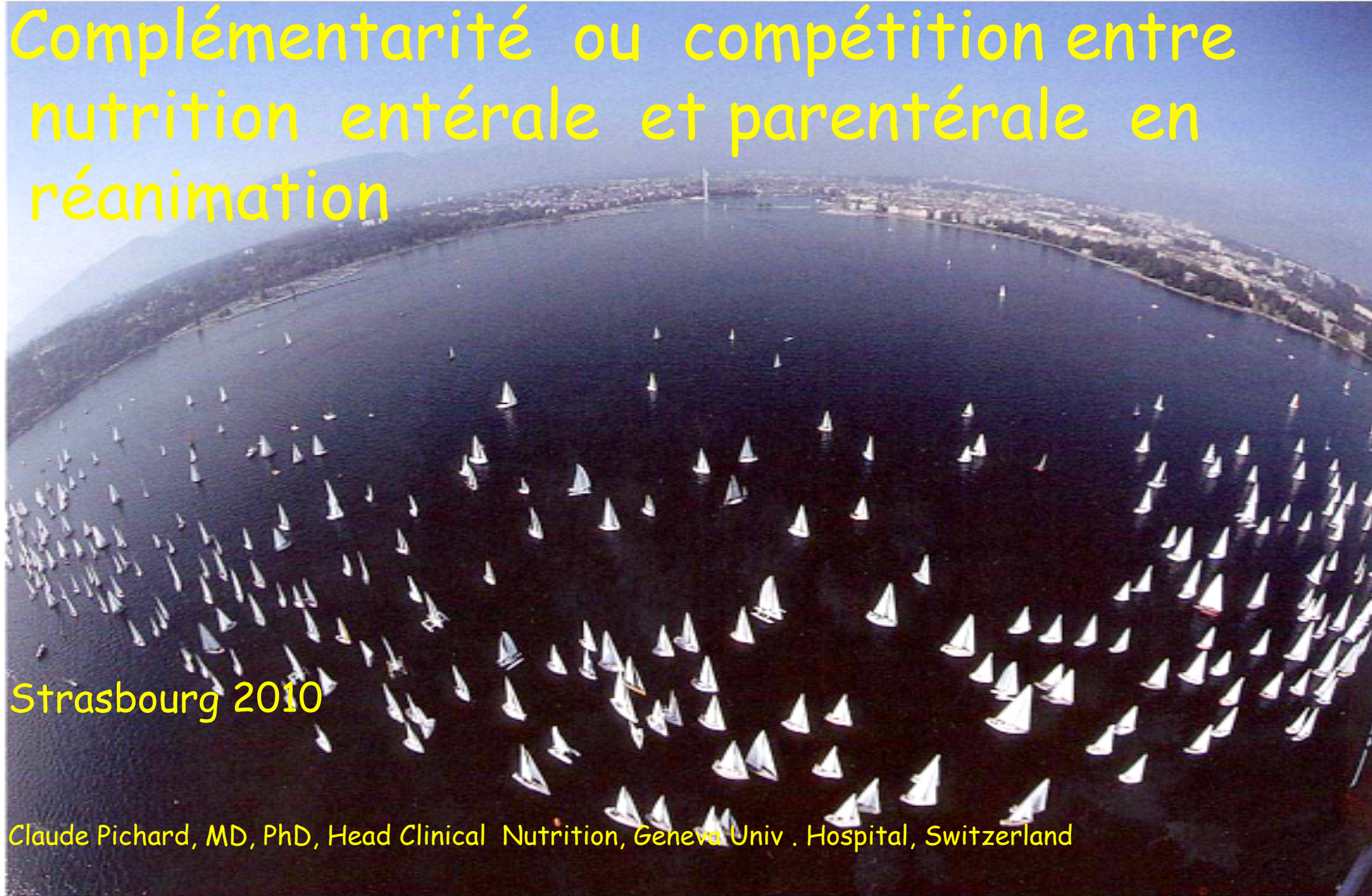


Complémentarité ou compétition entre nutrition entérale et parentérale en réanimation

Strasbourg 2010

Claude Pichard, MD, PhD, Head Clinical Nutrition, Geneva Univ. Hospital, Switzerland



MESSAGES

1. Nutrition hypocalorique / différée :
évolution clinique défavorable
1. Nutrition entérale (NE) -> apports énergétiques
suboptimaux
2. NE + Nutrition parentérale complémentaire : plus
favorable que NE seule

A photograph of a patient lying in a hospital bed, surrounded by various medical machines and equipment. The patient is covered with a white blanket and has a nasal cannula. The room is filled with medical devices, including monitors, IV stands with bags, and other specialized equipment. The text "Rationale For Feeding" is overlaid in large yellow letters on the right side of the image.

Rationale For Feeding

Prevalence of
Malnutrition
Is
HIGH

Prevalence of Malnutrition at Hospital Admission

All %	Schindler	2010	21007	27	
	Stratton	2006	9722	28	
Medicine	Kyle	2005	1707	51	
	Pichard	2004	996	46	
	Wyszynski	2003	1000	48	
	Waitzberg		200		
		4000	48		
		Kyle	2001	995	38
		Larsson	1993	38	
			29	46	
		Willard	1990	200	32
		Coats	1983	228	38
		McWhirter		199	
		300	45		
	Robinson	1987	100	56	

STRESS & CATABOLISM

≥ 7 - 14 g nitrogen / d.

≥ 220 - 440 g lean tissue / d.

Weight loss
(%)

Protein loss *
(%)

