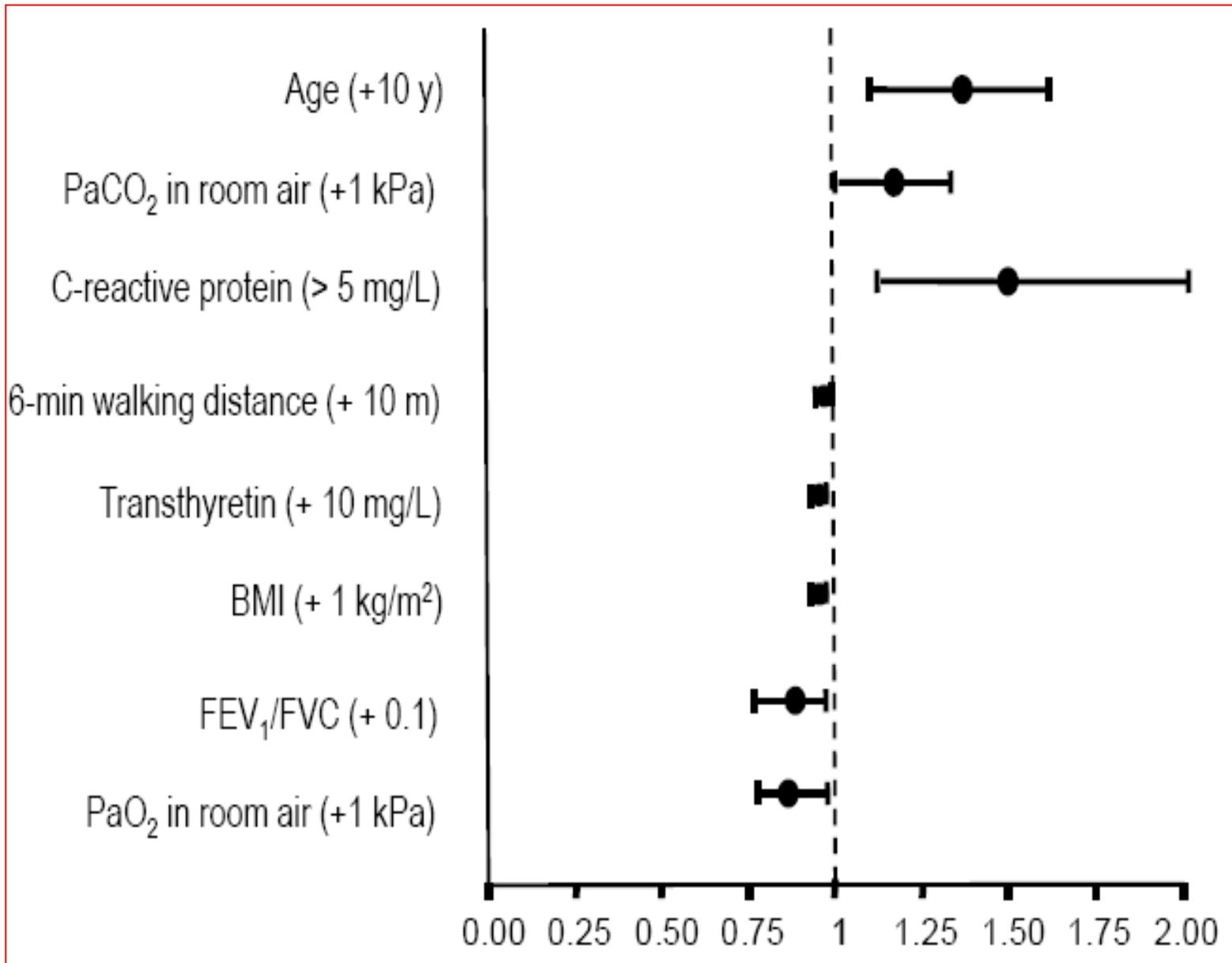
637 IRC suivis 53±31 mois

Cano NJM, Pichard C, Roth H, Court-Fortuné I, Cynober L, Gérard-Boncompain M, Cuvelier A, Jean-Pierre Laaban JP, Jean-Claude Melchior JCI, Raphaël JCI, Pison CM and the Clinical Research Group of the Société Francophone de Nutrition Entérale et Parentérale. Systems approach to survival of patients with chronic respiratory failure at home. *Clinical Nutrition 2014, Sept 3*

Epidémiologie
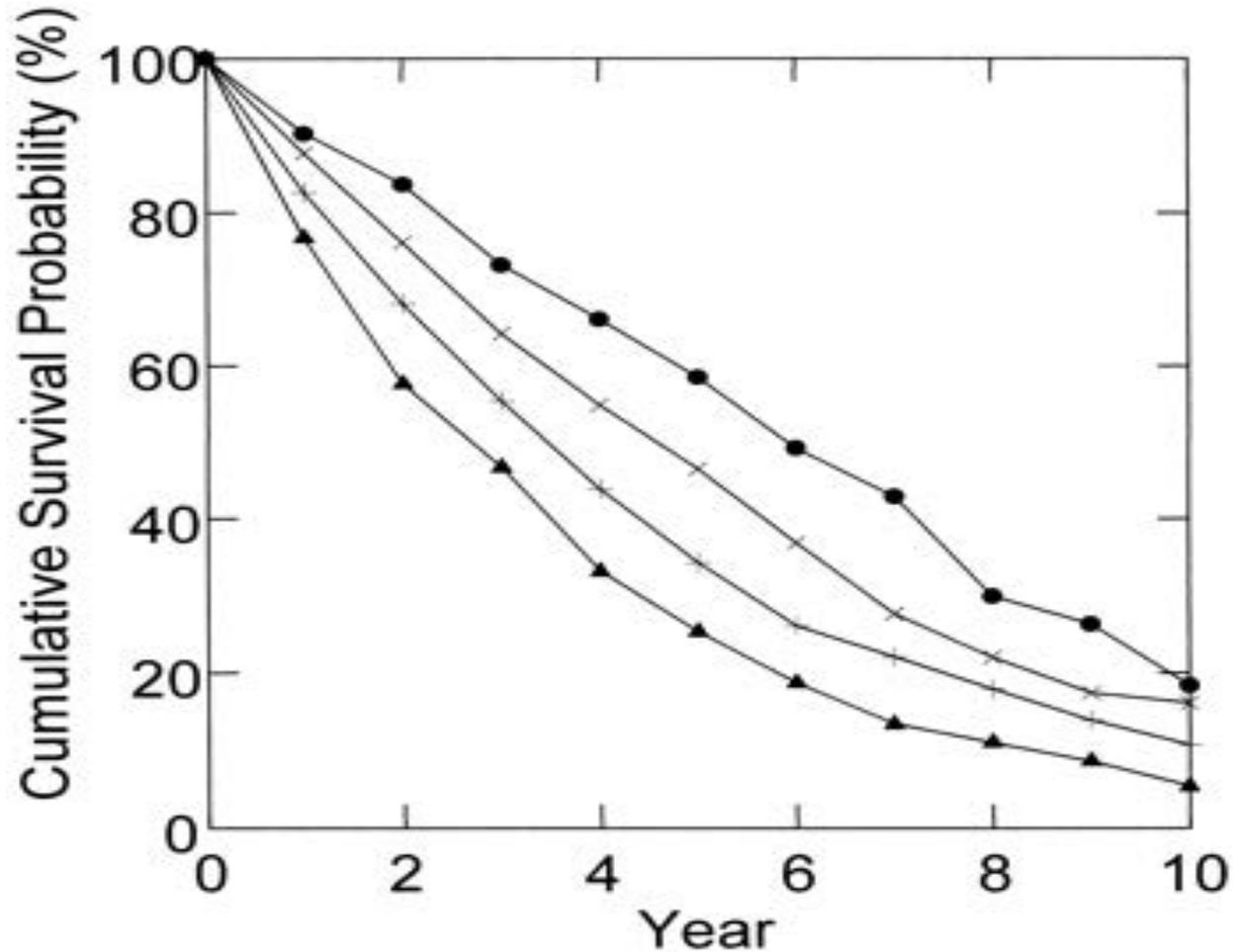
4 088 BPCO

PaO$_2$ < 8 kPa

VEMS / CVF < 0,6

OLT 1984 - 93

BMI
- ● 30 & +
- × 25 - 29
- + 20 -24
- ▲ < 20

Chest 2003;123:1460

Nutritional assessment and therapy in COPD: a European Respiratory Society statement

Evaluer

Annemie M. Schols[1], Ivone M. Ferreira[2,3], Frits M. Franssen[4], Harry R. Gosker[1], Wim Janssens[5], Maurizio Muscaritoli[6], Christophe Pison[7,8,9,10], Maureen Rutten-van Mölken[11,12], Frode Slinde[13], Michael C. Steiner[14], Ruzena Tkacova[15,16] and Sally J. Singh[14]

