Revalidation nutritionnelle et physique

Jean-Charles Preiser

ENC 2010

Mangerbouger.fr, le site de la nutrition santé et plaisir


One-Year Outcomes in Survivors of the Acute Respiratory Distress Syndrome

Margaret S. Herridge, M.D., M.P.H., Angela M. Cheung, M.D., Ph.D., Catherine M. Tansey, M.Sc., Andrea Matte-Martyn, B.Sc., Natalia Diaz-Granados, B.Sc., Fatma Al-Saidi, M.D., Andrew B. Cooper, M.D., Cameron B. Guest, M.D., C. David Mazer, M.D., Sangeeta Mehta, M.D., Thomas E. Stewart, M.D., Aiala Barr, Ph.D., Deborah Cook, M.D., and Arthur S. Slutsky, M.D., for the Canadian Critical Care Trials Group

N Engl J Med 2003;348:683-93.

GLOBAL ASSESSMENT

At the time of discharge from the ICU, patients who survived the acute respiratory distress syndrome were severely wasted and had lost 18 percent of their base-line body weight (Fig. 2). Seventy-one percent of patients (59 of 83) returned to their base-line weight by one year. All patients reported poor function and attributed this to the loss of muscle bulk, proximal weakness, and fatigue. Most patients had

DISTANCE WALKED IN SIX MINUTES

The distance walked in six minutes improved over the 12 months after discharge from the ICU but still remained lower than the predicted value[38] (Table 3). The patients attributed exercise limitation to global muscle wasting and weakness, foot drop (as a result of nerve-entrapment syndromes that began in the ICU), immobility of large joints (heterotopic ossification[40,41]), and dyspnea. The proportion of

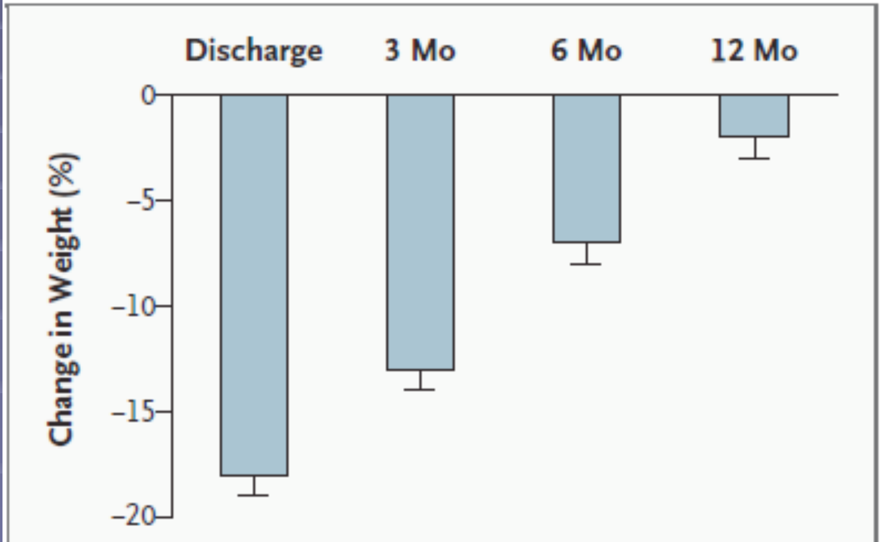
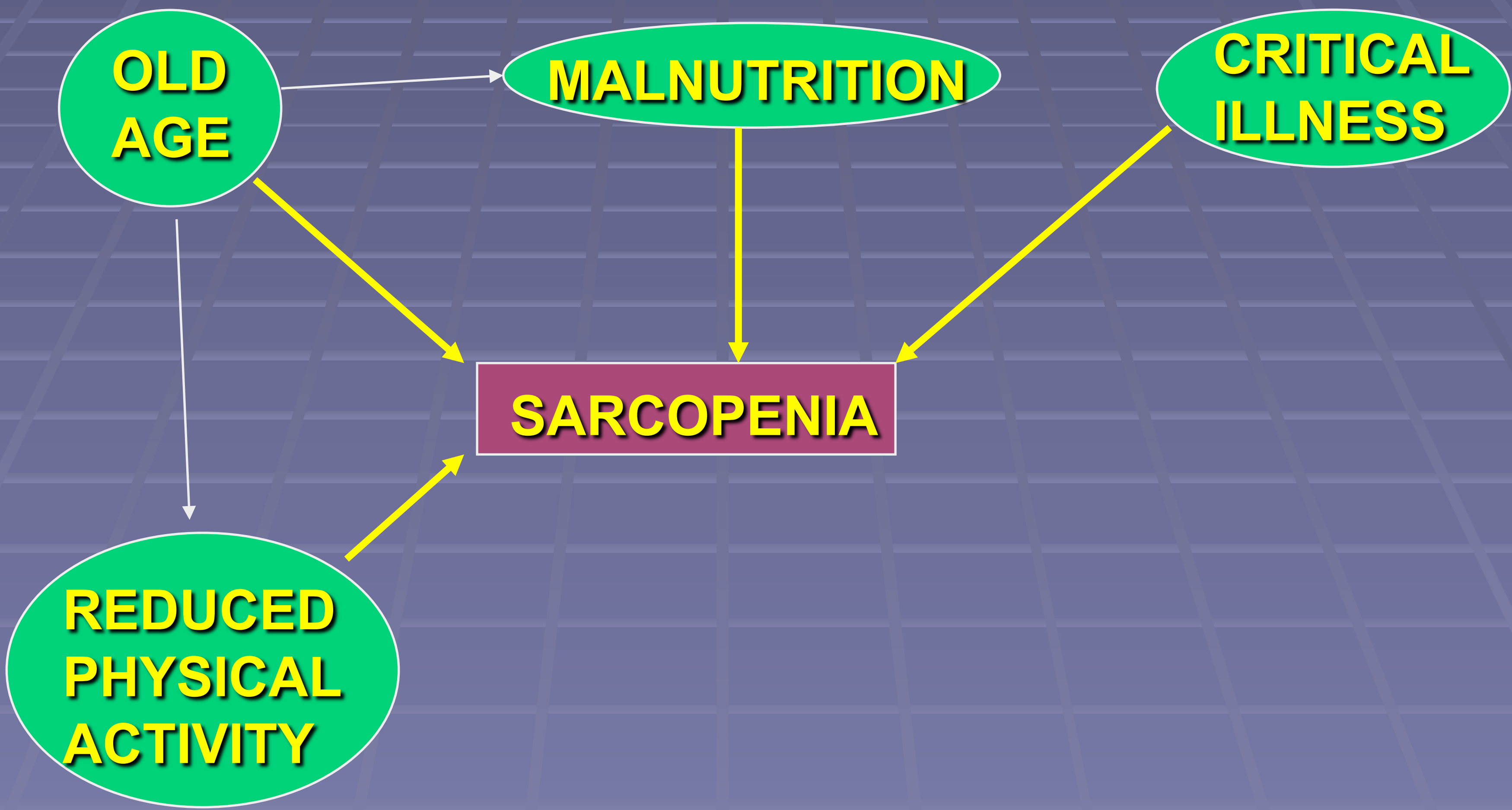


Figure 2. Mean (+SE) Change in Weight from Base Line among Patients with the Acute Respiratory Distress Syndrome at the Time of Discharge from the ICU and at 3, 6, and 12 Months.

THE PROBLEM


OLD AGE
MALNUTRITION
CRITICAL ILLNESS
SARCOPENIA
REDUCED PHYSICAL ACTIVITY

SARCOPENIA???

"No decline with age is more dramatic or potentially more functionally significant that the decline in lean body mass. Why have we not given it more attention? Perhaps it needs a name derived from the Greek. I'll suggest *sarcopenia*."

I. H. Rosenberg, 1989

William J. Evans

Sarcopenia

Sarcopenia is age-related loss of lean muscle mass

Loss of ~40% of muscle mass by 80 years of age

Loss of locomotion due to atrophy of type IIb fibers

Loss of capacity to withstand injuries and diseases

Changes in Skeletal Muscle With Age

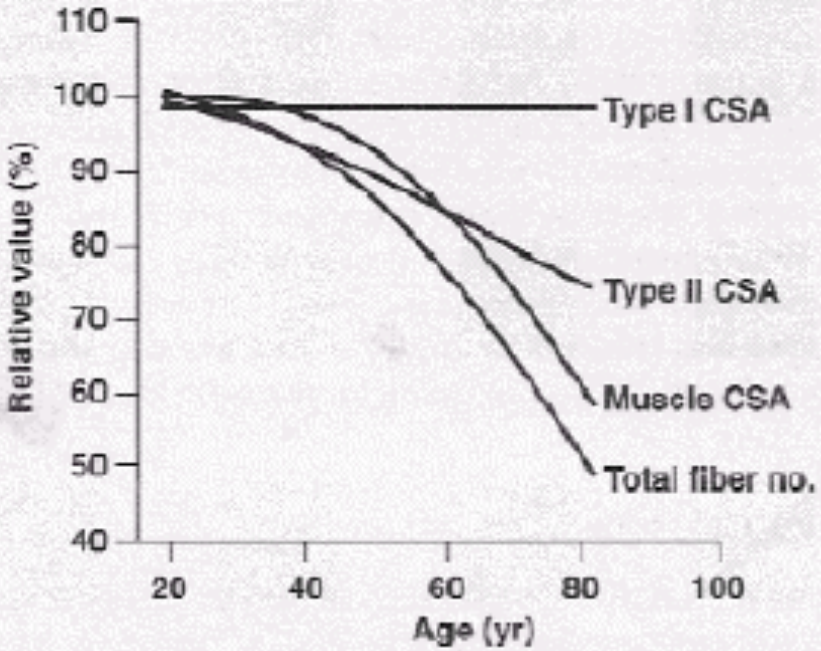


Fig. 2 - Relative changes in muscle size parameters in humans. Data are summarized from whole vastus lateralis reported by Lexell et al. (18). The decline in total muscle cross-sectional area (CSA) appears to be due to both a reduction in total fiber number and atrophy of type II fibers. The proportion of fiber types was unchanged, but due to the reduced size of type II fibers, the proportion of the total area occupied by type II fibers also declined with aging.