5

11.2 - 16.8

10

15.2 - 20.8

15

19.2 - 24.8

20

23.0 - 29.0

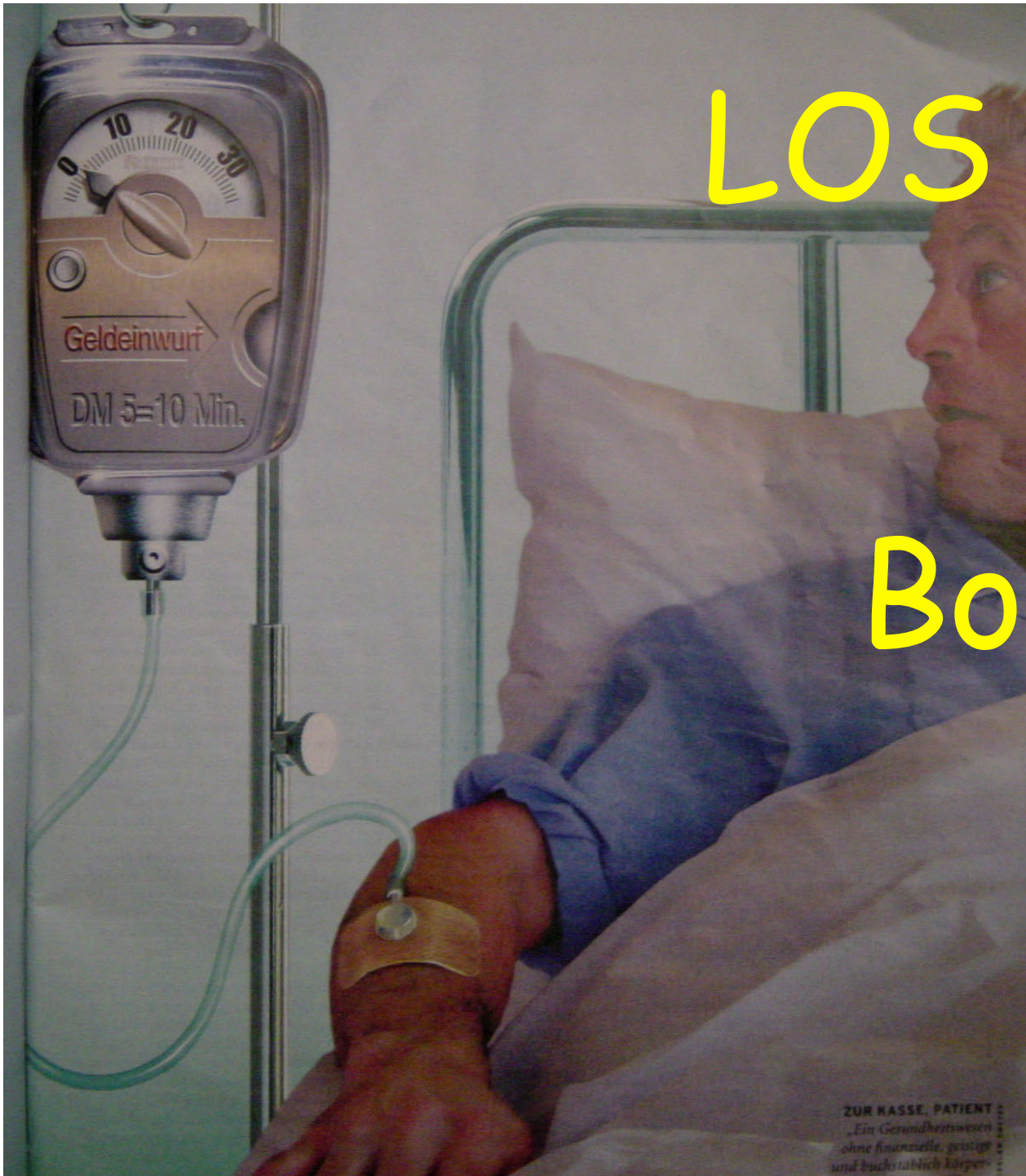
25

26.8 - 33.2

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

Energy deficit promotes
protein catabolism





LOS increases

If

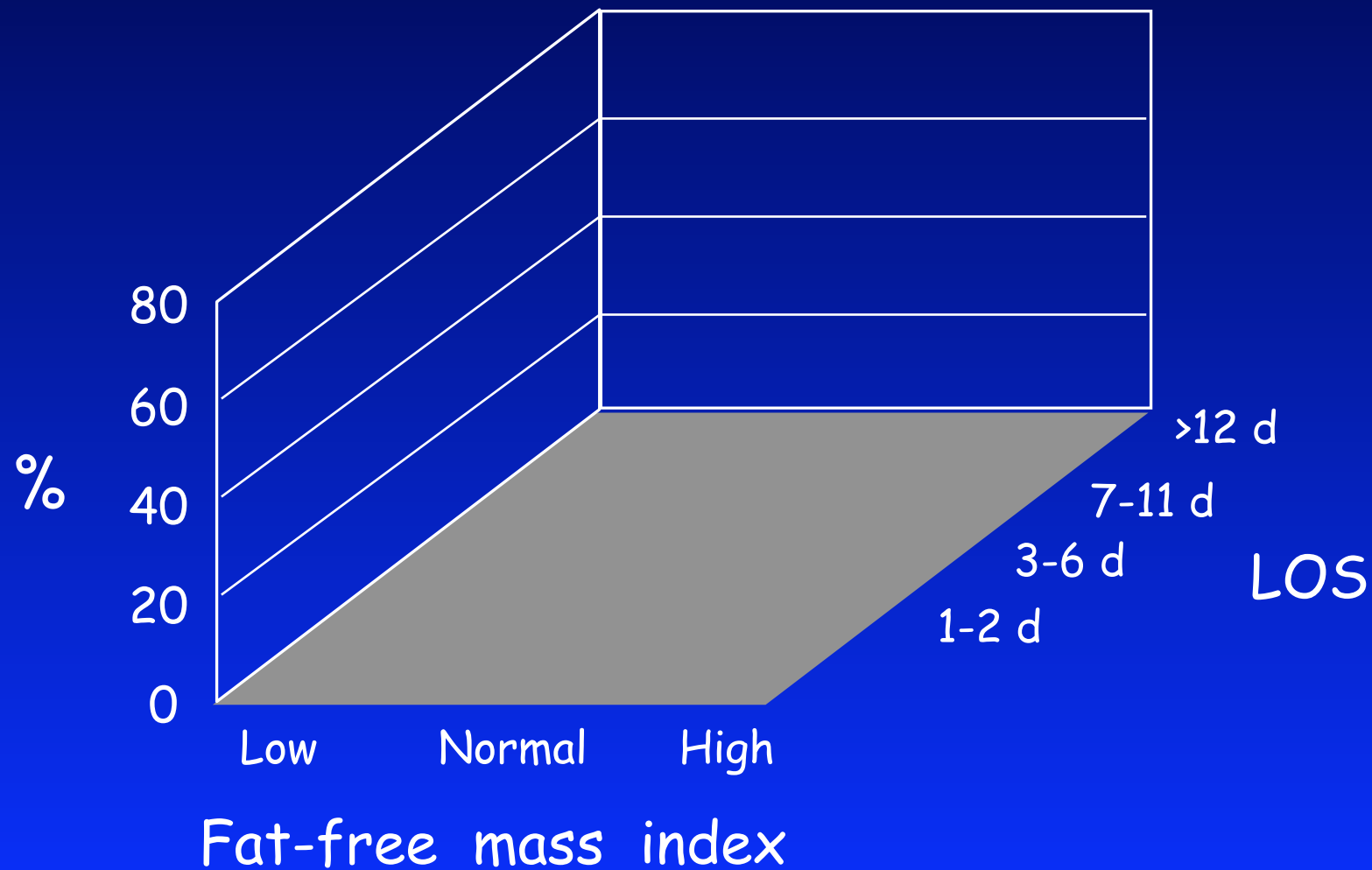
Body protein

Reserves

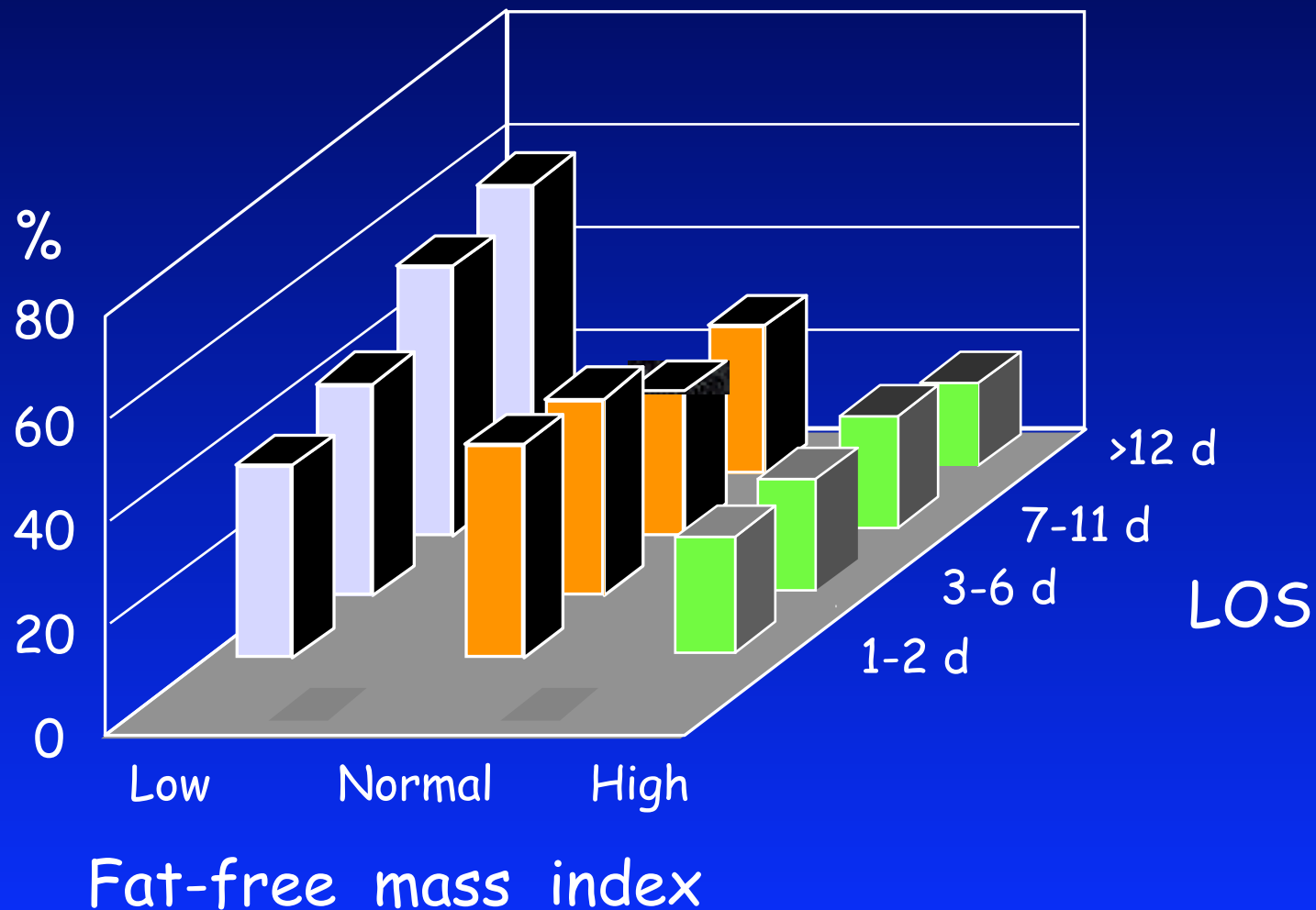
decrease

ZUR KASSE, PATIENT
„Ein Gesundheitswesen
ohne finanzielle, geistige
und buchstäblich Körper“

Fat-Free Mass Index at hospital admission is associated with