TABLE 1 Metabolic phenotypes

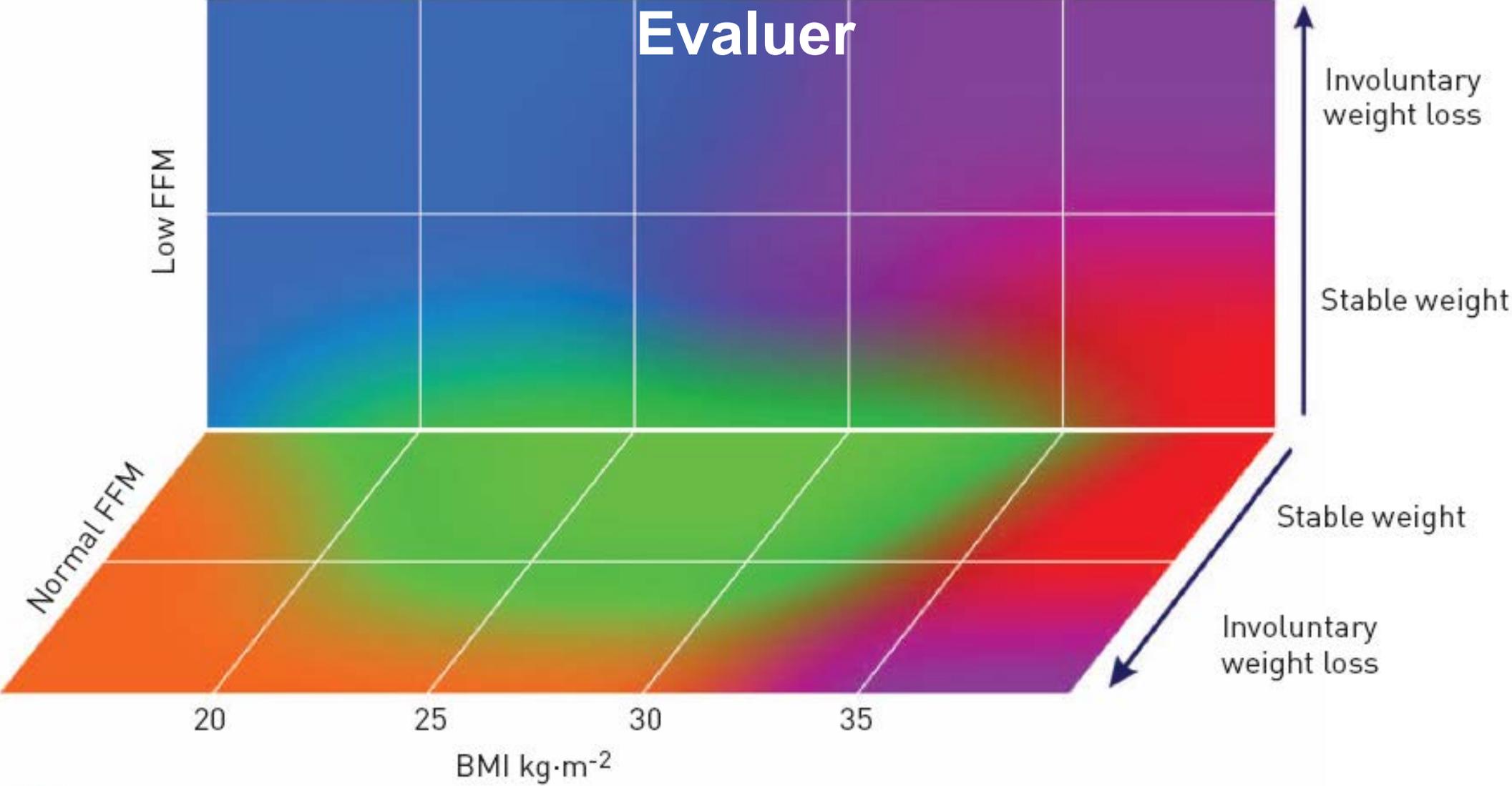| Metabolic phenotype	Definition	Clinical risk
Obesity	BMI 30–35 $kg \cdot m^{-2}$	Increased cardiovascular risk
Morbid obesity	BMI >35 $kg \cdot m^{-2}$	Increased cardiovascular risk
		Impaired physical performance
Sarcopenic obesity	BMI 30–35 $kg \cdot m^{-2}$ and SMI <2 SD below mean of young M and F reference groups [5]	Increased cardiovascular risk Impaired physical performance
Sarcopenia	SMI <2 SD below mean of young M and F reference groups	Increased mortality risk Impaired physical performance
Cachexia	Unintentional weight loss >5% in 6 months and FFMI <17 $kg \cdot m^{-2}$ (M) or <15 $kg \cdot m^{-2}$ (F)	Increased mortality risk Impaired physical performance
Precachexia	Unintentional weight loss >5% in 6 months	Increased mortality risk

BMI: body mass index (weight/height^2); SMI: appendicular skeletal muscle index (appendicular lean mass/height^2); M: male; F: female; FFMI: fat-free mass index (fat-free mass/height^2).

Schols AM, Ferreira IM, Franssen FM, Gosker HR, Janssens W, Muscaritoli M, Pison C, Rutten-van Mölken M, Slinde F, Steiner MC, Tkacova R, Singh SJ. Nutritional assessment and therapy in COPD: a European Respiratory Society statement. Eur Respir J. 2014 ;44:1504-20

Evaluer

Low FFM

Normal FFM

Involuntary weight loss

Stable weight

Stable weight

Involuntary weight loss

BMI kg·m^{-2}

20   25   30   35

- 🟩 Low risk
- 🟥 Increased cardiovascular risk
- 🟧 Increased mortality risk
- 🟦 Decreased physical performance and increased mortality risk
- 🟪 Decreased physical performance and increased cardiovascular risk

Schols AM, Ferreira IM, Franssen FM, Gosker HR, Janssens W, Muscaritoli M, Pison C, Rutten-van Mölken M, Slinde F, Steiner MC, Tkacova R, Singh SJ. Nutritional assessment and therapy in COPD: a European Respiratory Society statement. Eur Respir J. 2014 ;44:1504-20

Evaluer

ESPEN endorsed recommendation

Diagnostic criteria for malnutrition – An ESPEN Consensus Statement

T. Cederholm [a,*], I. Bosaeus [b], R. Barazzoni [c], J. Bauer [d], A. Van Gossum [e], S. Klek [f], M. Muscaritoli [g], I. Nyulasi [h], J. Ockenga [i], S.M. Schneider [j], M.A.E. de van der Schueren [k,l], P. Singer [m]

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[i] Department of Gastroenterology, Hepatology, Endocrinology, and Nutrition, Klinikum Bremen Mitte, Bremen, Germany
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Evaluer
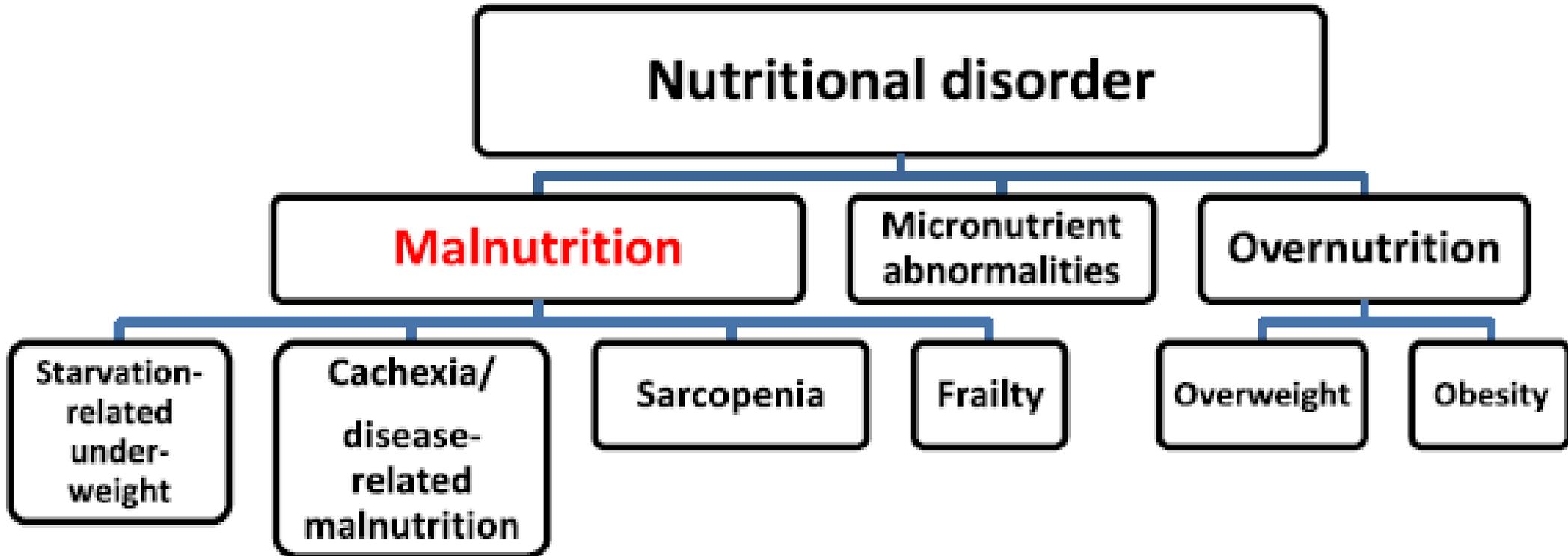
Fig. 3. A conceptual tree of nutritional disorders.

Evaluer

Fact box: Two alternative ways to diagnose malnutrition. Before diagnosis of malnutrition is considered it is mandatory to fulfil criteria for being "at risk" of malnutrition by any validated risk screening tool.

Alternative 1:

- BMI <18.5 kg/m^2

Alternative 2:

- Weight loss (unintentional) $> 10\%$ indefinite of time, or $>5\%$ over the last 3 months combined with either
- BMI <20 kg/m^2 if <70 years of age, or <22 kg/m^2 if ≥ 70 years of age or
- FFMI <15 and 17 kg/m^2 in women and men, respectively.

Evaluer - Sarcopénie

Evaluer - Sarcopénie

Evaluer

- **Symptômes, qualité de vie**

- **CSP,** Clin Nutr. 2018;37:144-8

- **Addictions**

- **Comorbidités**

- **EFR, débits, résistances, volumes, dl$_{CO}$, échanges gazeux, NO**

- **Imagerie, Stratix**

- **EFX, hyperinflation dynamique**

- **Optimisation traitements suivant GOLD / SPLF 2017**

**Enquête 2016 UK
630 000 à haut risque de dénutrition sur 3 millions de BPCO**

Don't forget the diet. Lancet Respir Med. 2016 Sep;4(9):675

Evaluer

Managing Malnutrition in COPD
www.malnutritionpathway.co.uk/copd/
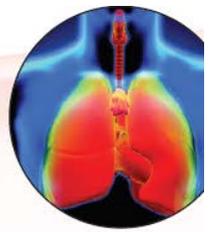
Identifying Malnutrition According to Risk Category Using 'MUST'* - First Line Management Pathway

BMI score	Weight loss score — Unplanned weight loss score in past 3-6 months	Acute disease effect score (unlikely to apply outside hospital)
>20kg/m² — Score 0 18.5 – 20kg/m² — Score 1 <18.5kg/m² — Score 2	<5% — Score 0 5 – 10% — Score 1 >10% — Score 2	If patient is acutely ill and there has been, or is likely to be, no nutritional intake for more than 5 days — Score 2

Total score 0-6

Low risk - score 0 Routine clinical care	Medium risk - score 1 Observe	High risk - score 2 or more Treat**
- **Provide green leaflet:** 'Eating Well for your Lungs' to raise awareness of the importance of a healthy diet - If BMI >30 (obese) treat according to local guidelines - **Review / re-screen** annually.	- **Dietary advice** to maximise nutritional intake. Encourage small frequent meals and snacks, with high energy and protein food and fluids - **Provide yellow leaflet:** 'Improving Your Nutrition in COPD' to support dietary advice NICE recommends COPD patients with a BMI <20kg/m² should be prescribed oral nutritional supplements (ONS). See ONS pathway, over the page - **Review progress** after 1-3 months: - if improving continue until 'low risk' - if deteriorating, consider treating as 'high risk'.	- **Dietary advice** to maximise nutritional intake. Encourage small frequent meals and snacks, with high energy and protein food and fluids - **Provide red leaflet:** 'Nutrition Support in COPD' to support dietary advice - **Prescribe oral nutritional supplements (ONS)** and monitor. See ONS pathway, over the page - **Review progress** according to ONS pathway, over the page - On improvement, consider managing as 'medium risk' - **Refer to dietitian** if no improvement or more specialist support is required.