CHARACTERISTICS OF MUSCLE FIBERS

- Type II
  - Fast-twitch
  - Less active oxidative metabolism
  - Less susceptible to hypoxia
  - Less resistant to fatigue
  - Rapid movements (legs)
- Type I
  - Slow-twitch
  - More active oxidative metabolism
  - More susceptible to hypoxia
  - More resistant to fatigue
  - Maintenance of posture (back)

DEGREE OF SARCOPENIA

"sarx" – flesh

"penia" – loss or deficiency

Class I

A value of lean body mass 1 to 2 standard deviations below the average value calculated in healthy, young adults.

Class II

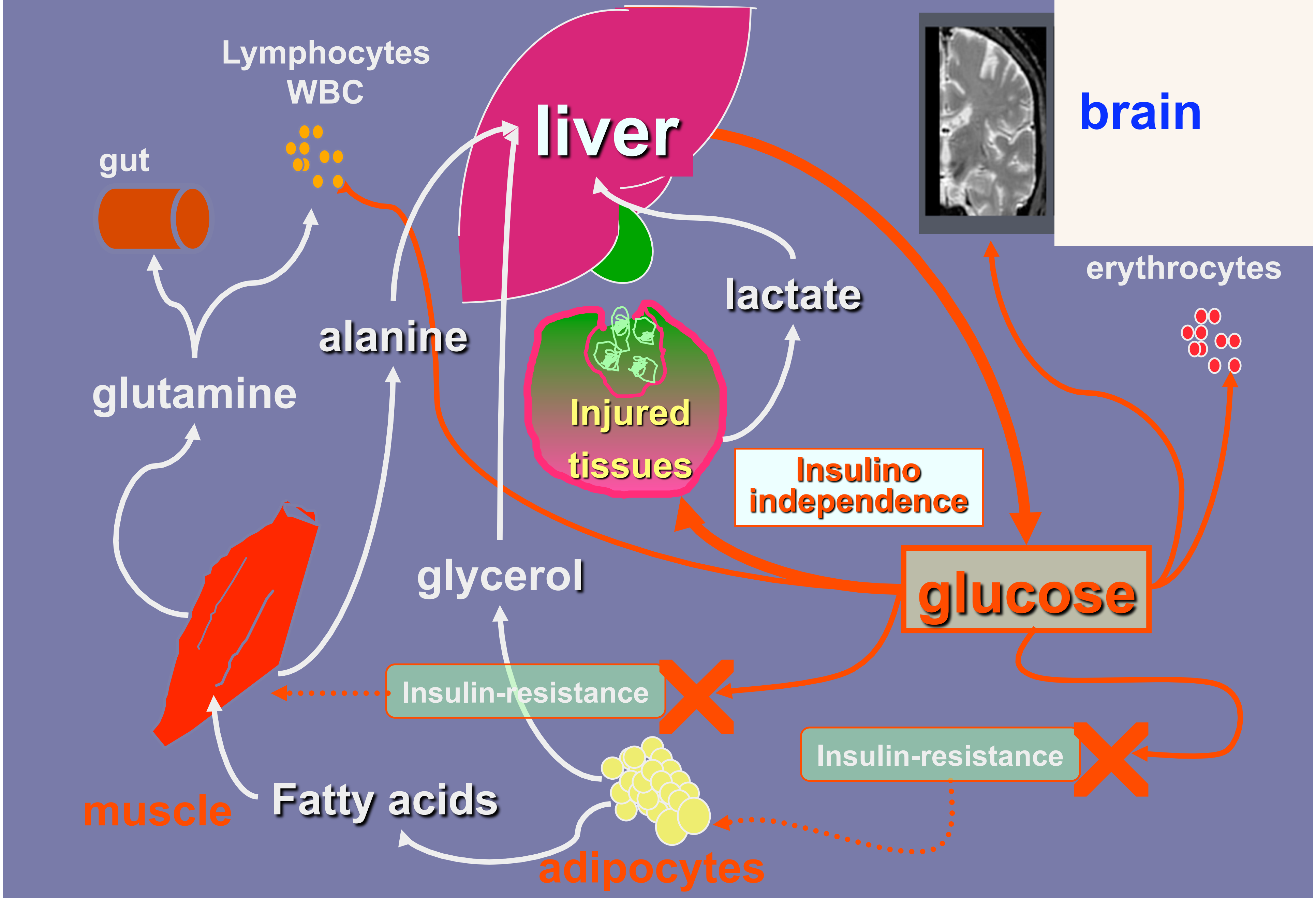
A value of lean body mass greater than 2 standard deviations below the average value calculated in healthy, young adults.

Contribution of organs and tissue to **resting** energy expenditure

Organ	BW %	% total REE	Organ MR Kcal/kg/d
Heart	0.4	10 %	400-600
Kidneys	0.4	8 %	400
Brain	1.9	20 %	240
Liver	2.321 %	200	
Skeletal muscle	4022 %	13	
Adipose	214%	4.5	
Others	3316	12	

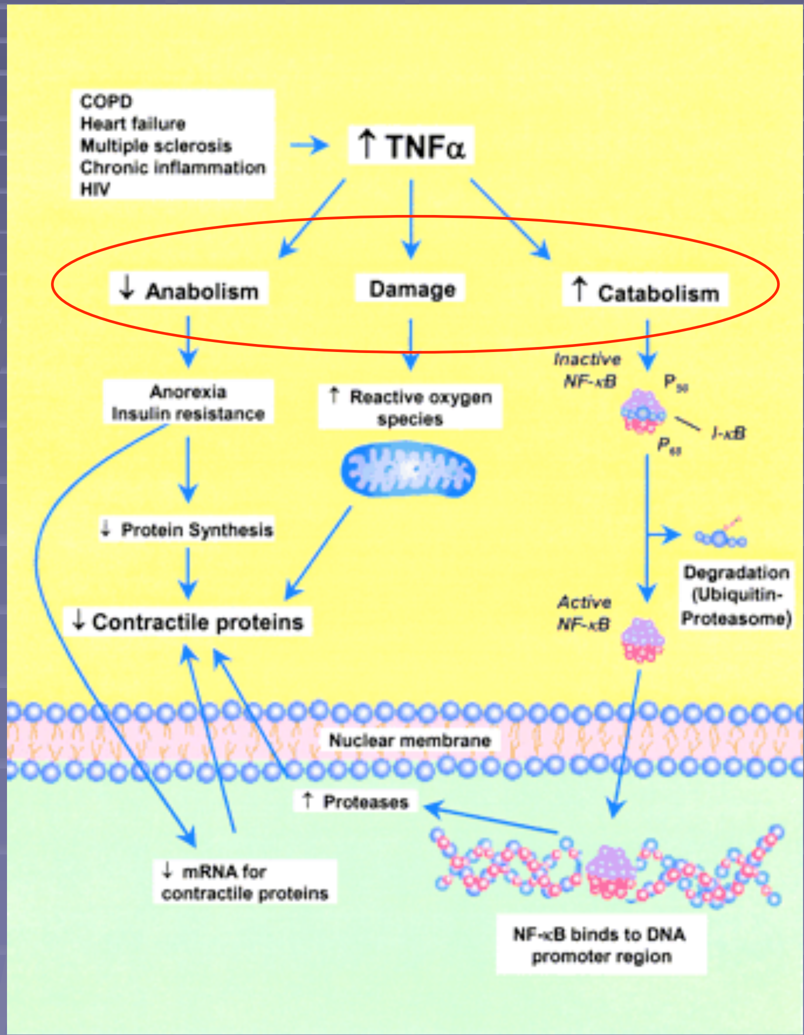
Nelson et al, Am J Clin Nutr 1992; 56: 848

METABOLIC ADAPTATION TO STRESS



Role of TNF in muscle wasting

Laghi American J Respir Crit Care Med 2003; 168 :10-48



Metabolic response in ICU patients

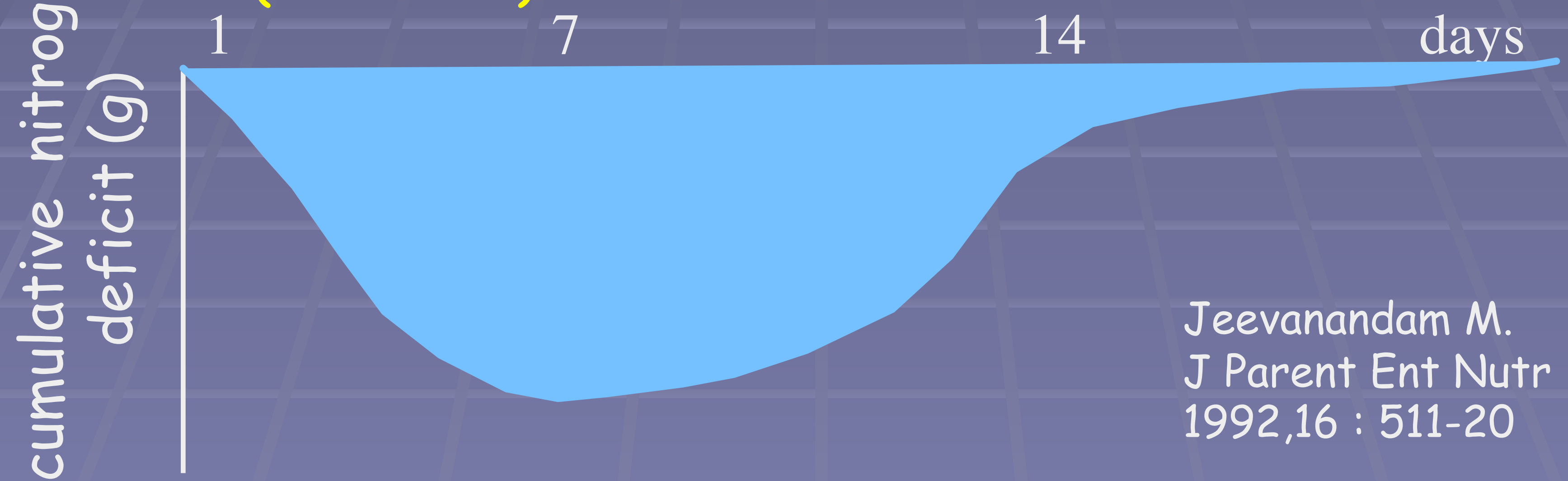
WOUND has priority

Protein stores mobilized (catabolic)