Increased LOS : a prospective controlled population study
(N = 996) Pichard C et al. Am J Clin Nutr 79, 2004: 613-8



Fat-Free Mass Index at hospital admission is associated with
Increased LOS : a prospective controlled population study
(N = 996) Pichard C et al. Am J Clin Nutr 79, 2004: 613-8



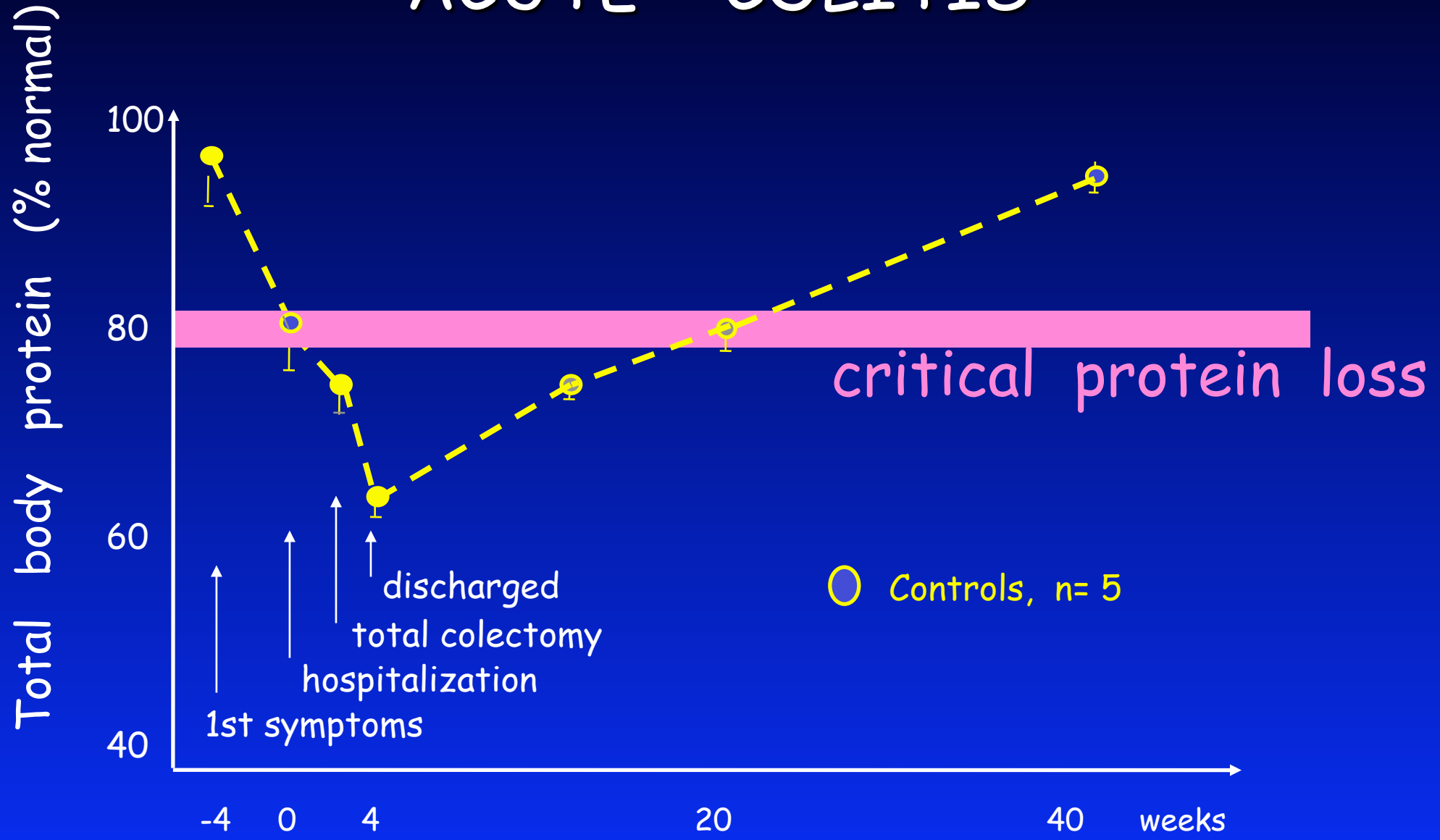
Fat-Free Mass Index at hospital admission is associated with
Increased LOS : a prospective controlled population study
(N = 996) Pichard C et al. Am J Surg 2004; 188: 613-8