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Traiter

Schols *et al.* AJRCCM 1995;152;1268-74

- **Patients** 233, VEMS 35 ± 5 %

- **Durée** 8 semaines, réhabilitation

- **Intervention, 3 bras avec exercice en e**
  - exercice + éducation
  - exercice + éducation + SNO + placebo
  - exercice + éducation + SNO + anabolisant

- **Résultats**
  - augmentation poids avec SNO
  - augmentation masse non grasse et force maximale inspiratoire avec anabolisant

Traiter

Schols *et al.* AJRCCM 1998;157;1791-7

MULTIVARIATE ANALYSIS OF PREDICTORS OF MORTALITY: PROSPECTIVE STUDY

Variables		RR	95% CI	p Value
Change in weight	Linear*	0.996	0.992–0.999	0.01
Change in $P_{I_{max}}$	Linear	0.990	0.976–1.004	NS
Treatment	P versus A	0.753	0.447–1.267	NS
	N versus A	0.872	0.530–1.432	NS
BMI	Linear	0.868	0.803–0.939	< 0.001
FEV_1	Linear	0.983	0.962–1.003	NS
IVC	Linear	0.995	0.982–1.008	NS
Pa_{O_2}	Linear	0.877	0.751–1.024	NS
Pa_{CO_2}	Linear	0.977	0.707–1.352	NS
Age, yr	Linear	1.056	1.022–1.090	< 0.001

Definition of abbreviation: $P_{I_{max}}$ = maximal static inspiratory pressure. For other definitions, *see* Tables 1 and 2.
* Entered as time-dependent covariate.

Traiter

Ferreira IM, Brooks D, White J, Goldstein R. Nutritional supplementation for stable chronic obstructive pulmonary disease. Cochrane Database Syst Rev. 2012 Dec 12;12:CD000998

Study or Subgroup	Mean Difference	SE	Experimental Total	Control Total	Weight	Mean Difference IV, Random, 95% CI
1.7.1 Undernourished						
DeLetter 1991 (1)	1.2	0.4123	18	17	18.0%	1.20 [0.39, 2.01]
Efthimiou 1988 (2)	4.1	1.5071	7	7	1.3%	4.10 [1.15, 7.05]
Fuenzalida 1990 (3)	1.22	1.4284	5	4	1.5%	1.22 [-1.58, 4.02]
Lewis 1987 (4)	1.2	0.442	10	11	15.7%	1.20 [0.33, 2.07]
Otte 1989	1.36	0.4579	13	15	14.6%	1.36 [0.46, 2.26]
Rogers 1992	2.8	1.8243	15	12	0.9%	2.80 [-0.78, 6.38]
Schols 1995 (5)	2.4	0.5967	39	25	8.6%	2.40 [1.23, 3.57]
Sugawara 2010 (6)	1.91	0.7184	17	14	5.9%	1.91 [0.50, 3.32]
van Wetering 2010	2.8	0.9745	16	14	3.2%	2.80 [0.89, 4.71]
Weekes 2009	2.1	1.607	30	25	1.2%	2.10 [-1.05, 5.25]
Whittaker 1990	3	0.8944	6	4	3.8%	3.00 [1.25, 4.75]
Subtotal (95% CI)			176	148	74.8%	1.73 [1.29, 2.17]
Heterogeneity: Tau² = 0.06; Chi² = 11.21, df = 10 (P = 0.34); I² = 11%						
Test for overall effect: Z = 7.70 (P < 0.00001)						
1.7.2 Nourished						
Schols 1995	1.5	0.8061	33	38	4.7%	1.50 [-0.08, 3.08]
Subtotal (95% CI)			33	38	4.7%	1.50 [-0.08, 3.08]
Heterogeneity: Not applicable						
Test for overall effect: Z = 1.86 (P = 0.06)						
1.7.3 Combined population of undernourished and nourished						
Knowles 1988 (7)	2.05	3.1791	13	12	0.3%	2.05 [-4.18, 8.28]
Steiner 2003	1.21	0.779	25	35	5.0%	1.21 [-0.32, 2.74]
Sugawara 2012	1.5	0.4486	17	14	15.2%	1.50 [0.62, 2.38]
Subtotal (95% CI)			55	61	20.5%	1.44 [0.68, 2.19]
Heterogeneity: Tau² = 0.00; Chi² = 0.14, df = 2 (P = 0.93); I² = 0%						
Test for overall effect: Z = 3.72 (P = 0.0002)						
Total (95% CI)			264	247	100.0%	1.62 [1.27, 1.96]
Heterogeneity: Tau² = 0.00; Chi² = 11.66, df = 14 (P = 0.63); I² = 0%						
Test for overall effect: Z = 9.24 (P < 0.00001)						
Test for subgroup differences: Chi² = 0.45, df = 2 (P = 0.80), I² = 0%						

17 studies, 8 combined with exercise, increased body weight

Traiter

Ferreira IM, Brooks D, White J, Goldstein R. Nutritional supplementation for stable chronic obstructive pulmonary disease. Cochrane Database Syst Rev. 2012 Dec 12;12:CD000998

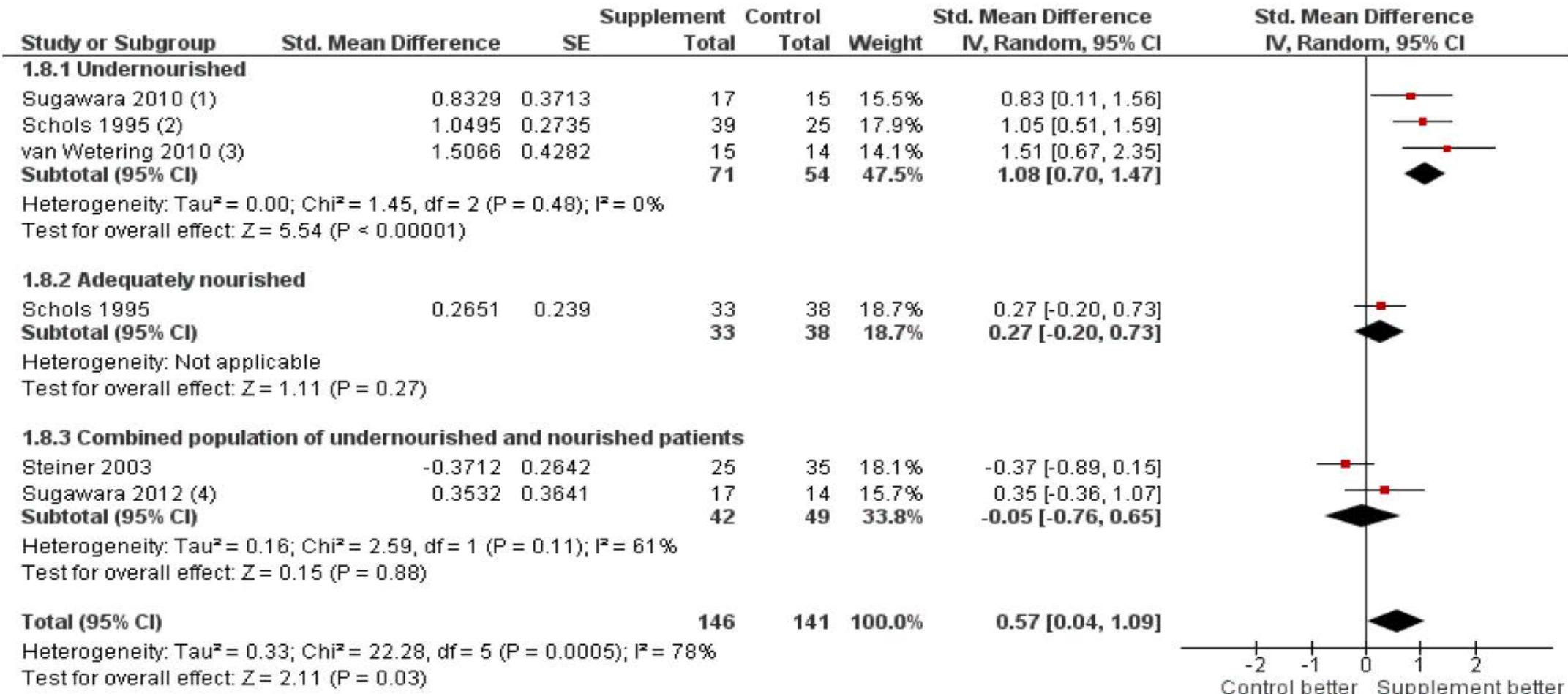| Study or Subgroup	Std. Mean Difference	SE	Supplement Total	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI	Std. Mean Difference IV, Random, 95% CI
1.8.1 Undernourished							
Sugawara 2010 (1)	0.8329	0.3713	17	15	15.5%	0.83 [0.11, 1.56]	
Schols 1995 (2)	1.0495	0.2735	39	25	17.9%	1.05 [0.51, 1.59]	
van Wetering 2010 (3)	1.5066	0.4282	15	14	14.1%	1.51 [0.67, 2.35]	
Subtotal (95% CI)			71	54	47.5%	1.08 [0.70, 1.47]	
Heterogeneity: Tau² = 0.00; Chi² = 1.45, df = 2 (P = 0.48); I² = 0%							
Test for overall effect: Z = 5.54 (P < 0.00001)							
1.8.2 Adequately nourished							
Schols 1995	0.2651	0.239	33	38	18.7%	0.27 [-0.20, 0.73]	
Subtotal (95% CI)			33	38	18.7%	0.27 [-0.20, 0.73]	
Heterogeneity: Not applicable							
Test for overall effect: Z = 1.11 (P = 0.27)							
1.8.3 Combined population of undernourished and nourished patients							
Steiner 2003	-0.3712	0.2642	25	35	18.1%	-0.37 [-0.89, 0.15]	
Sugawara 2012 (4)	0.3532	0.3641	17	14	15.7%	0.35 [-0.36, 1.07]	
Subtotal (95% CI)			42	49	33.8%	-0.05 [-0.76, 0.65]	
Heterogeneity: Tau² = 0.16; Chi² = 2.59, df = 1 (P = 0.11); I² = 61%							
Test for overall effect: Z = 0.15 (P = 0.88)							
Total (95% CI)			146	141	100.0%	0.57 [0.04, 1.09]	
Heterogeneity: Tau² = 0.33; Chi² = 22.28, df = 5 (P = 0.0005); I² = 78%							
Test for overall effect: Z = 2.11 (P = 0.03)							