WOUND & BODY have priority

BOD Y has priority

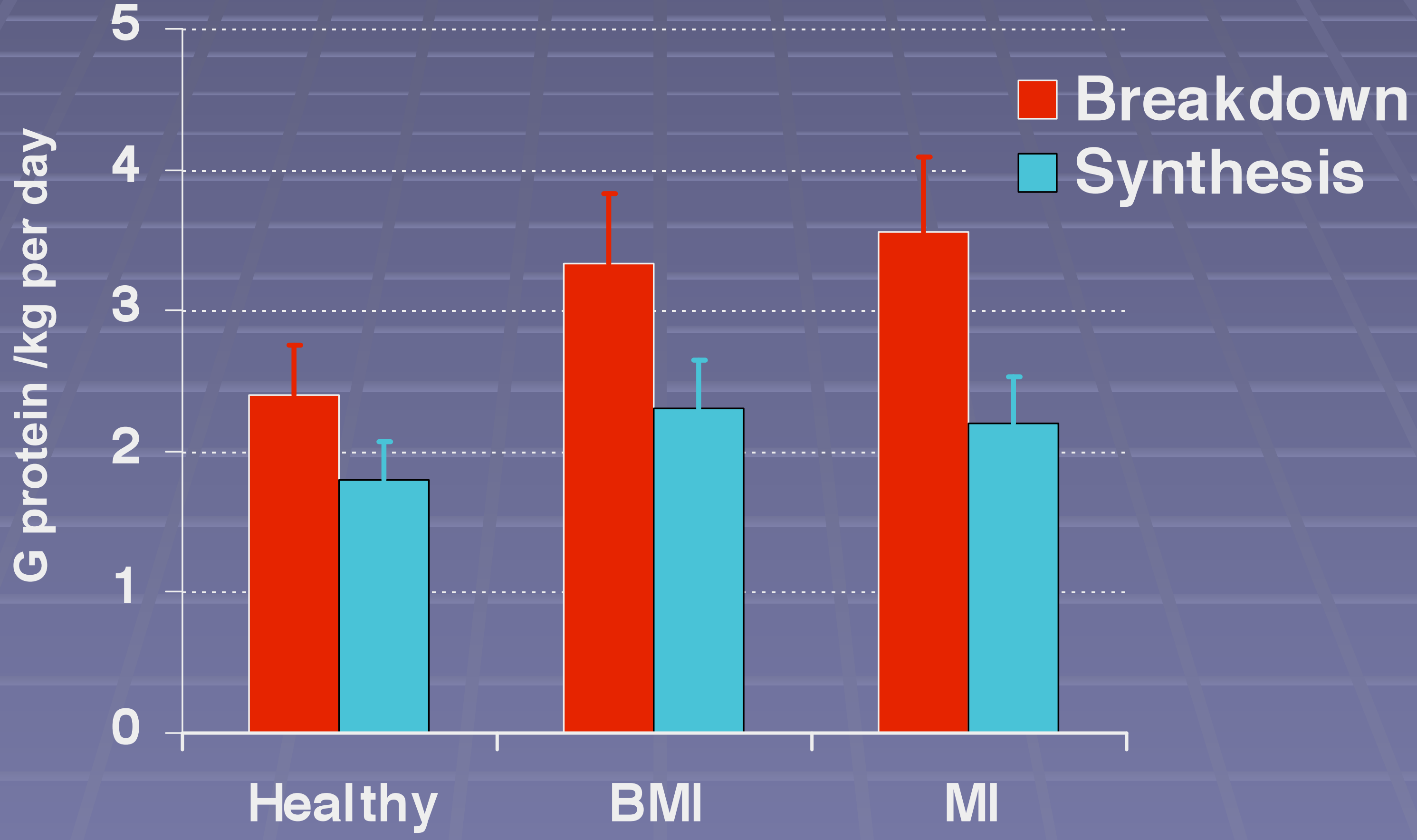
Protein stores replenished (anabolic)



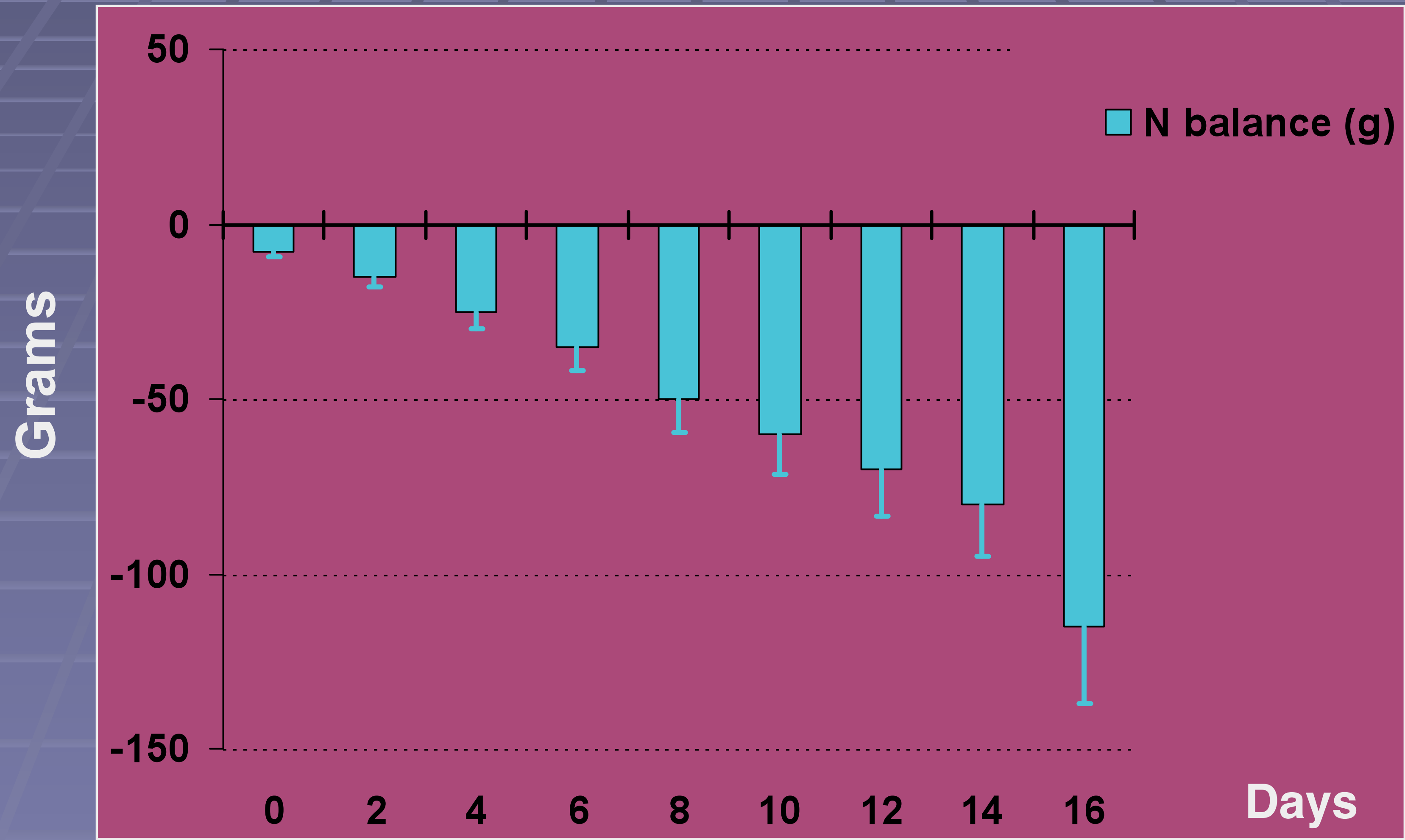
Jeevanandam M.
J Parent Ent Nutr
1992,16 : 511-20

Protein metabolism in trauma patients with or without brain injury

Petersen SR et al, J. Trauma 1993; 34: 653



Cumulative N balance in mechanically ventilated patients receiving full enteral feeding



Weight loss (%)	Protein loss * (%)
5	11.2 - 16.8
10	15.2 - 20.8
15	19.2 - 24.8
20	23.0 - 29.0
25	26.8 - 33.2