Loss of Lean Mass
Is
a critical factor

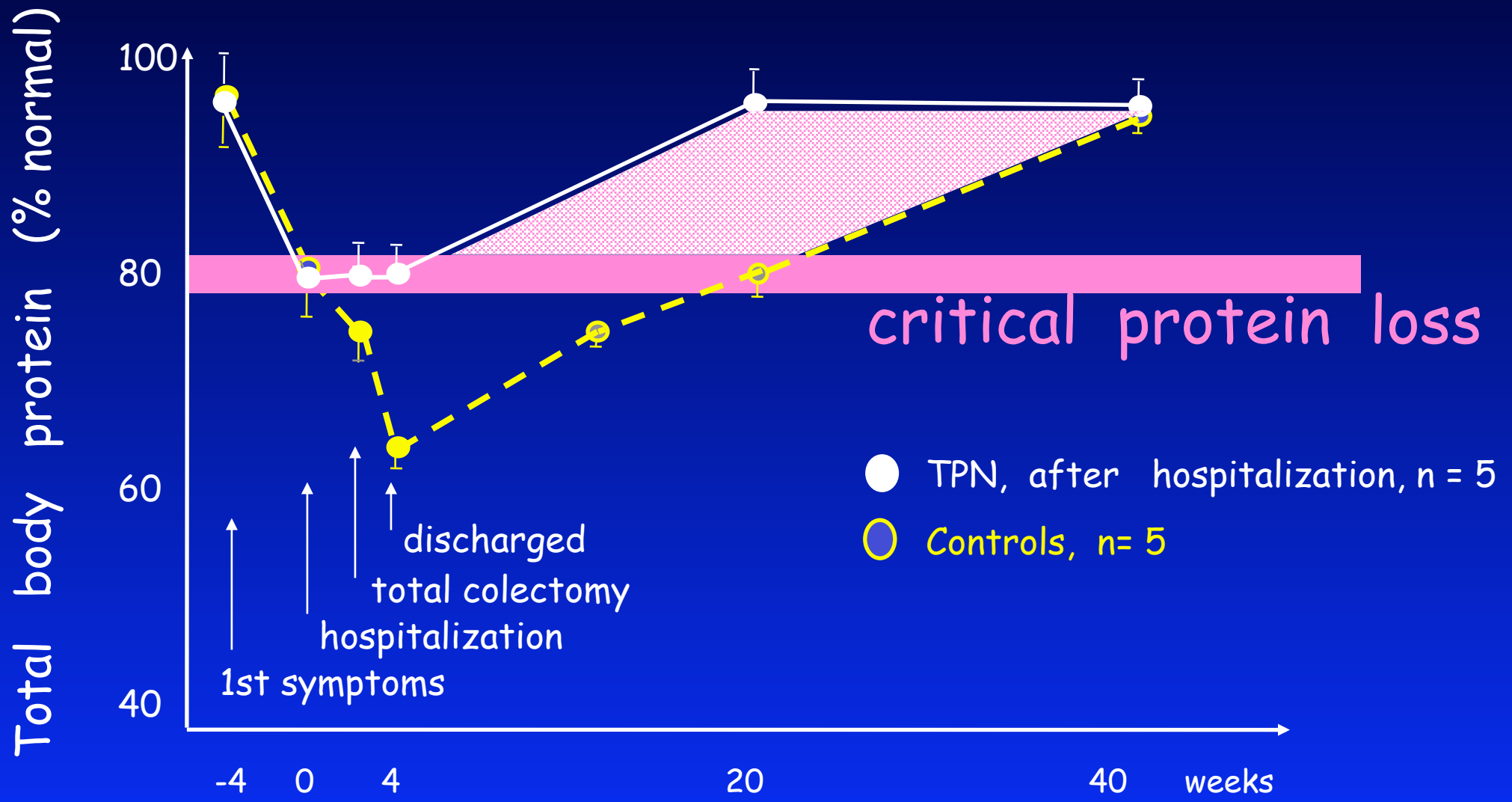


Length of stay: low vs. normal FFM
3 - 6 d : OR 3.8, CI 1.6 - 8.9
≥ 12 d : OR 5.6, CI 3.1-10.4