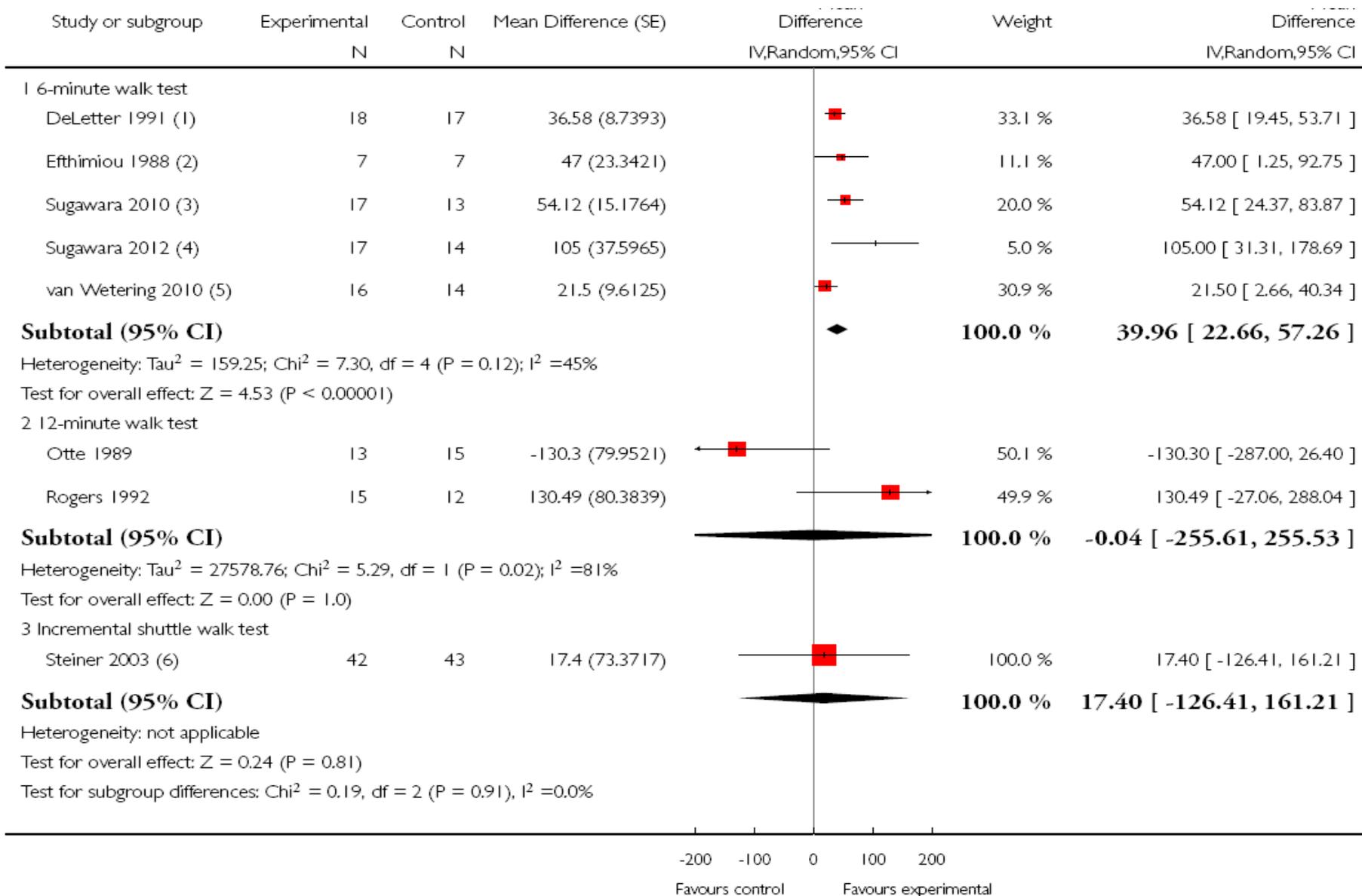-2 -1 0 1 2
Control better   Supplement better

Traiter

Ferreira IM, Brooks D, White J, Goldstein R. Nutritional supplementation for stable chronic obstructive pulmonary disease. Cochrane Database Syst Rev. 2012 Dec 12;12:CD000998


Study or subgroup	Experimental N	Control N	Mean Difference (SE)	Difference IV,Random,95% CI	Weight	Difference IV,Random,95% CI
1 6-minute walk test						
DeLetter 1991 (1)	18	17	36.58 (8.7393)		33.1 %	36.58 [19.45, 53.71]
Efthimiou 1988 (2)	7	7	47 (23.3421)		11.1 %	47.00 [1.25, 92.75]
Sugawara 2010 (3)	17	13	54.12 (15.1764)		20.0 %	54.12 [24.37, 83.87]
Sugawara 2012 (4)	17	14	105 (37.5965)		5.0 %	105.00 [31.31, 178.69]
van Wetering 2010 (5)	16	14	21.5 (9.6125)		30.9 %	21.50 [2.66, 40.34]
Subtotal (95% CI)					100.0 %	**39.96 [22.66, 57.26]**

Heterogeneity: Tau^2 = 159.25; Chi^2 = 7.30, df = 4 (P = 0.12); I^2 =45%
Test for overall effect: Z = 4.53 (P < 0.00001)

2 12-minute walk test						
Otte 1989	13	15	-130.3 (79.9521)		50.1 %	-130.30 [-287.00, 26.40]
Rogers 1992	15	12	130.49 (80.3839)		49.9 %	130.49 [-27.06, 288.04]
Subtotal (95% CI)					100.0 %	**-0.04 [-255.61, 255.53]**

Heterogeneity: Tau^2 = 27578.76; Chi^2 = 5.29, df = 1 (P = 0.02); I^2 =81%
Test for overall effect: Z = 0.00 (P = 1.0)

3 Incremental shuttle walk test						
Steiner 2003 (6)	42	43	17.4 (73.3717)		100.0 %	17.40 [-126.41, 161.21]
Subtotal (95% CI)					100.0 %	**17.40 [-126.41, 161.21]**

Heterogeneity: not applicable
Test for overall effect: Z = 0.24 (P = 0.81)
Test for subgroup differences: Chi^2 = 0.19, df = 2 (P = 0.91), I^2 =0.0%

-200   -100   0   100   200
Favours control   Favours experimental

Traiter

IRAD2 study in Chronic Respiratory Failure
Pison et al. Thorax 2011;66:953-60

- **Patients**   60, 66.6±9.6 yrs, BMI 21.5±3.8
                    62, 65.1±9.6 yrs, BMI 21.4±4.0

- **Duration**   12 weeks, 12 months follow-up

- **Intervention** - Education + Exercise + ONS + oral Testosterone
                   - Education
- **Results**
  - 3 months: increases in body weight, FFM,QF, Hb, endurance, Wmax, QoL in women
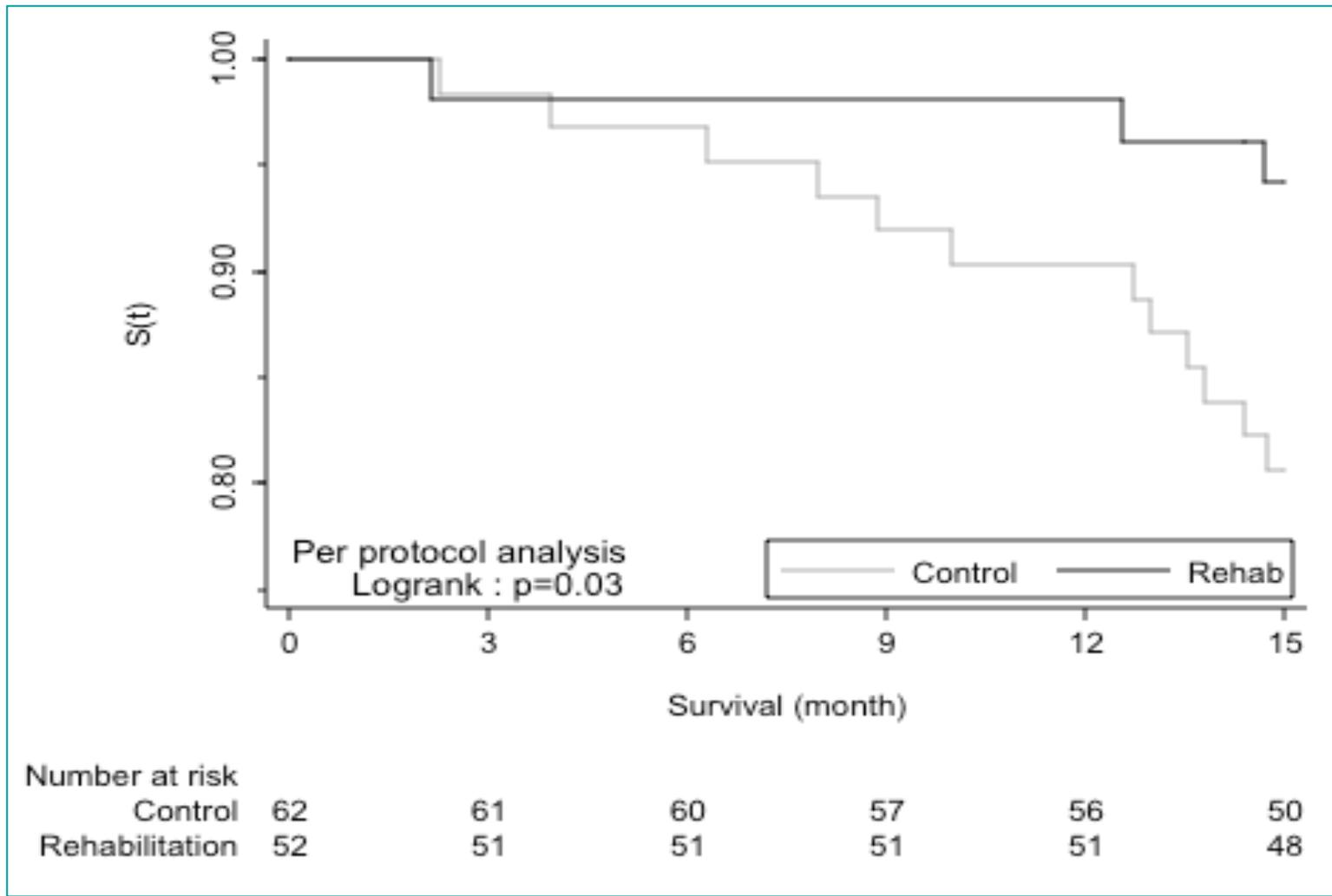 - 15 months : better survival per-protocol analysis