* in vivo neutron analysis. Hill G.L. J Parent Enteral Nutr 16, 197-218, 1992

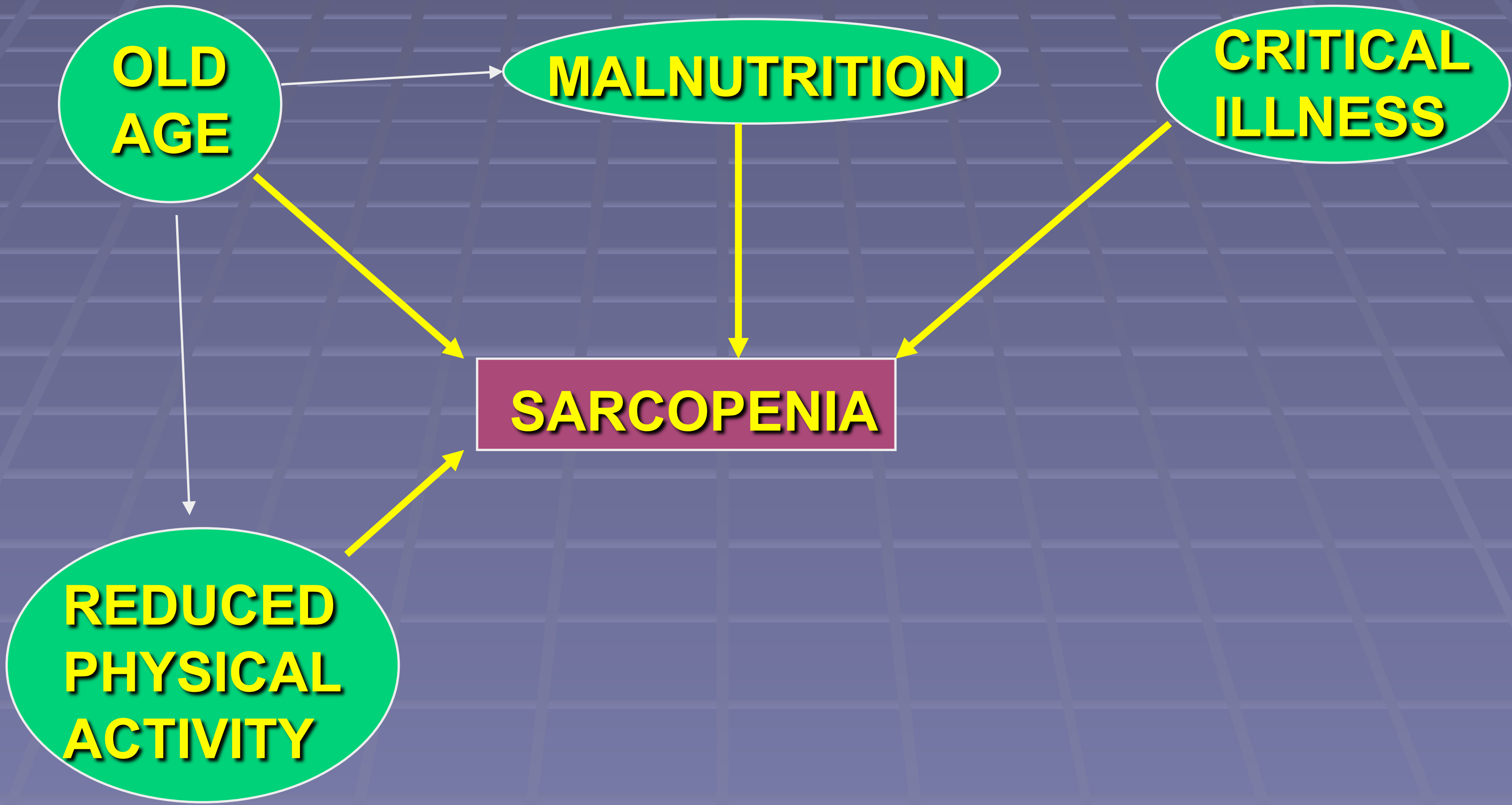
Protein losses during critical illness

≥ 7 - 14 g nitrogen / d.

≥ 220 - 440 g lean tissue / d

> 80-200 g/d muscular proteins

THE PROBLEM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Common concern and goal

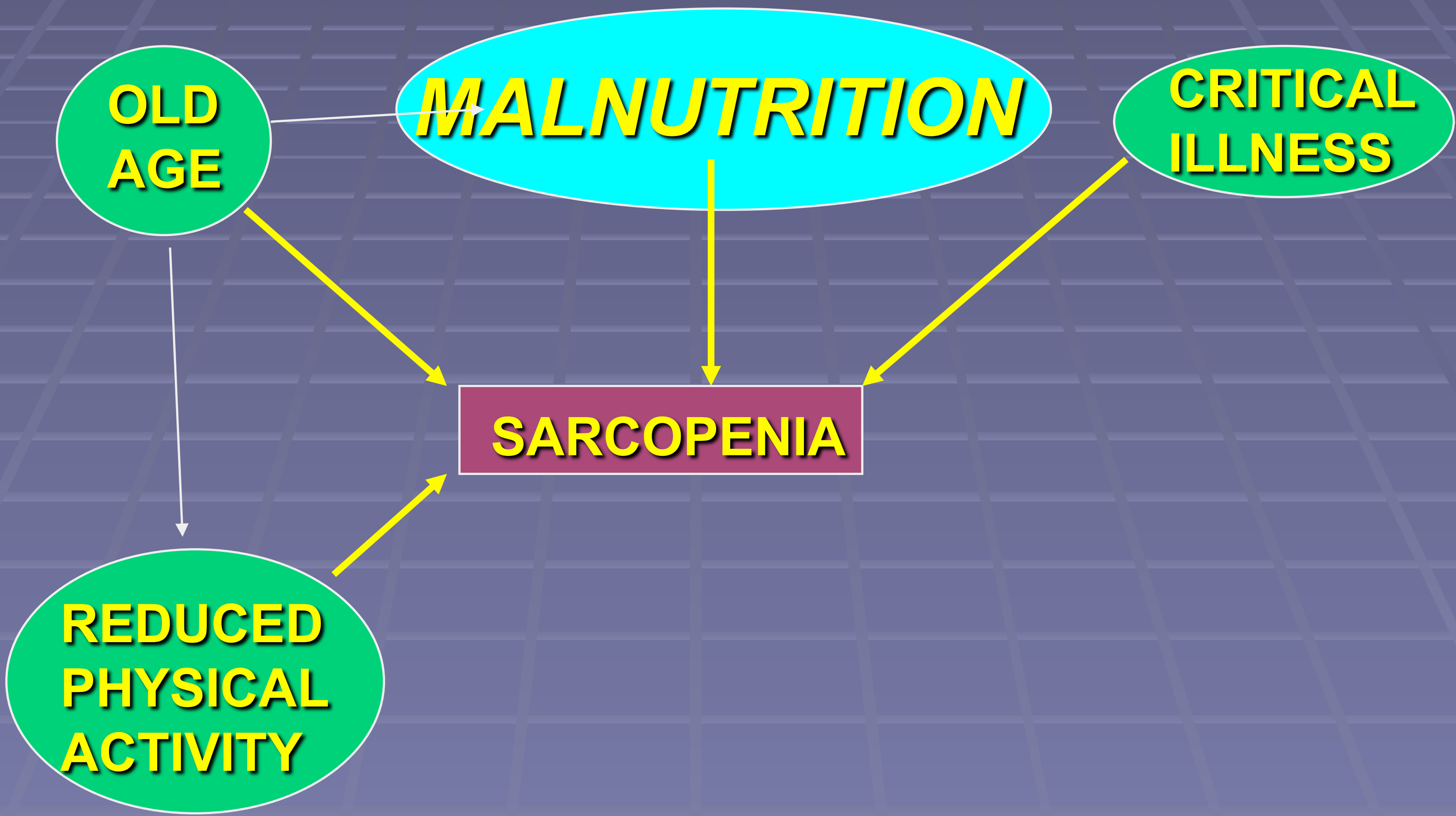
- How to preserve muscular mass and function?

Exercise

Nutrition

- Energy
- Proteins
- Water-electrolytes
- Micronutriments

THE PROBLEM



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HOW MUCH PROTEINS?

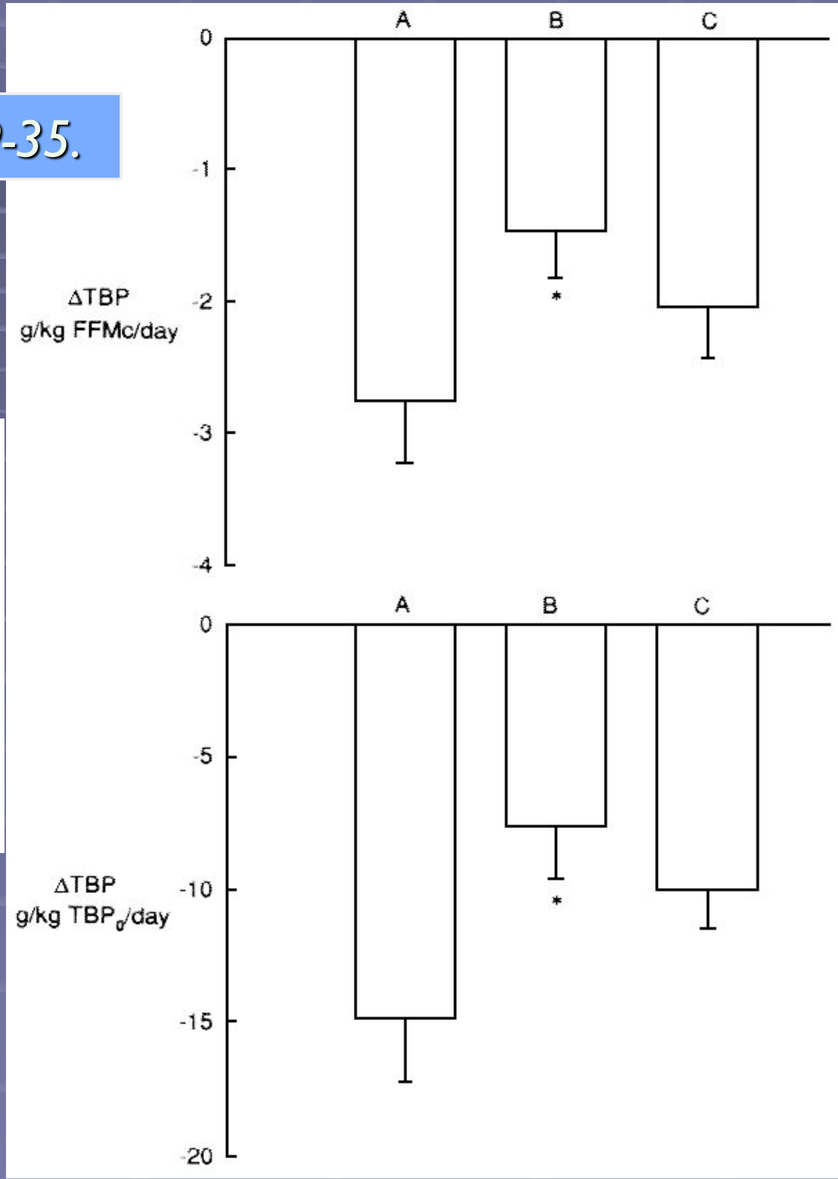
HOW MUCH PROTEINS?