ACUTE COLITIS



ACUTE COLITIS



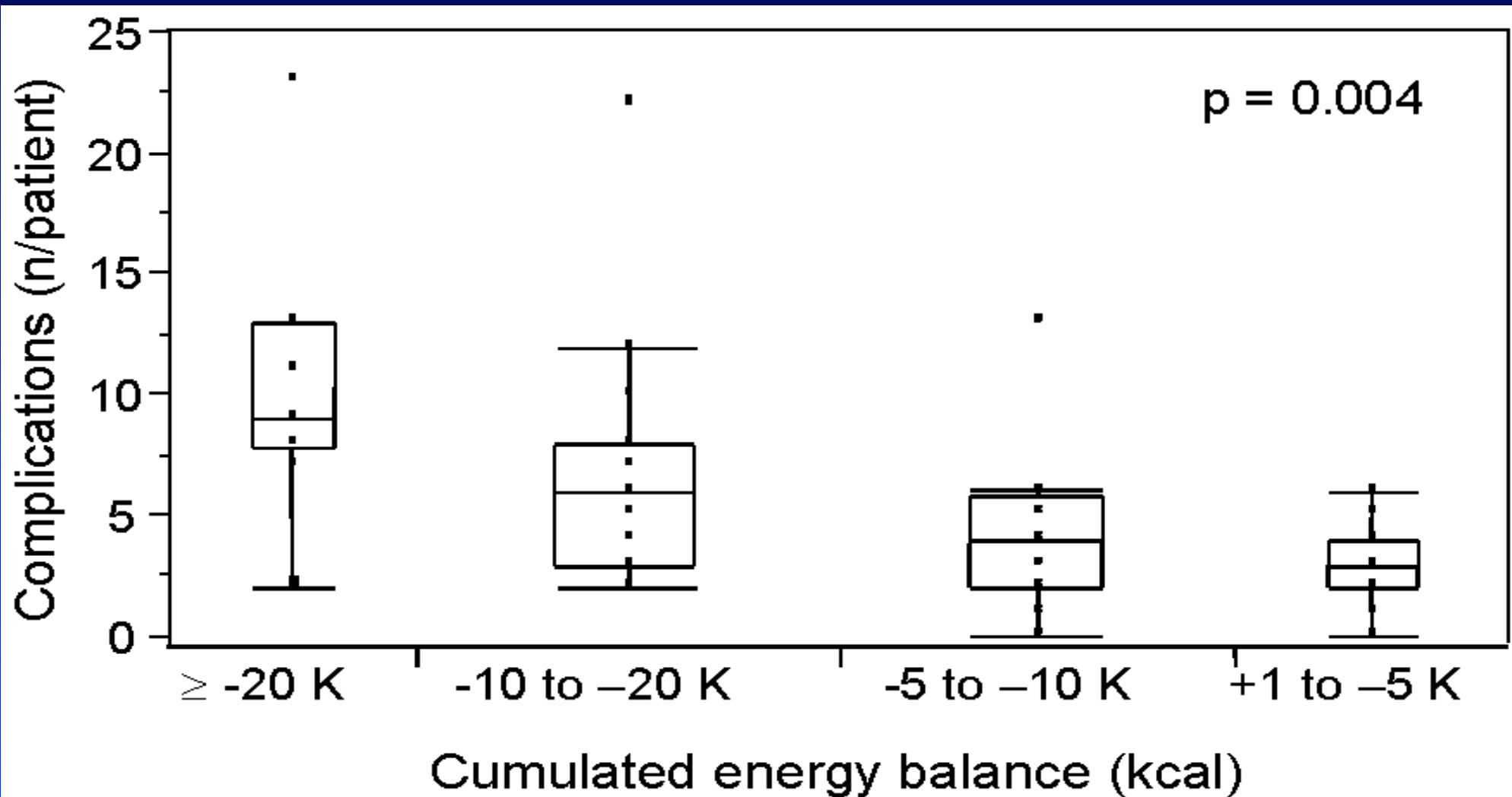
Hypocaloric feeding Prolongs



ICU stay

Impact of hypocaloric feeding on ICU outcome

Villet et al, Clin Nutr 2005, 24: 502





EN

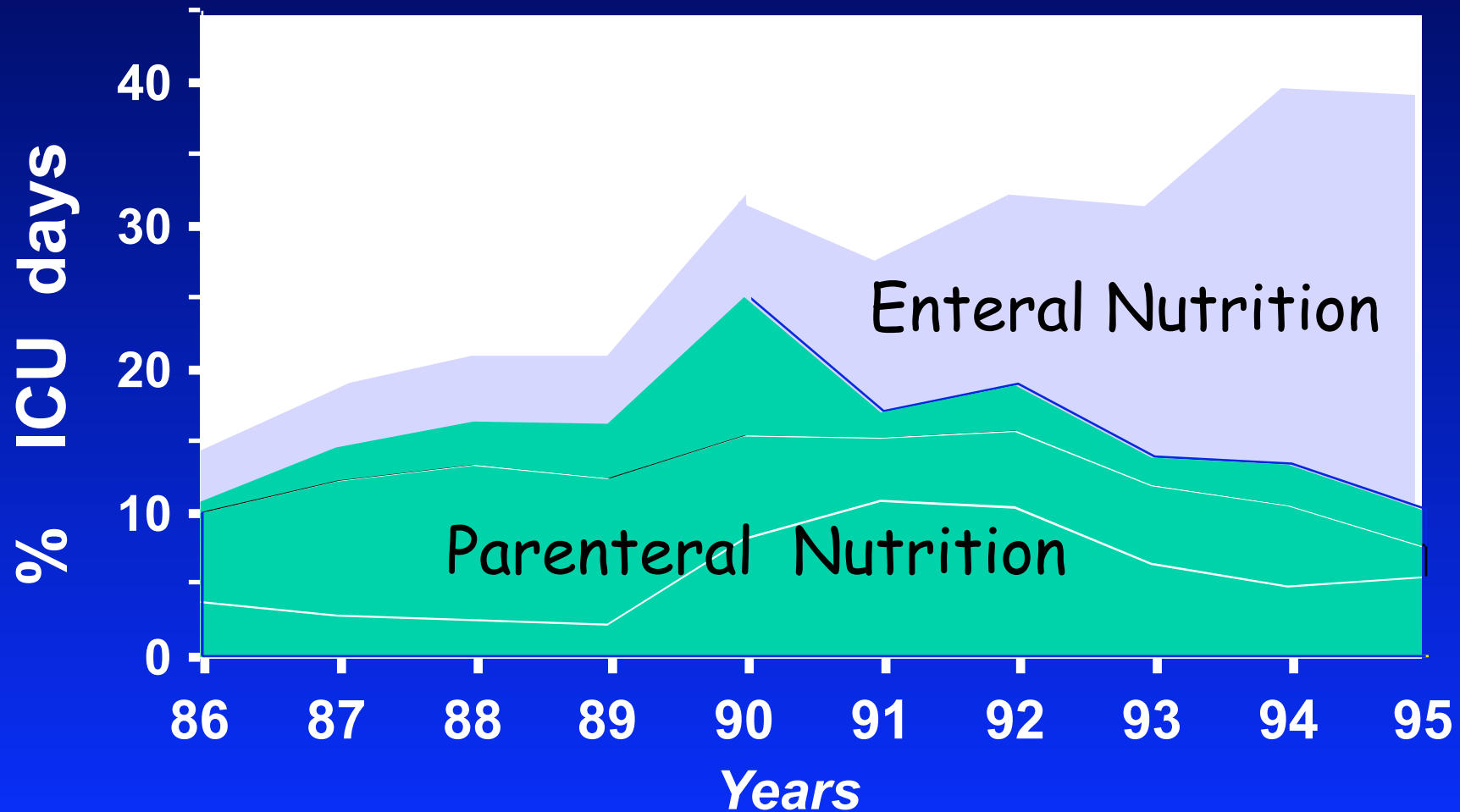
« Better »

than

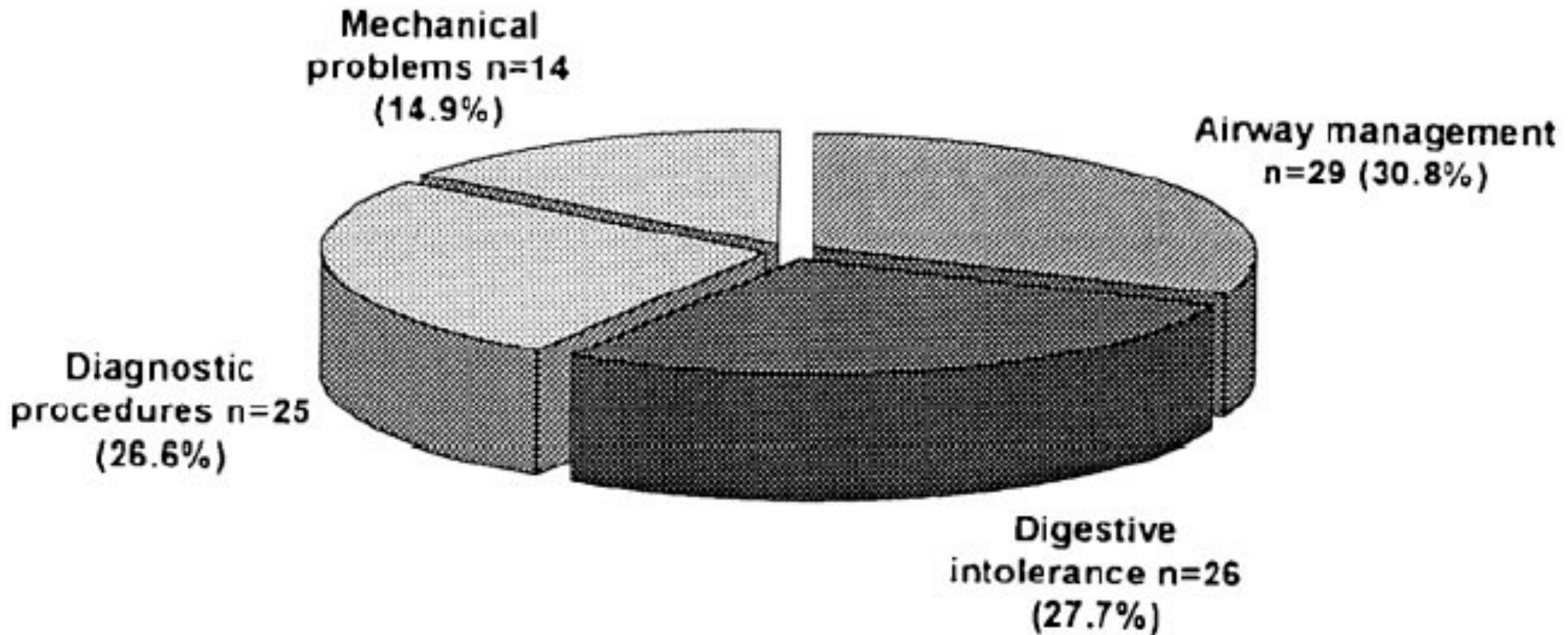
PN

A 10-year survey of nutritional support in a surgical ICU : 1986-1995

Berger M. et al. Nutrition 1997: 13, 870-7



Feeding interruption for various reasons



... 58 % of ICU patients included in an enteral feeding protocol achieved their target ...

Infusion protocol improves delivery of enteral tube feeding in ICU

Spain DA et al. JPEN 1999, 23: 288-292

... Out of 494 ICU patients, < 30% reached 70% of their protein needs ...

Higher calorie prescriptions improves nutrients delivery during the first 5 days of enteral nutrition