Traiter

IRAD2 study in Chronic Respiratory Failure
Pison et al. Thorax 2011;66:953-60
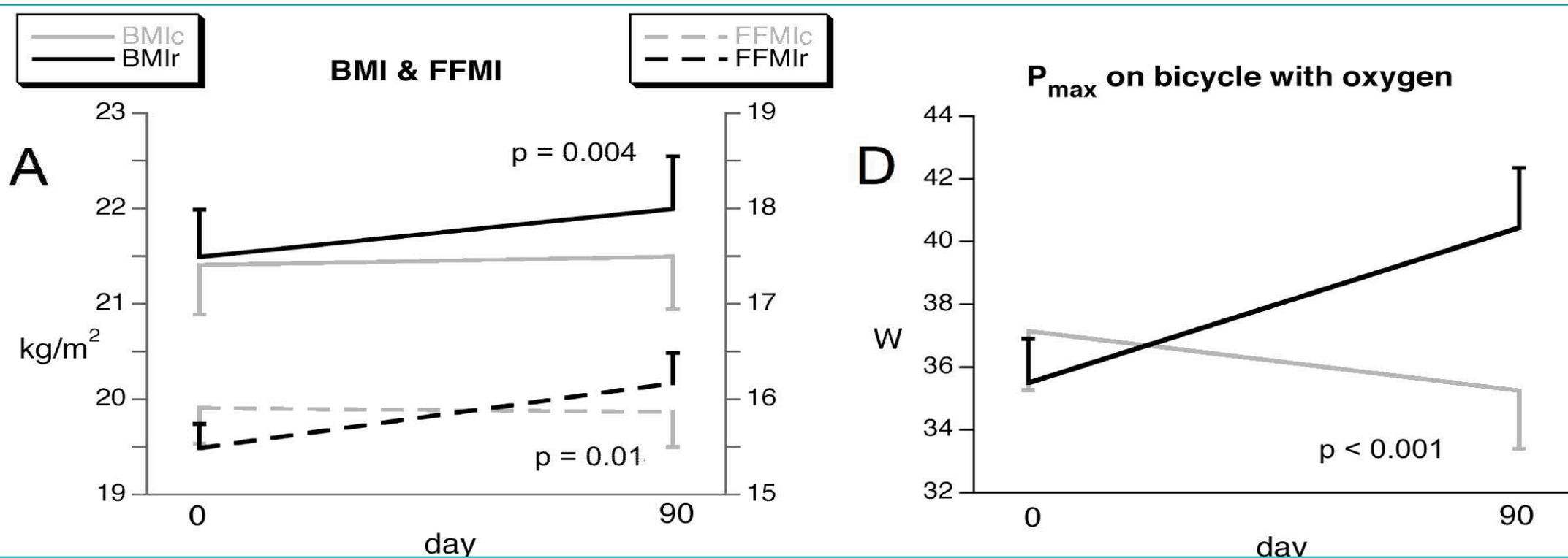
Traiter

IRAD2 study in Chronic Respiratory Failure
Pison et al. Thorax 2011;66:953-60

Traiter

A randomized clinical trial investigating the efficacy of targeted nutrition as adjunct to exercise training in COPD

Coby van de Bool[1], Erica P.A. Rutten[2], Ardy van Helvoort[1,3], Frits M.E. Franssen[1,2], Emiel F.M. Wouters[1,4] & Annemie M. W.J. Schols[1*]

Figure 1 NUTRAIN flowchart. A total of 1640 patients referred for pulmonary rehabilitation were assessed for trial eligibility. COPD patients (post-bronchodilator FEV1/FVC <0.7) were eligible when they had low muscle mass (FFMI < sex- and age-specific 25th percentile FFMI values) and referred for outpatient rehabilitation. A total of 1420 patients were excluded and 139 eligible patients declined to participate; 81 patients were enrolled in the trial and randomized to NUTRITION or PLACEBO. Two of the 81 randomized patients did not start the treatment. During the PR, the drop-out rate was 9.5% (4 patients) in NUTRITION and 5.4% (2 patients) in PLACEBO.
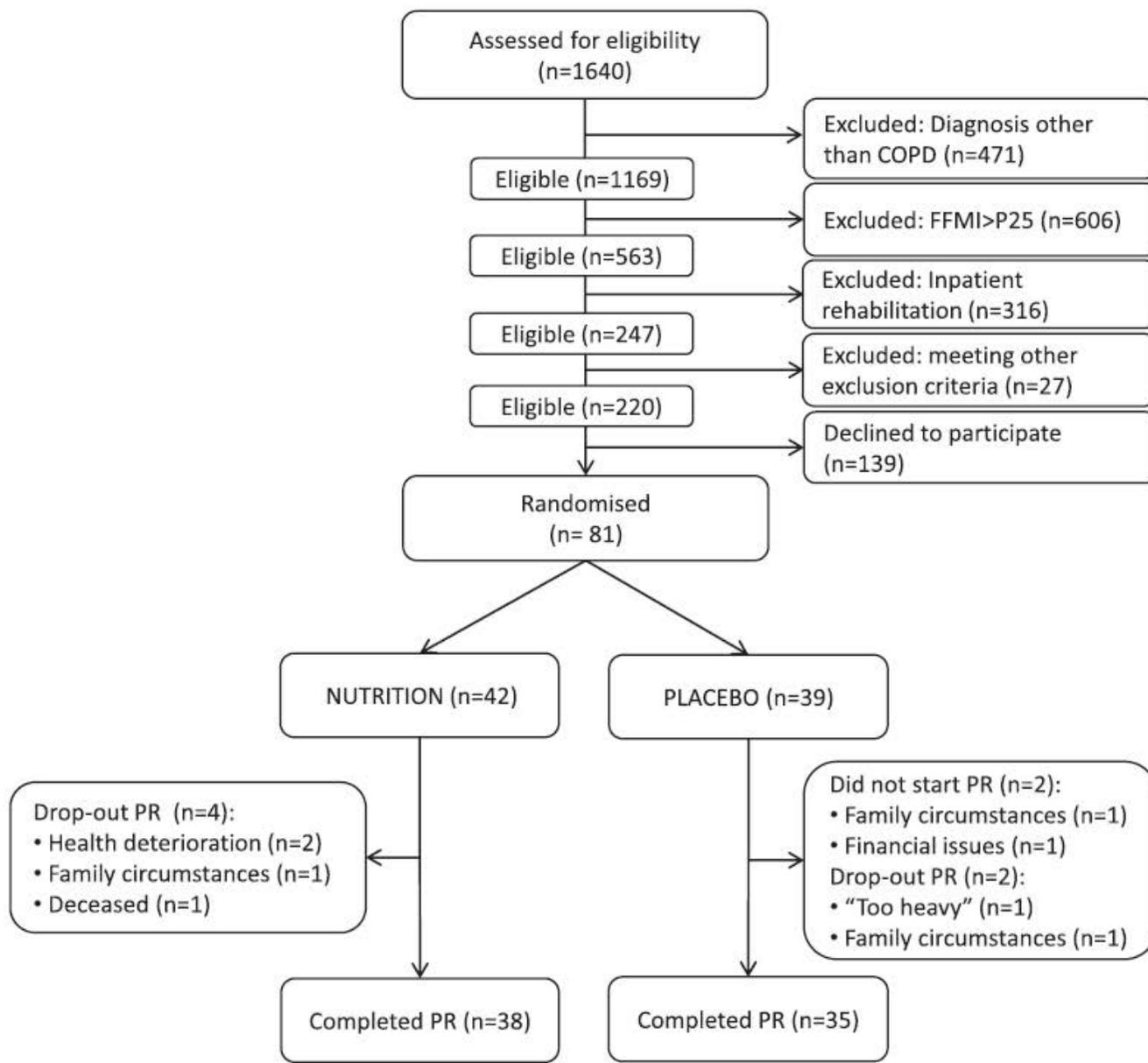
Traiter

		PLACEBO (n = 35)		NUTRITION (n = 38)		Between group differences (NUTRITION − PLACEBO)
		Pre	Post	Pre	Post	
		Mean ± SEM	Mean ± SEM	Mean ± SEM	Mean ± SEM	Adj. difference ± SEM[a]
Plasma nutrient levels	BCAA, μmol/L	471.6 ± 11.6	483.9 ± 15.5	445.3 ± 11.6	450.1 ± 10.3	−14.4 ± 14.2
	Vitamin D, nmol/L	44.6 ± 3.3	49.9 ± 4.0	54.2 ± 4.9	68.0 ± 3.6***	12.8 ± 4.3**
	AA, % of total FA	11.3 ± 0.4	11.0 ± 0.5	10.6 ± 0.5	9.5 ± 0.3*	−1.2 ± 0.5*
	EPA, % of total FA	1.2 ± 0.1	1.1 ± 0.1	1.1 ± 0.1	2.1 ± 0.2***	1.0 ± 0.2***
	DHA, % of total FA	3.2 ± 0.2	2.9 ± 0.1*	3.0 ± 0.2	3.8 ± 0.1***	0.9 ± 0.2***
	N-3 FA, % of total FA	5.5 ± 0.3	5.2 ± 0.2	5.3 ± 0.3	7.3 ± 0.3***	2.2 ± 0.4***
	N-6 FA, % of total FA	34.8 ± 0.4	35.5 ± 0.4	35.1 ± 0.3	33.4 ± 0.5***	−2.2 ± 0.5***
Body composition	Total body mass, kg	65.7 ± 1.7	66.0 ± 1.7	63.8 ± 1.7	65.7 ± 1.7***	1.5 ± 0.6*
	BMC, g	2427.2 ± 85.9	2428.5 ± 84.1	2326.7 ± 78.7	2339.2 ± 80.3	10.0 ± 17.7
	SMM, kg	18.5 ± 0.6	18.8 ± 0.6**	17.2 ± 0.6	17.8 ± 0.7**	0.3 ± 0.2
	FM, kg	19.4 ± 1.4	19.2 ± 1.4	19.8 ± 1.1	21.0 ± 1.1***	1.6 ± 0.5**
Lower limb muscle function	QMS, Nm	121.2 ± 6.9	132.0 ± 7.2**	121.7 ± 6.9	135.3 ± 8.2***	2.8 ± 4.6
Exercise performance	CET, s	237.9 ± 12.3	482.4 ± 62.5***	323.2 ± 38.8	467.2 ± 54.7***	−109.7 ± 70.4
	6MWD, m	492.5 ± 14.0	492.0 ± 16.6	504.0 ± 14.5	500.3 17.9	−3.9 ± 12.2
Respiratory muscle function	IMS, kPa	7.1 ± 0.3	7.5 ± 0.3	6.7 ± 0.4	7.2 ± 0.4**	0.0 ± 0.3
Physical activity level	PAL, steps/day	4664.7 ± 415.9	3841.9 ± 393.4**	4790.1 ± 352.2	4866.4 ± 479.0	929.5 ± 459.2*
Mood	HADS total score	11.1 ± 1.2	8.5 ± 0.9**	12.2 ± 1.0	9.2 ± 1.1***	−0.2 ± 1.0
	HADS anxiety score	6.0 ± 0.7	4.1 ± 0.5**	6.3 ± 0.7	4.8 ± 0.6***	0.4 ± 0.6
	HADS depression score	5.1 ± 0.6	4.4 ± 0.5	5.9 ± 0.5	4.4 ± 0.6**	−0.5 ± 0.6