Ishibashi N, et al. Crit Care Med 1998; 26: 1529-35.

Patient Group	Protein (g/kg/day)	Dextrose (kcal/kg/day)	Lipid (kcal/kg/day)	Nonprotein Calorie Intake (kcal/kg/day)
A (n = 7)	1.14 ± 0.13[a,b]	18.3 ± 2.1	8.9 ± 7.9	27.3 ± 8.2
B (n = 8)	1.47 ± 0.11[b]	20.4 ± 1.4[c]	7.0 ± 5.4	27.4 ± 5.4
C (n = 8)	1.86 ± 0.14[b]	24.7 ± 2.3[c]	6.6 ± 3.4	31.3 ± 2.5
p^d	<.001	<.001	NS	NS

[a]Mean ± SD; [b]$p < .001$ for all pairwise comparisons; [c]$p < .001$ for comparison with group A; [d] analysis of variance.

ΔTBP : loss of Total body protein (in vivo neutron Activation)



What do we want to do?

- To give the required amount of calories and nitrogen and micronutrients
  - 20-25 non-protein kcal / kg.d
  - 1-1.5 g proteins / kg.d
  - Cal/N ratio < 150
  - Trace elements
  - Vitamins
- To protect gut function and to prevent gut atrophy
  - Early enteral feeding

Positive energy balance is associated with accelerated muscle atrophy and increased erythrocyte glutathione turnover during 5 wk of bed rest[1–3]

Gianni Biolo, Francesco Agostini, Bostjan Simunic, Mariella Sturma, Lucio Torelli, Jean Charles Preiser, Ginette Deby-Dupont, Paolo Magni, Felice Strollo, Pietro di Prampero, Gianfranco Guarnieri, Igor B Mekjavic, Rado Pišot, and Marco V Narici

Am J Clin Nutr 2008;88:950–8.

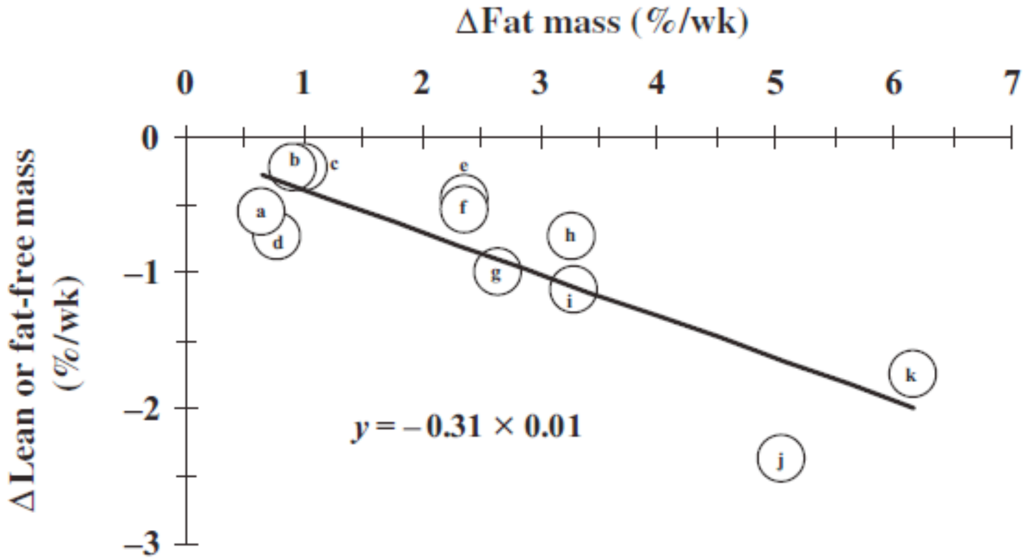
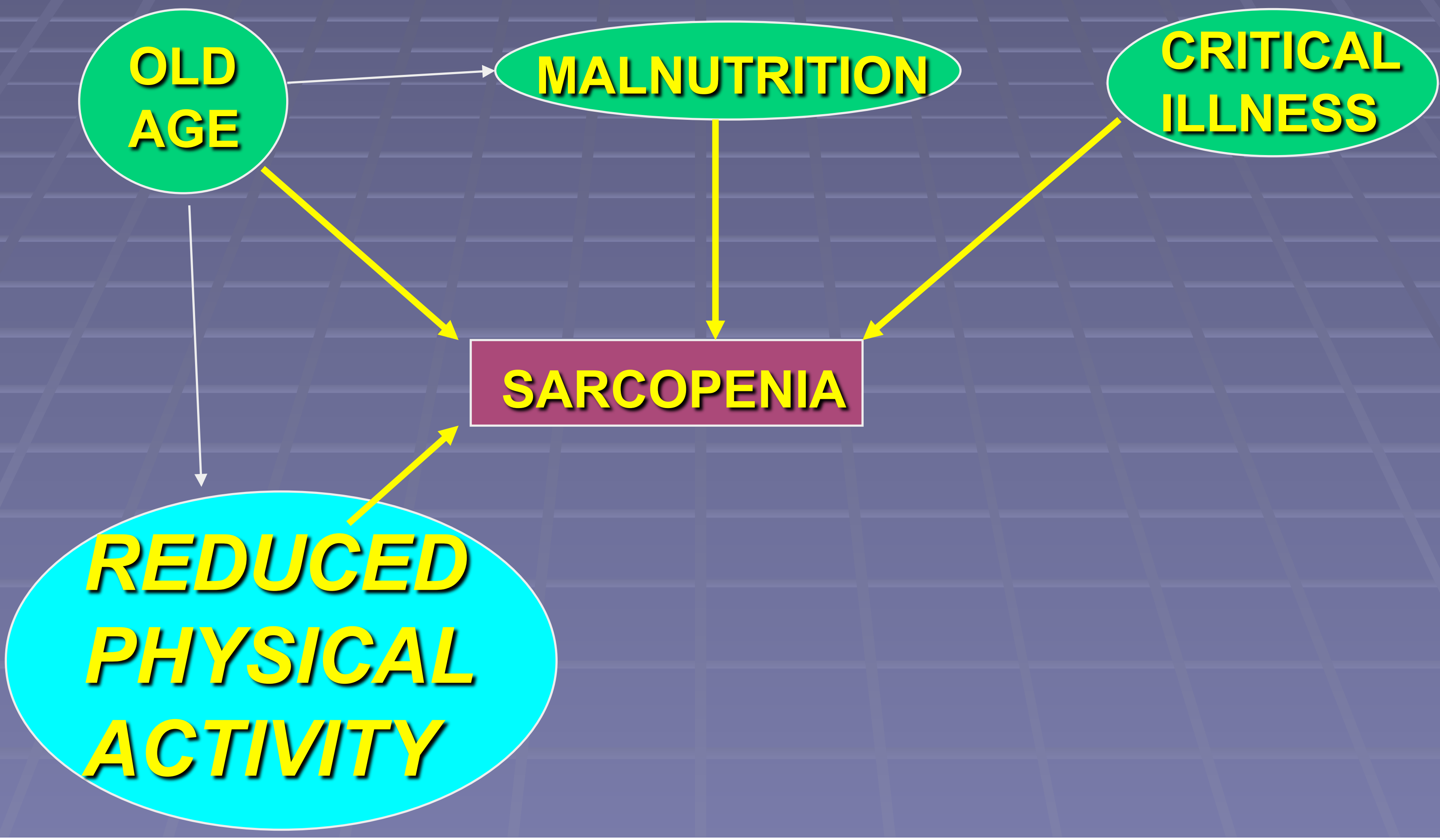


FIGURE 2. Relation between average values of absolute changes in fat mass and lean mass (by dual-energy X-ray absorptiometry) or fat-free mass (by bioelectrical impedance analysis) in previous studies and in the present study. Letters inside (or just outside of) circles represent values from these studies: a, Barbe et al (10); b, Scheld et al (13); c, Stein et al (12); d, present study, lower-energy-balance group; e, Blanc et al (6); f, Krebs et al (7); g, Lovejoy et al (11); h, Gretebeck et al (8); i, present study, higher-energy-balance group; j, Ferrando et al (9); and k, Olsen et al (5). $r = -0.85$, $P = 0.001$; $n = 11$.