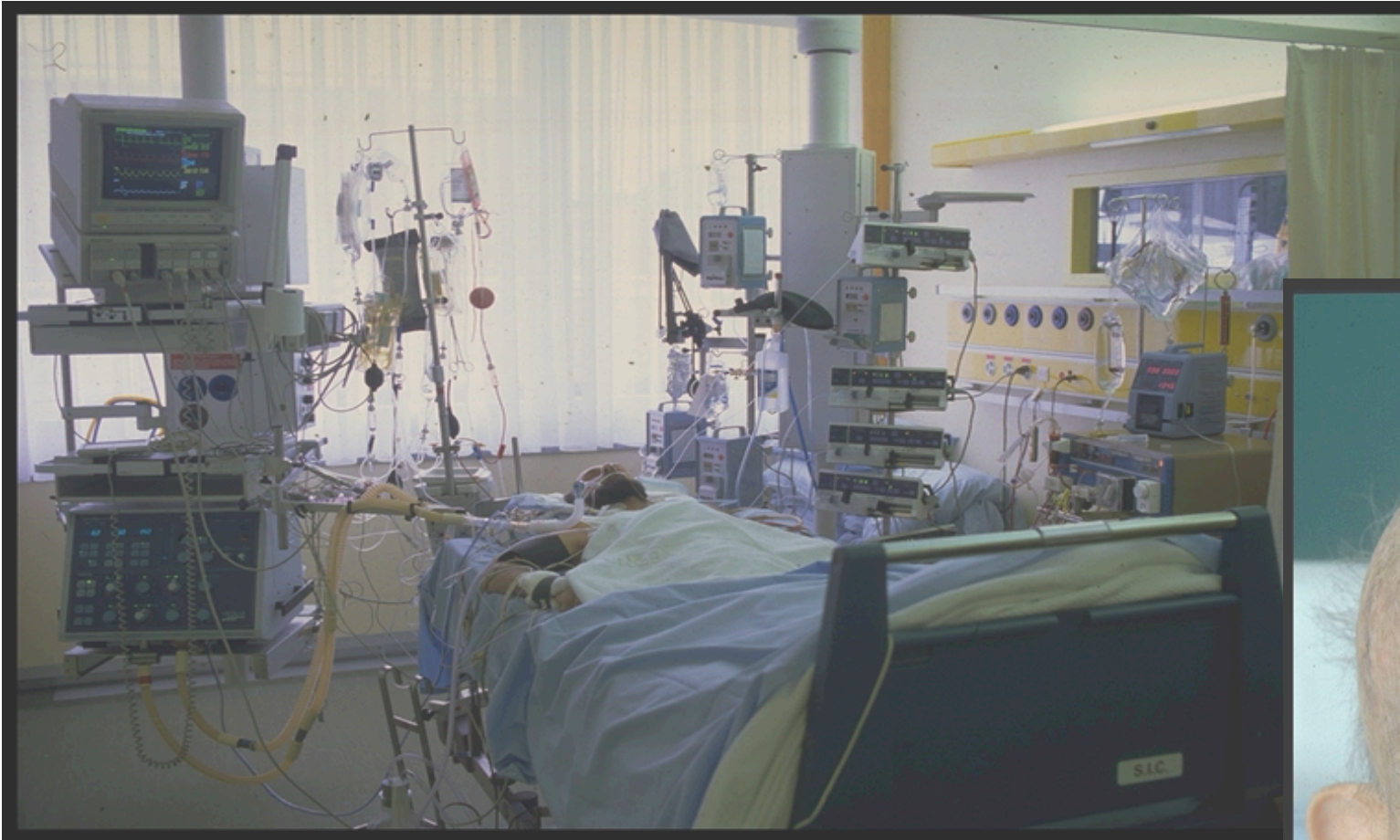
Genton L et al. Clin Nutr 2004; 23: 307-315

Enteral nutrition



in

ICU



Ageing

Intensity,
chronicity...



ICU :

How can we optimize

nutritional needs

coverage ?

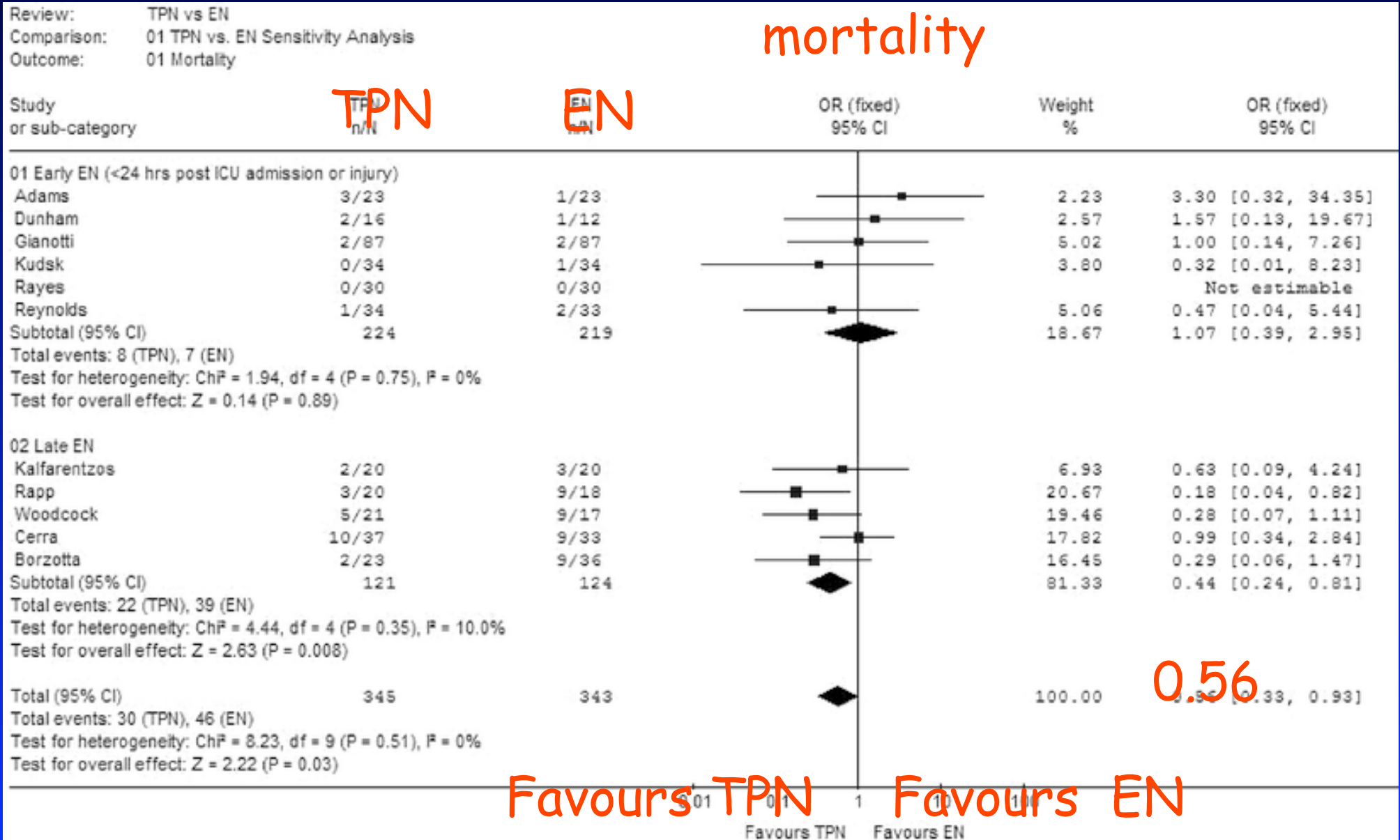
Parenteral vs. Enteral nutrition in the critically ill patient: a meta-analysis of trials using the intention to treat principle

Simpson F, Doig GS. *Int Care Med* 2005;31: 12-23

465 publications, 9 trials with complete follow-up ->
ITT analysis

Parenteral vs. Enteral nutrition in the critically ill patient: A meta-analysis of trials using the intention to treat principle

Simpson F, Doig GS. *Int Care Med* 2005;31: 12-23



Parenteral vs. Enteral nutrition in the critically ill patient: a meta-analysis of trials using the intention to treat principle

Simpson F, Doig GS. Int Care Med 2005;31: 12-23

465 publications, 9 trials with complete follow-up -> ITT analysis

- Reduced mortality associated with PN use.
- Bias: early TPN vs. delayed EN.
- Despite an association with increased infectious complications, a grade B+ evidence-based recommendation -> PN if EN cannot be initiated within 24 h of ICU admission or injury.



Guidelines

ESPEN Guidelines on Enteral Nutrition: Intensive Care

Kreymann K. G. et al.

Clin Nutr 2006, 25: 245-59.

Free at: www.espen.org

ESPEN



EUROPEAN
SOCIETY OF
PARENTERAL
AND ENTERAL
NUTRITION





ESPEN Guidelines on Enteral Nutrition: Intensive Care

Kreymann, K. G. et al. Clin Nutr 2006, 25: 245-59.

1. EN should be given to all ICU patients not expected to be taking a full oral diet within 3d.
2. Initiate EN within the first 24 h.



ESPEN Guidelines on Enteral Nutrition: Intensive Care

Kreymann, K. G. et al. Clin Nutr 2006, 25: 245-59.

3. Initial acute phase : max. 20-25 kcal/kg BW/d

Then, 25-30 kcal/kg BW/d.