Data are mean ± SEM or %. BCAA, branched-chain amino acids; AA, arachidonic acid; EPA, eicosapentaenoic acid; DHA, docosahexaenoic acid; n-3 FA, omega 3 fatty acids; n-6 FA, omega 6 fatty acids; BMC, bone mineral content; SMM, skeletal muscle mass; FM, fat mass; QMS, quadriceps muscle strength; CET, cycle endurance time; 6MWD, 6 min walking distance; IMS, inspiratory muscle strength; PAL, physical activity level; HADS, Hospital anxiety and depression scale.

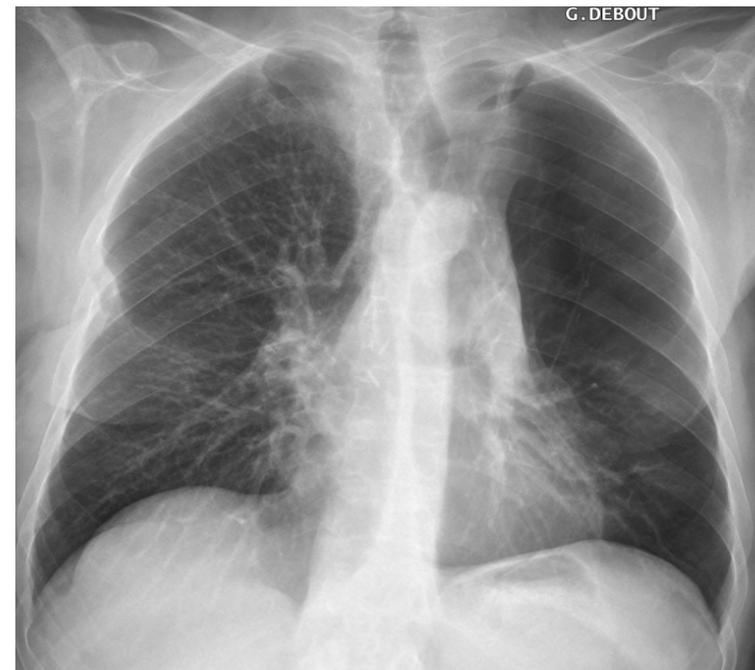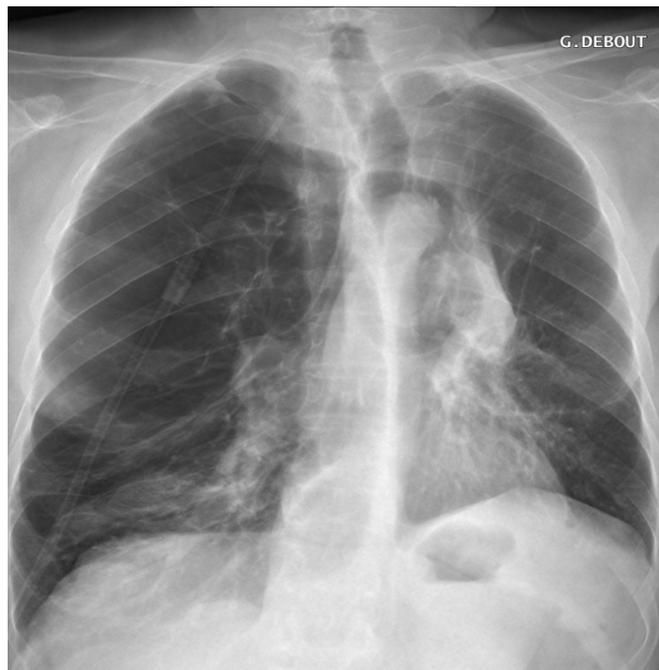# Traiter VNI

Budweiser *et al.* Respir Care 2006;51:126-32
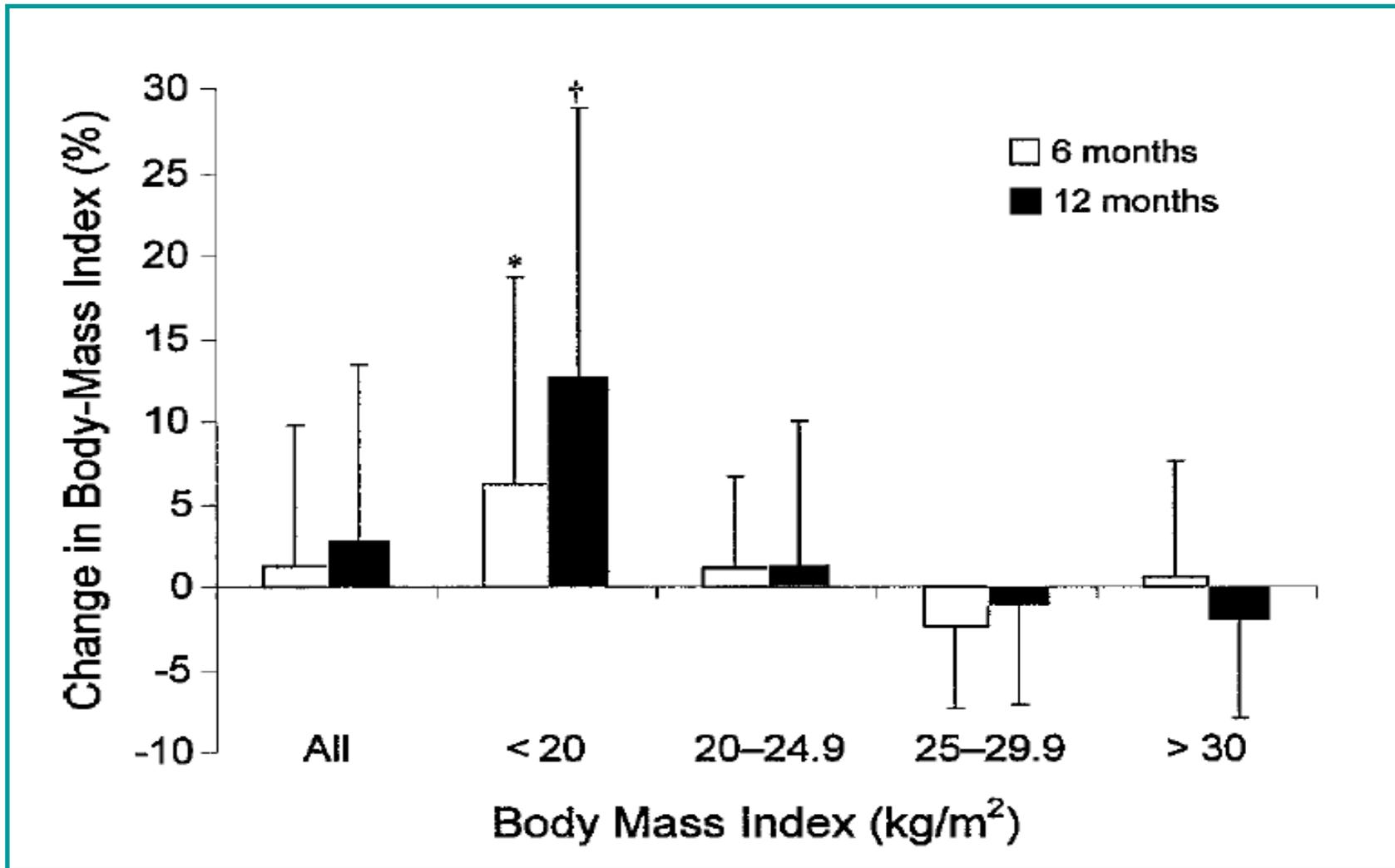
Traiter- *ELVR*

Homme 67 ans, emphysème-HTAP, réhabilitation nutritionnelle à domicile
Réduction du volume pulmonaire par voie endoscopique LSG, 01-2010
Transplantation pulmonaire droite, 05-2010. *Eur J Cardiothorac Surg 2012, June 13*

Date	09-2009	02-2010	07-2010
Poids, IMC	56, 21	61, 22,9	60, 22,6
VEMS, L	0,77	1,17	2,25
CVF, L	2,27	2,86	3,31
Pa0$_2$, kPa	5,36	6	12

Yaël Julian, diététicienne

Relations d'interêts :
Diététicienne chez AGIR à dom.

Prestataire de santé à domicile

État nutritionnel : critères diagnostiques de surpoids ou d'obésité

Le diagnostic de surpoids ou d'obésité repose sur les critères ci-dessous :
surpoids : IMC > 25 kg/m²
obésité : IMC > 30 kg/m²
obésité morbide : IMC > 40 kg/m²

Si surpoids ou obésité, conseils pour modifier le régime alimentaire afin de maintenir la masse musculaire et de diminuer la masse grasse.
Il ne faut pas chercher à faire maigrir les patients BPCO.

Une impédancemétrie est utile pour dépister une baisse de la masse maigre chez les patients dont l'IMC est compris entre 21 et 26.