THE PROBLEM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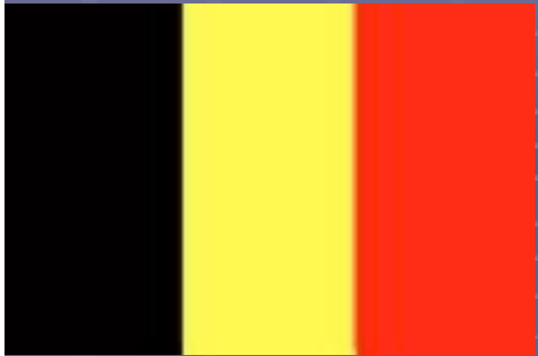


Passive mobilisation

De Prato et al NCM 2008 (abstract)

Thirty minutes of Passive mobilisation - cycling (20 rpm) 2x/day

WORKING HYPOTHESIS OF THE STUDY

Is passive physical activity able

- to decrease the loss in muscle proteins (nitrogen balance and 3-MH/creatinine ratio)?
- to influence muscle mass (anthropometric)?
- to influence muscle function (electrophysiology)?

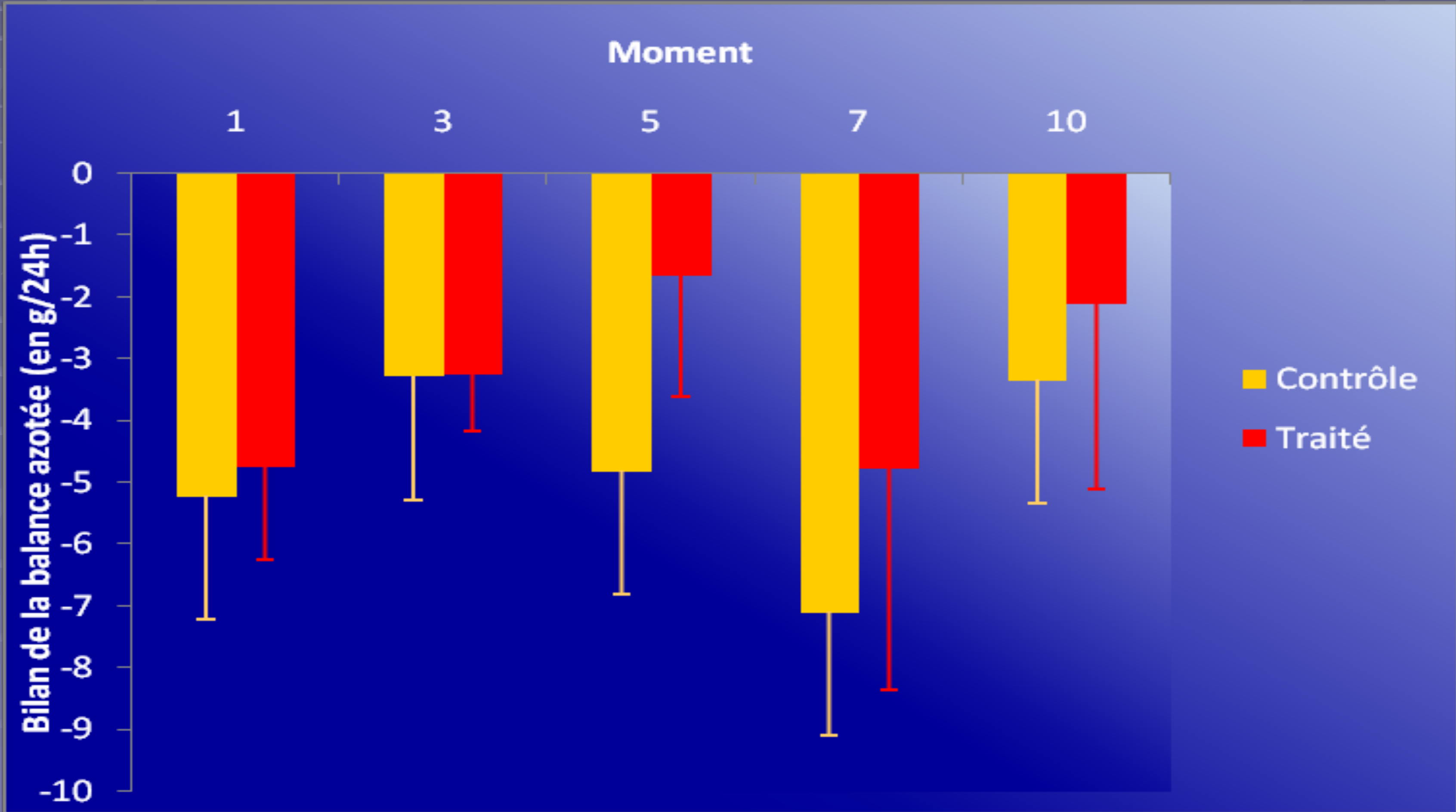
INCLUSION CRITERIA

- Coma or sedation anticipated for > 10 days
- Hemodynamic stability
- No contra-indication to passive mobilisation

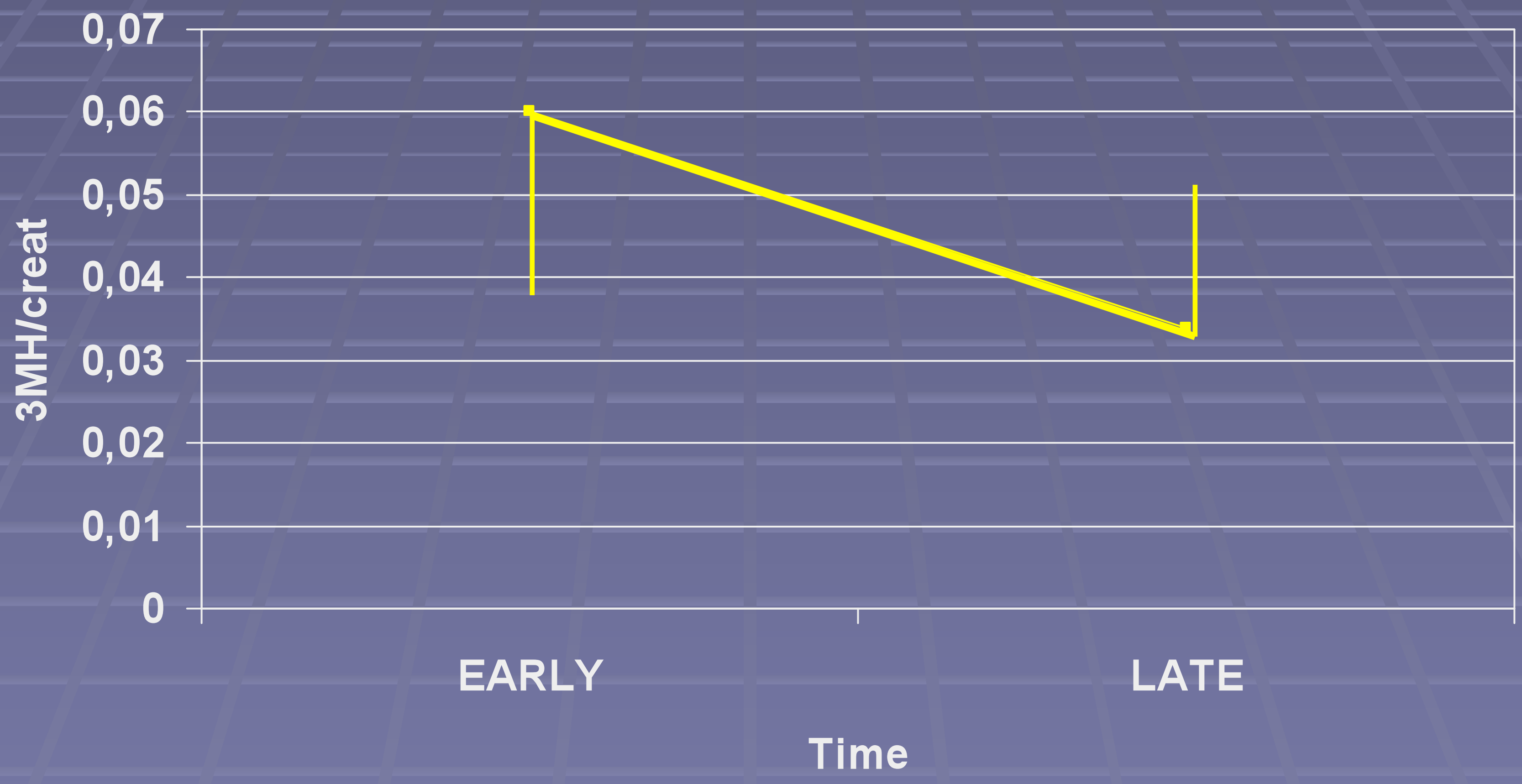
STUDY POPULATION

	Control	Bicycle
n	8	7
Mean age	67	64
M/F	5/3	3/4
Mean Cal / prot /d	1400/56	1368/55