4. Supplemental TPN, only if target nutrient

intake not possible by EN alone

Guidelines

ESPEN Guidelines Parenteral Nutrition: Intensive Care

Singer P. et al.

Clin Nutr 2009, 28: 387-400.

Free at: www.espen.org

ESPEN



EUROPEAN
SOCIETY OF
PARENTERAL
AND ENTERAL
NUTRITION





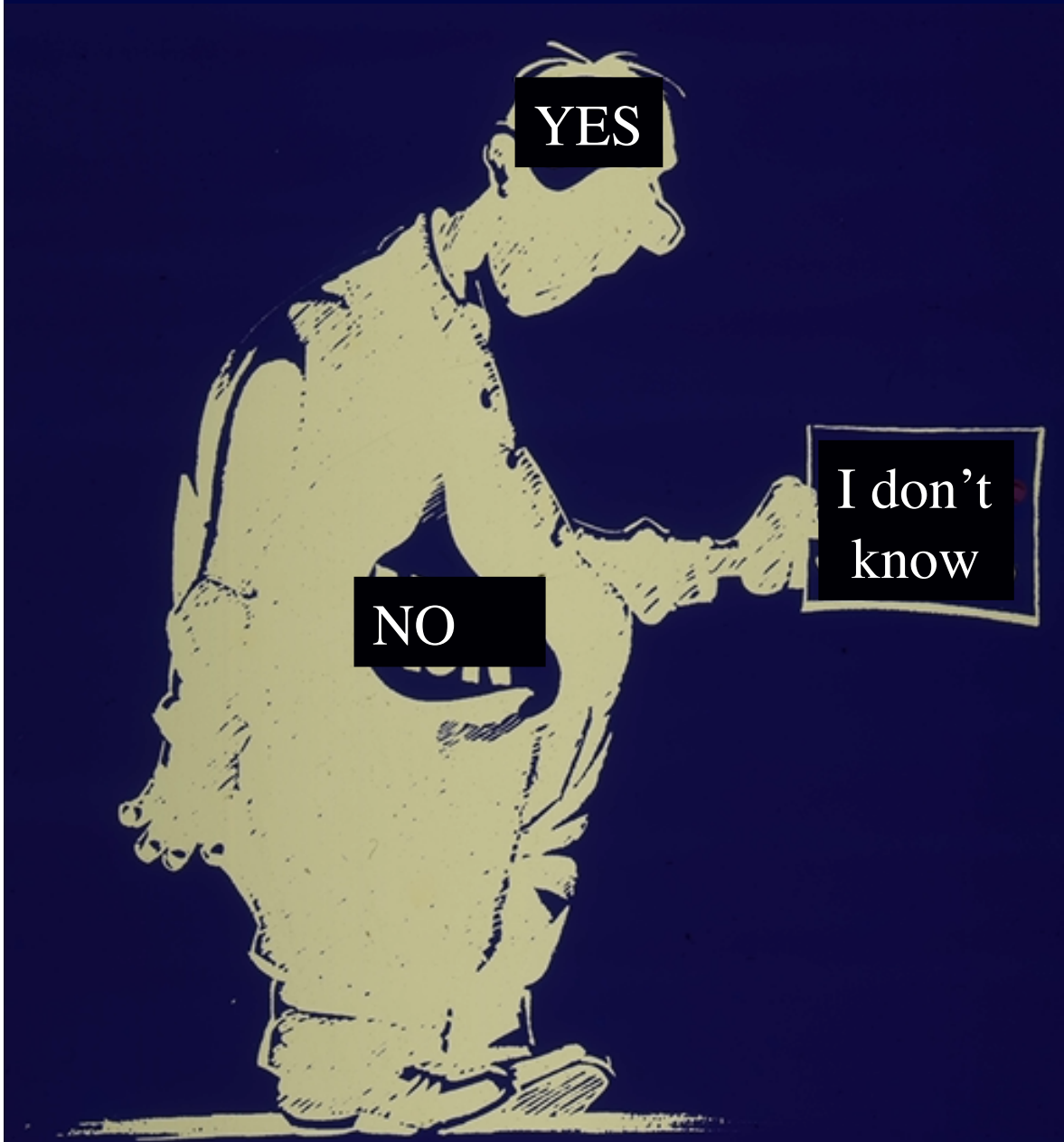
ESPEN Guidelines on Parenteral Nutrition: Intensive Care

Singer P. et al. Clin Nutr 2009, 28: 387-400

3. Patients should be fed because starvation or underfeeding in ICU patients is associated with increased morbidity and mortality.

4. All patients who are not expected to be on normal nutrition within 3 days should receive PN within 24 to 48 h if EN is contraindicated or if they cannot tolerate EN.

Enteral Nutrition (EN)

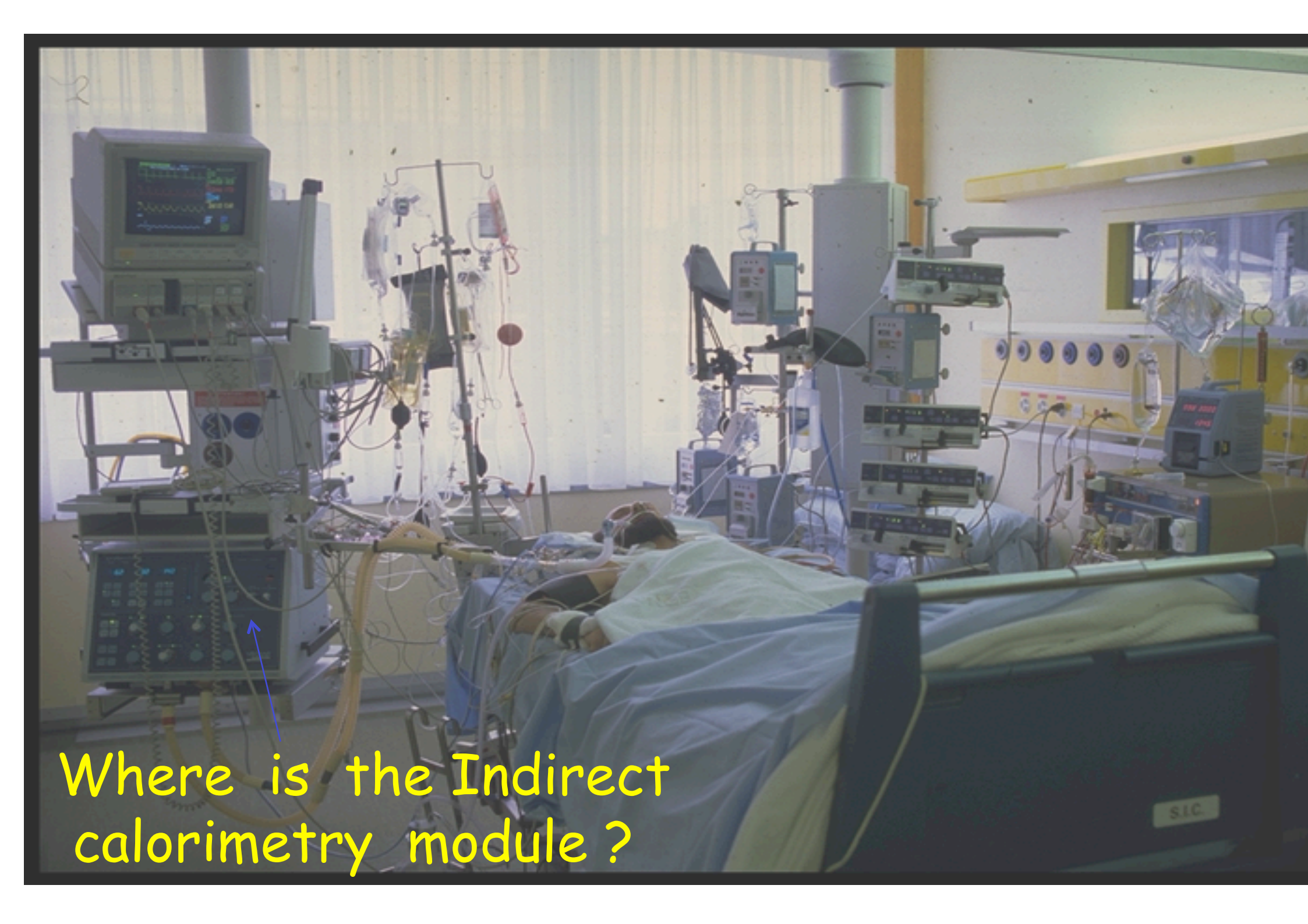


+
Supplemental
Parenteral
Nutrition :
Better
than
EN alone

ICU :

Energy is critical !