État nutritionnel :
Critères diagnostiques de dénutrition

Les critères diagnostiques de la dénutrition chez un patient ayant une BPCO sont différents des critères de dénutrition modérée ou sévère de la population générale.

Le dosage de l'albuminémie n'est pas recommandé car il n'est pas assez sensible et est influencé par l'état inflammatoire de ces patients.

L'évaluation de l'état nutritionnel chez le patient porteur de BPCO repose sur :

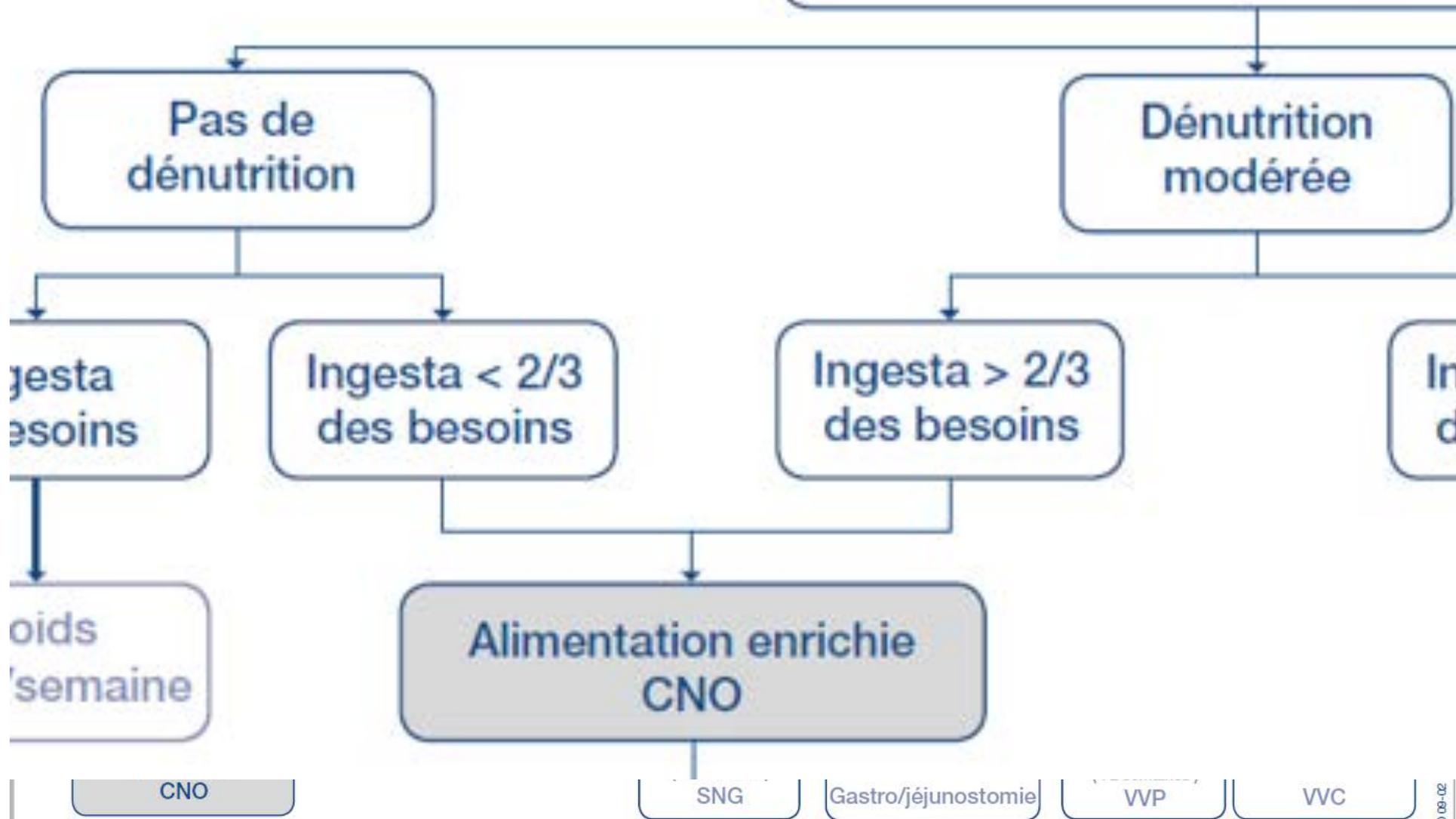Le calcul de l'index de masse corporelle (IMC)

L'indice de masse maigre

Le pourcentage de perte de poids

Une vigilance étroite voire une prise en charge nutritionnelle seront mises en place en cas d' IMC < 21 kg/m² et/ou une perte de poids de 10 % en 6 mois, ou un indice de masse non grasse < 25e percentile.

Pourcentage de perte de poids	60 kg	130 kg
5 %	3 kg	6,5 kg
10 %	6 kg	13 kg
15 %	9 kg	19,5 kg

https://www.nutritionclinique.fr/imc/

CNO : compléments nutritionnels oraux ; SNG : sonde naso-gastrique ; VVP : voie veineuse périphérique ; VVC : voie veineuse centrale

Enrichir les repas en protéines

Augmenter sa consommation de :

- viande, poisson, œuf, tels quel ou cachés dans les préparations
- produits laitiers
- légumes secs (lentilles, pois chiche, pois cassés...)

Aliments	Exemples d'enrichissement
Viande	Jambon, jambon de dinde, blanc de poulet, charcuterie, viande hachée...
Poisson	Thon, surimi, anchois, hareng, foie de morue ... Effiloché ou mixé
Œufs	En neige dans les préparations sucrées En omelette dans les préparations salées ou tel quel dans les potages
Fromage	Gruyère râpé, fromage à tartiner, parmesan
Lait	Lait en poudre, lait concentré

Enrichir les repas en lipides

- Mettre en place une cuisine riche en matières grasses ajoutées
- Lors des collations, consommer des fruits oléagineux ou des entremets
- Augmenter la consommation de fromage

Aliments	Exemples d'enrichissement
Huile	Olive, tournesol, arachide et mélange de 4 huiles (type isio4) pour la cuisson Olive, colza, noix pour l'assaisonnement
Beurre	Cru ou fondu
Margarine	Crue, fondue ou cuite
Produits laitiers	Lait entier, yaourt au lait entier, yaourt enrichis en crème, yaourt à la grecque, fromage, desserts lactés, crème de gruyère…
Mayonnaise	Pour les crudités et les sauces
Fruits oléagineux	Amande, noix, cacahuète, noisette … Dans les préparations sucrées ou salées

Fragmenter les prises alimentaires

- L'alimentation peut être fractionnée en faisant 6 à 8 repas dans la journée.

- Proposer des collations à 10h, 16 h et 21h

- Penser à toujours avoir quelque chose à grignoter sur soi.

Prescrire des compléments nutritionnels oraux hyperénergétiques et hyperprotéinés

Adaptation goût et texture

En dehors des repas

En complément de l'alimentation

Tous les jours → Diversité (texture, parfum)

Peut être pris en plusieurs fois

Servir frais, tiédis ou glacé

Cuisinés

https://www.nutritionclinique.fr/les-complements-nutritionnels-oraux/

Les situations ou facteurs de risque de dénutrition chez le patient BPCO

VEMS < 50 % de la valeur prédite / exacerbations fréquentes

tabagisme

veuvage, solitude

état dépressif

≤ 2 repas par jour

≥ 3 médicaments par jour

constipation

problèmes bucco-dentaires

revenus insuffisants

régimes restrictifs

**Equipe interdisciplinaire
Prise en charge globale**

Conseil minimum /
entretien motivationnel

Posture éducative

Sevrage
tabagique

Activité
Physique
Adaptée

APA Agir à Dom
Ressources locales

Rééducation

Coordination avec
kinés libéraux

Nutrition

Diététiciens Agir à Dom
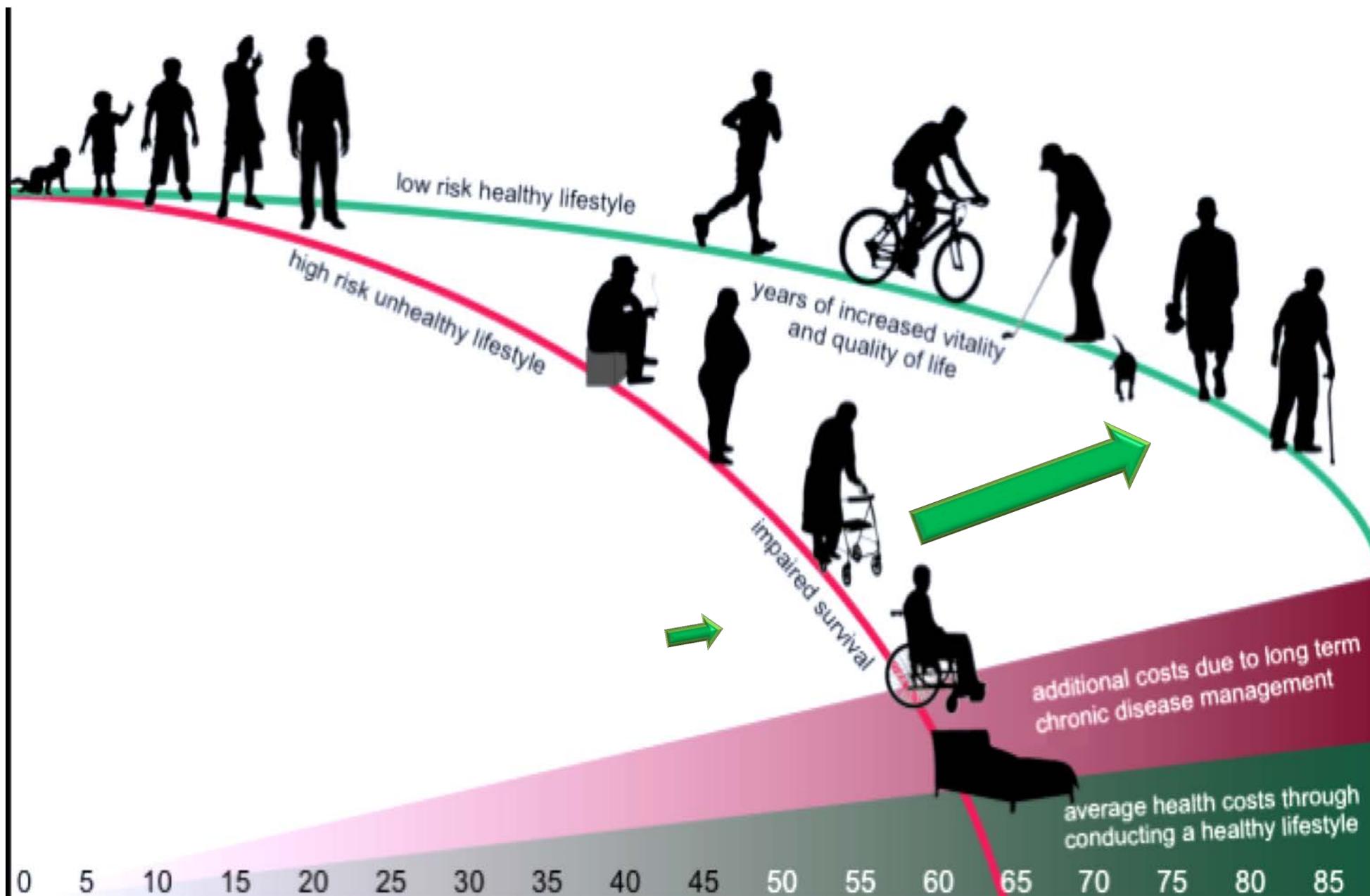Diététiciens libéraux