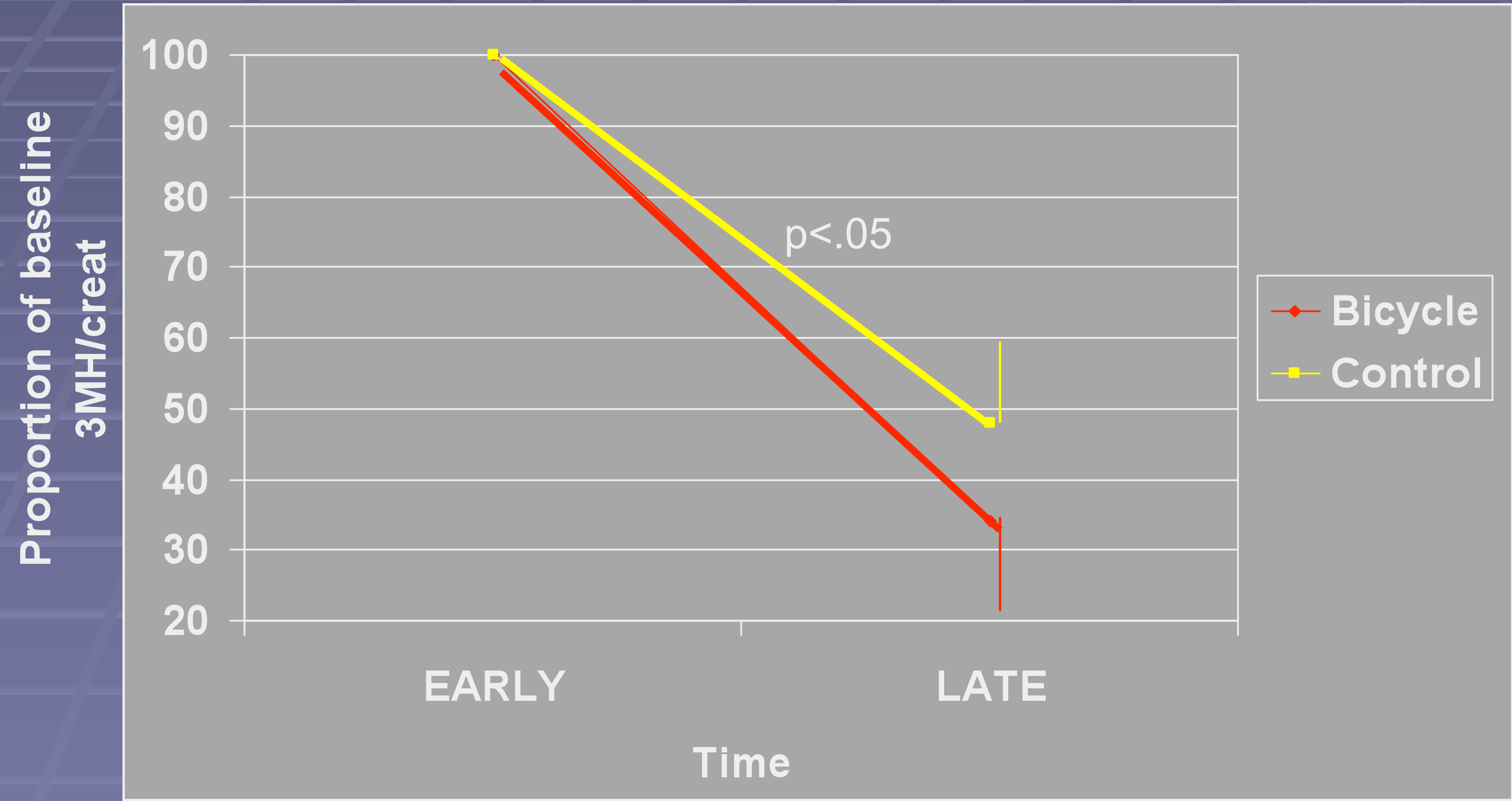
Nitrogen balance



Slow decrease of muscle catabolism over time



Effects of exercise on muscle protein catabolism



Anthropometrical data

		Control	Bicycle
D1	**R calf**	41,82 (2.48)	38,36 (2.65)
	L calf	42,09 (2.49)	38,28 (2.66)
	R leg	31,01 (1.60)	30,41 (1.70)
	L leg	31,74 (1.77)	30,11 (1.89)
D10	**R calf**	41,59 (2.31)	37,48 (2.47)
	L calf	41,46 (2.28)	37,61 (2.44)
	R leg	30,42 (1.80)	29,80 (1.47)
	L leg	29,99 (1.38)	30,03 (1.47)

Early exercise in critically ill patients enhances short-term functional recovery*

Chris Burtin, PT, MSc; Beatrix Clerckx, PT; Christophe Robbeets, PT; Patrick Ferdinande, MD, PhD; Daniel Langer, PT, MSc; Thierry Troosters, PT, PhD; Greet Hermans, MD; Marc Decramer, MD, PhD; Rik Gosselink, PT, PhD

Crit Care Med 2009; 37:2499

Measurements and Main Results: All outcome data are reflective for survivors. Quadriceps force and functional status were assessed at intensive care unit discharge and hospital discharge. Six-minute walking distance was measured at hospital discharge. No adverse events were identified during and immediately after the exercise training. At intensive care unit discharge, quadriceps force and functional status were not different between groups. At hospital discharge, 6-min walking distance, isometric quadriceps force, and the subjective feeling of functional well-being (as measured with "Physical Functioning" item of the Short Form 36 Health Survey questionnaire) were significantly higher in the treatment group ($p < .05$).

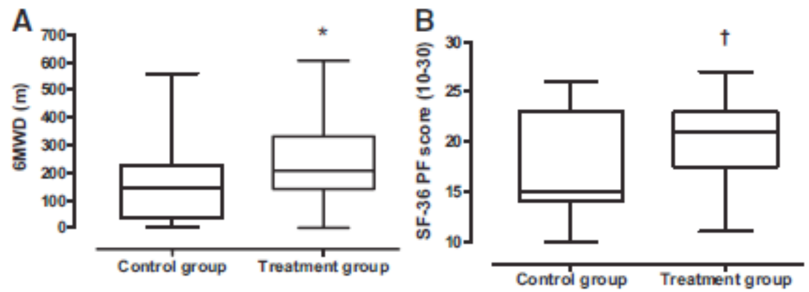


Figure 3. *A*, *Boxplot* of 6MWD at hospital discharge. *6MWD*, 6-min walking distance. $*p < .05$ compared with control group. *B*, *Boxplot* of SF-36 PF score at hospital discharge. *SF-36 PF*, "Physical Function" item of Short Form 36 Health Survey Questionnaire. $\dagger p < .01$ compared with control group.

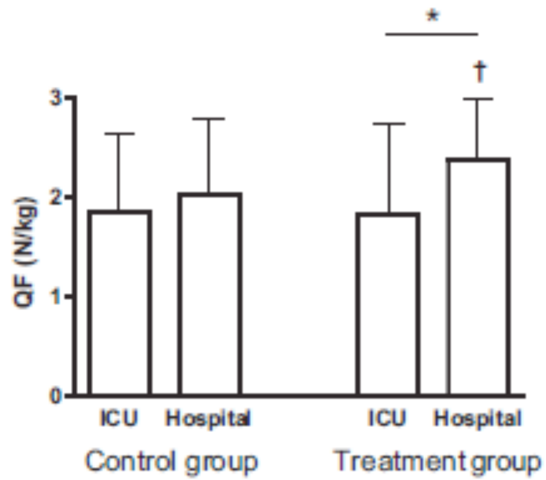
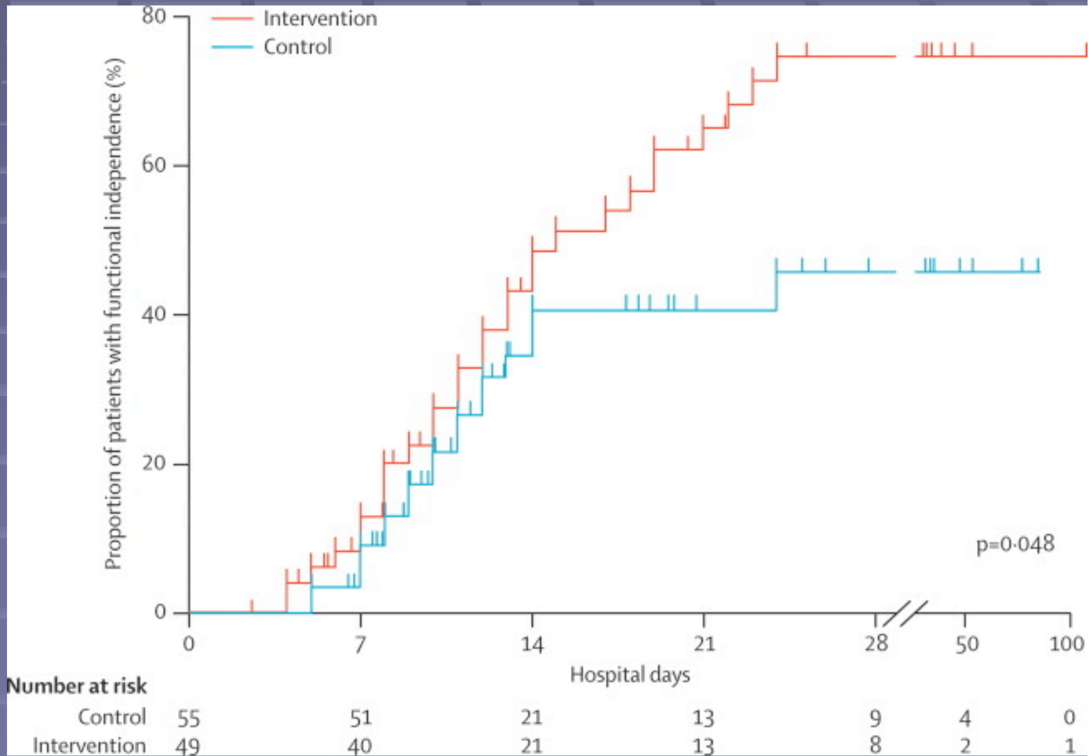


Figure 4. Isometric quadriceps force at intensive care unit (*ICU*) discharge and at hospital discharge. Data are presented as mean and standard deviation. *QF*, quadriceps force; *hospital*, day of hospital discharge. $*p < .01$ between ICU and hospital discharge; $\dagger p < .05$ compared with control group.

Early physical and occupational therapy in mechanically ventilated, critically ill patients.

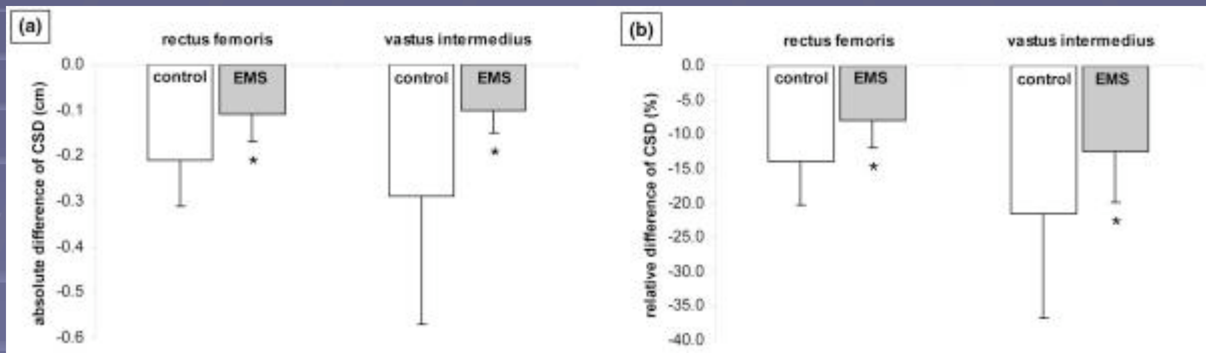
Schweickert WD Lancet 2009;373:1874

Sedated adults (>/=18 years of age) in the ICU who had been on mechanical ventilation for less than 72 h, were eligible for enrolment in this randomised controlled trial We randomly assigned 104 patients to early exercise and mobilisation (physical and occupational therapy) during periods of daily interruption of sedation (intervention; n=49) or to daily interruption of sedation with therapy as ordered by the primary care team (control; n=55). The primary endpoint was the number of patients returning to independent functional status at hospital discharge-was defined as the ability to perform six activities of daily living and the ability to walk independently.



Electrical muscle stimulation preserves the muscle mass of critically ill patients

Gerovasili Crit Care 2009;13:R161

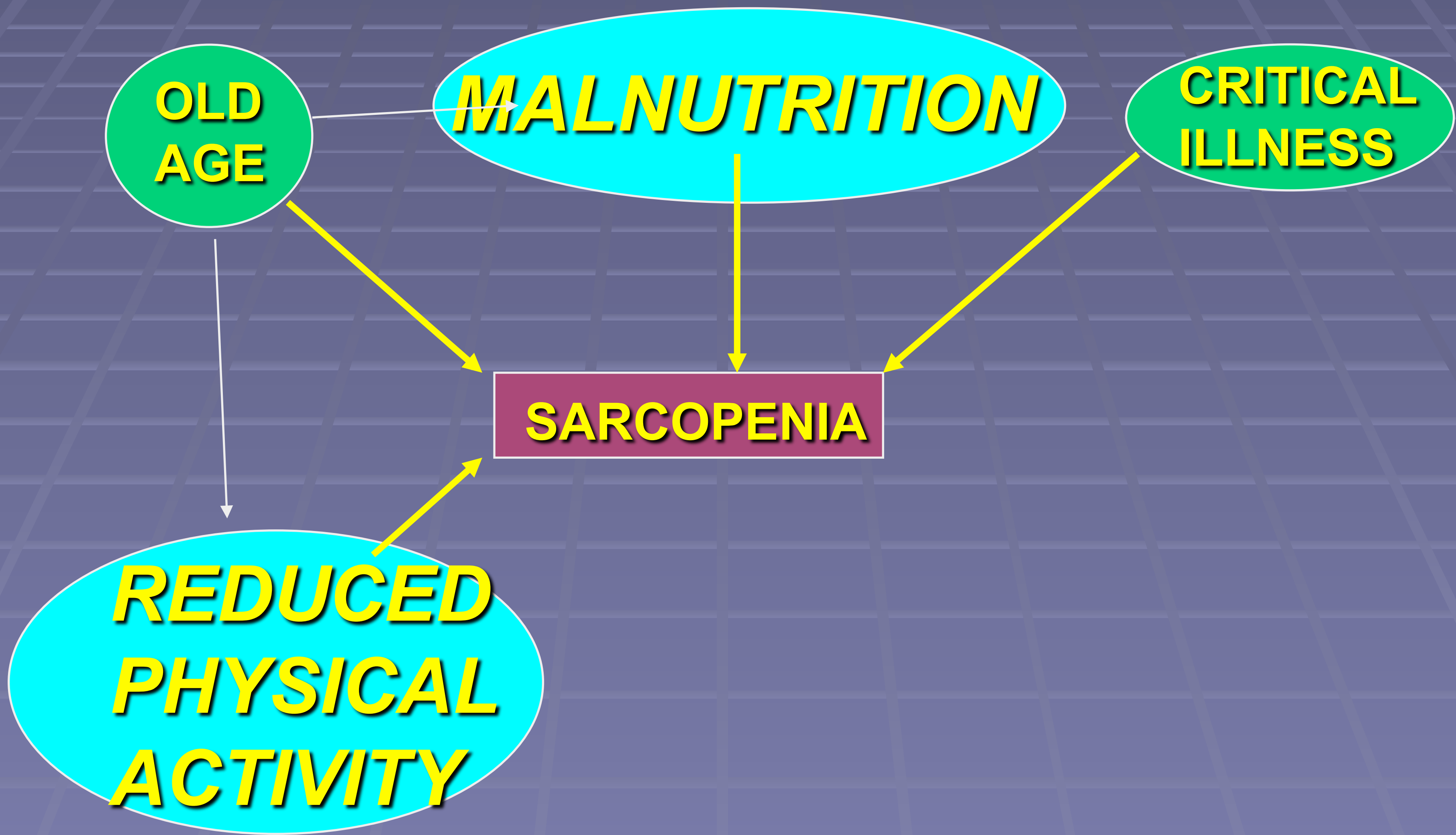


Forty-nine critically ill patients (age: 59 +/- 21 years) with an APACHE II admission score >or=13 were randomly assigned after stratification upon admission to receive daily EMS sessions of both lower extremities (EMS-group) or to the control group (control group). Muscle mass was evaluated with US, by measuring the cross sectional diameter (CSD) of the vastus intermedius and the rectus femoris of the quadriceps muscle.

Case report

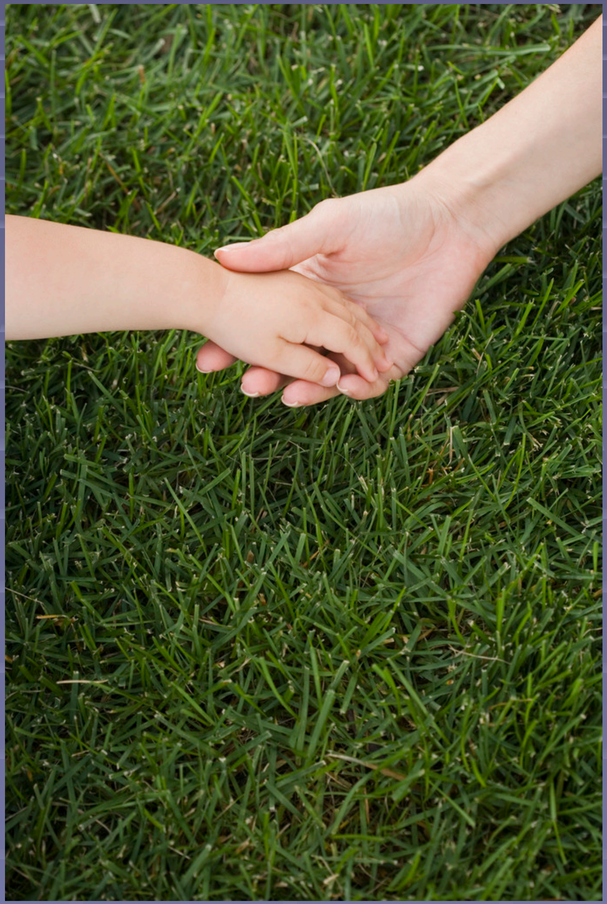
Needham JAMA 2008;300:1685

THE WAY TO A SOLUTION



Conclusion

Exercise



Nutrition

THE ICU – STEPDOWN UNIT OF THE FUTURE??

30th Annual Meeting of the Belgian Soc of Intensive Care Medicine December 3, Palais des Congrès – Liège

Endocrinology, Metabolism and Nutrition

Endocrinology in the ICU

- Endocrine alterations in the critically ill (G Van den Berghe)
- Adrenal failure in the ICU (D Mesotten)
- Current status of the ACTH test (J Groeneveld Amsterdam)
- Steroid supplementation : for which patients? (D Annane Garches)
- Safe anabolic strategies (J Takala Bern)

Metabolic changes of critical illness

- Use of substrates (M Singer London)
- Insulin resistance (S Weber-Carstens Berlin)
- Promising metabolic substrates : lactate and friends (X Leverve Paris)
- Glucose control in the ICU (JC Preiser)

Nutrition in the ICU

- Permissive underfeeding or early caloric intake adapted to match energy expenditure (R Thibault - Nantes)
- Recent lipid formulations for the critically ill (Y Carpentier Brussels)
- Optimal protein intake (J Wernerman Stockholm)
- Specialised nutrients (R Griffiths Liverpool)
- How to apply guidelines at bedside? (V Fraipont Liege)

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VVKVM
Vlaamse Vereniging voor Klinische Voeding en Metabolisme

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