Patients
Techniciens / IDE

Psycho-
Sociale

Assistant social
Agir à Dom
Ressources locales (CCAS…)

Traitement
chronique

Pharmaciens Agir à Dom
Equipe soignante du patient

Prévenir > Réparer

low risk healthy lifestyle

high risk unhealthy lifestyle

years of increased vitality and quality of life

impaired survival

additional costs due to long term chronic disease management

average health costs through conducting a healthy lifestyle

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85

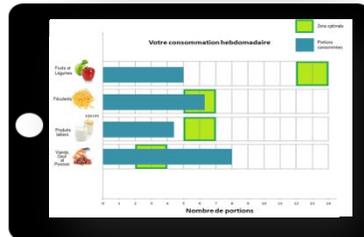# Monitorer le Bien-être et la Santé à la Maison

Cook2Health
20 sujets Grenoble

MBSM
100 sujets Grenoble
60 sujets Aberystwyth

Protein intake and exercise for optimal muscle function with aging: Recommendations from the ESPEN Expert Group

Nicolaas E.P. Deutz [a,*], Jürgen M. Bauer [b], Rocco Barazzoni [c], Gianni Biolo [c], Yves Boirie [d], Anja Bosy-Westphal [e], Tommy Cederholm [f,g], Alfonso Cruz-Jentoft [h], Zeljko Krznarić [i], K. Sreekumaran Nair [j], Pierre Singer [k], Daniel Teta [l], Kevin Tipton [m], Philip C. Calder [n,o]

Dietary protein intake
- Older adults have greater protein needs to compensate for anabolic resistance and hypermetabolic disease.
- Older adults may also have decreased intake due to age-related appetite loss, medical conditions, financial limits.
- Optimal intake of at least 1.0 to 1.5 g protein/kg BW/day is recommended; individual needs depend upon the severity of malnutrition risk.

Exercise
- Regular exercise helps maintain skeletal muscle strength and function in older adults.
- Resistance training has limited but positive effects on recovery of muscle in older people.
- A combination of resistance training and adequate dietary protein/amino acid intake for healthy muscle aging is recommended.
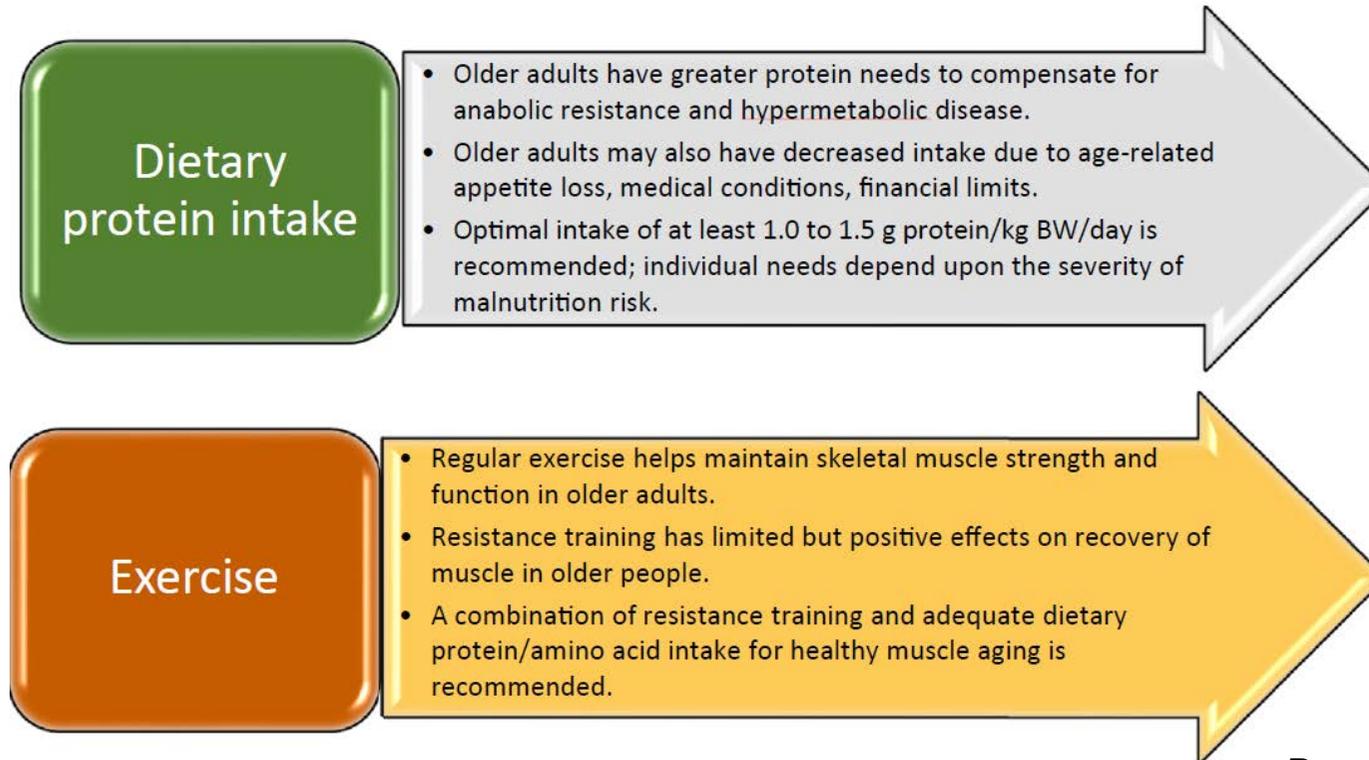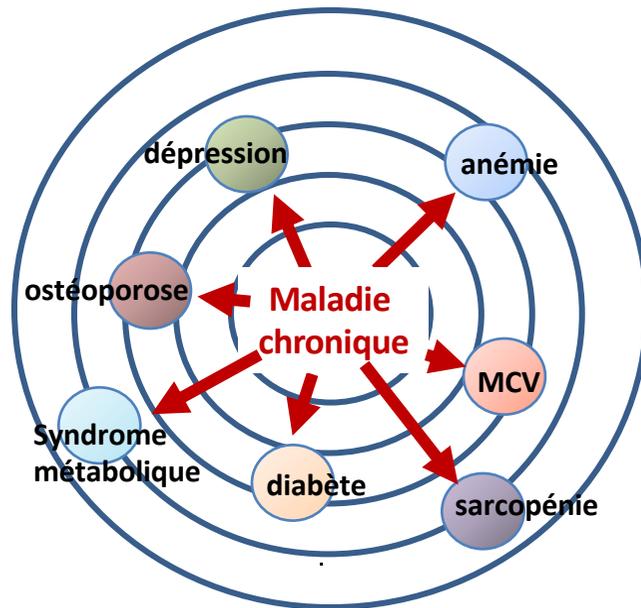
Fig. 3. Recommendations for maintaining healthy muscle with aging.

Bauer J, J Am Med Dir Assoc 2014
Deutz NEP, Clin Nutr 2014

Courtoisie du Pr. Yves Boirie

Hierarchiser les priorités thérapeutiques dans les maladies chroniques ?

Cibler l'état nutritionnel et la mobilité pour préserver la santé

Diagramme de gauche : dépression, anémie, ostéoporose, Maladie chronique, MCV, Syndrome métabolique, diabète, sarcopénie

Diagramme de droite : dépression, anémie, ostéoporose, MOBILITE, MCV, Syndrome métabolique, diabète, sarcopénie

Dépistage, prise en charge clinique et thérapeutique de la maladie d'organe ou de système mais... nombreuses comorbidités
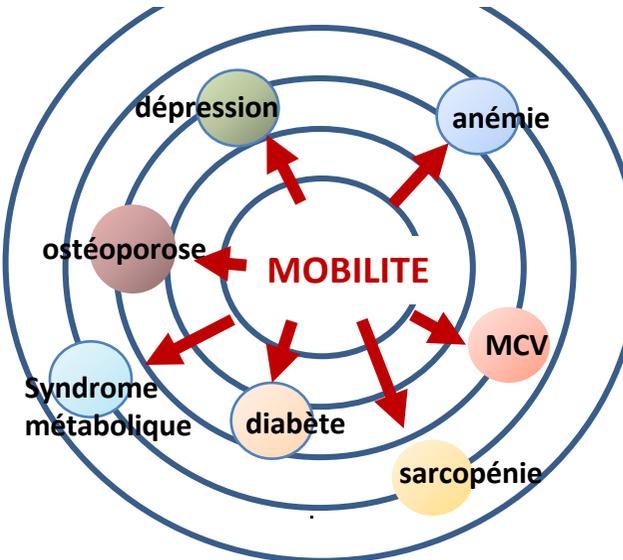
Dépistage, prise en charge clinique de la dysmobilité en plus de la maladie →amélioration du pronostic et de la qualité de vie

Courtoisie du Pr. Yves Boirie

5 messages

- **La composition corporelle nous informe dans les maladies chroniques respiratoires**

- **« Maigrir, c'est mourir au cours des maladies chroniques »** *Campagne 2017 SFNEP, Pr. E. Fontaine*

- **Intervenir est possible : Nutrition x Activités physiques**

- **Les comportements alimentaires modulent la Santé Respiratoire**

- **Améliorer les comportements alimentaires par des objets connectés en population générale pour protéger la Santé Respiratoire ?**