2



Where is the Indirect calorimetry module ?

Energy supply level correlates with ICU mortality : A multicentre study in 1209 patients

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²Critical Care, Universitätsklinikum Eppendorf, Hamburg

³General Surgery, Klinikum St. Georg, Leipzig

⁴Anesthesiology, Emergency Critical Care, Universitätsklinikum Göttingen, Göttingen

⁵Baxter GmbH, Medical Affairs, Munich, Germany

⁶HealthEcon AG, HealthEcon AG, Basel, Switzerland

HYPOTHESIS

„early“ nutrition

(> 1500 kcal within the first 3 days)

is associated with a better clinical outcome (reduced mortality and morbidity) than

„late“ nutrition

(< 1500 kcal within the first 3 days).

METHOD

- Recruitment : 3548 patients (ICU cost analysis study)
14 ICUs of 9 German University Hospitals
- Extraction : 1209 ICU patients with
 - LOS > 4 d.
 - enteral or parenteral nutrition, and/or iv energy
- Stratification
 - > 1500 kcal / 3 first d. = « early »
 - < 1500 kcal / 3 first d. = « late »

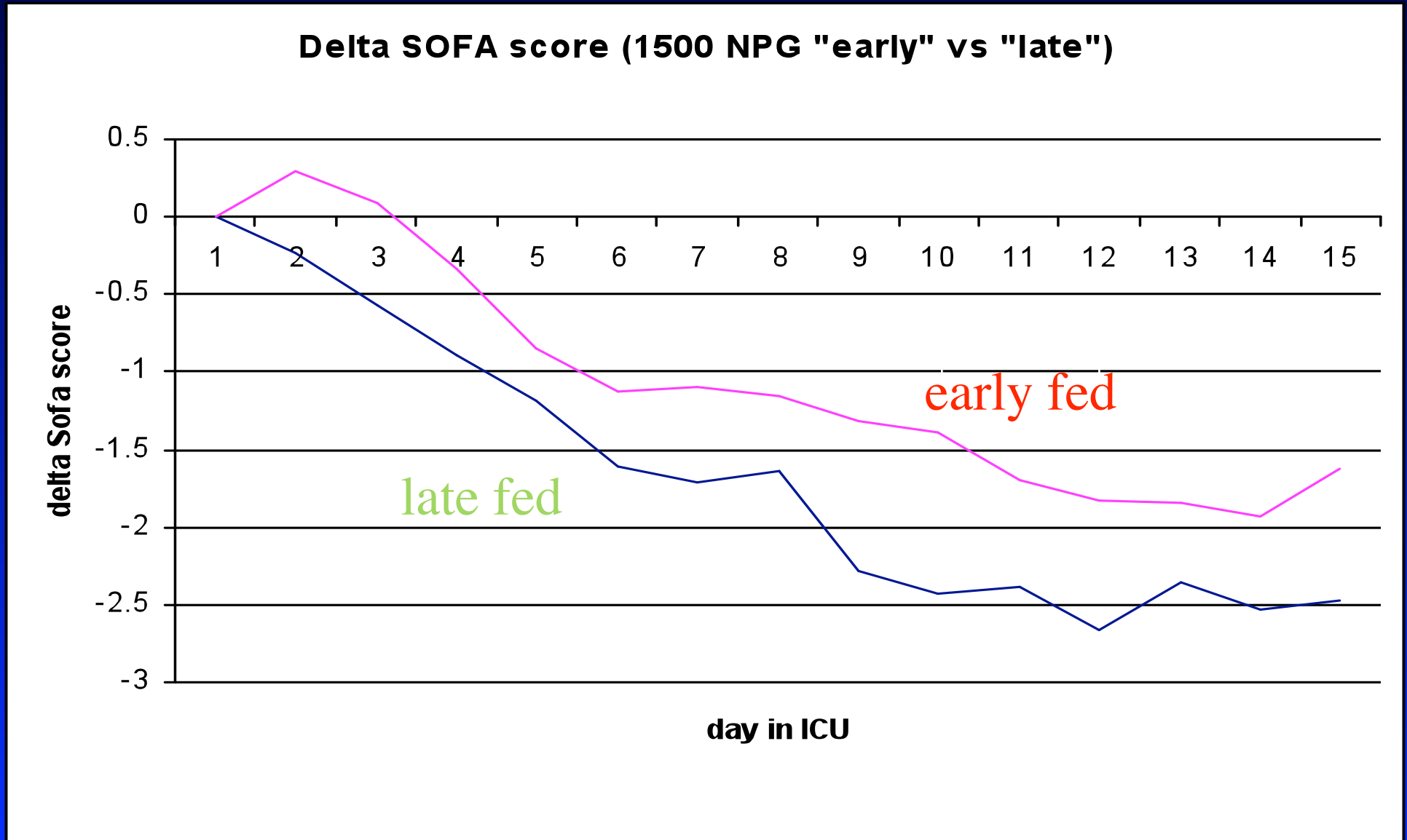
RESULTS (NPG)

		Early N =374	Late N =835	p value
Age	(x± SD)	59.3 ± 17.2	61.2 ± 17.5	0.07
gender	(m/f)	235/139	525/307	0.2
mortality ICU	(%)	50 (13.4%)	155 (18.6)	0.026
mortality hospital	(%)	70 (18.7%)	202 (24.2%)	0.035
LOS ICU	x±SD (median)	13.8±12.5 (9.1)	13.3±11.4 (9)	0.49
LOS hospital	x±SD (median)	33.4±34.0 (25)	32.2±26.7 (26)	0.52
sepsis	n (%)	92 (24.6%)	250 (29.9%)	0.056
acute kidney failure	n (%)	38 (10%)	120 (14.4%)	0.044
mechanical ventilation	(x± SD)	10.3 ± 10.5 (7)	9.5 ± 10.0 (6)	0.22
NPG kcal/days 1-3	(x± SD)	2732±1136	499±458	<0.001

Early feeding: >1500 NPG kcal on days 1-3 / late feeding: <1500 NPG kcal on days 1-3

Delta SOFA score over ICU length of stay:

→ statistically significant from days 2 - 11



RESULTS (NPG)

cut off Energy kcal	n early	n late	ICU mortality Early n (%)	ICU mortality Late n (%)	p-value	Odds Ratio
1600	342	867	45 (13.2)	160 (18.5)	0.027	1.494
1500	374	835	50 (13.4)	155 (18.6)	0.026	1.477
1400	400	809	54 (13.5)	151 (18.7)	0.024	1.470
1300	439	770	57 (13.0)	148 (19.3)	0.005	1.601
1200	463	746	63 (13.6)	142 (19.0)	0.014	1.492
1100	495	714	70 (14.1)	135 (18.9)	0.030	1.416
1000	538	671	79 (14.7)	126 (18.8)	0.059	1.343
900	571	638	86 (15.1)	119 (18.7)	0.097	1.293
800	607	602	97 (16.0)	108 (17.9)	0.36	1.149
600	689	520	110 (16.0)	95 (18.3)	0.29	1.176

CONCLUSION

The supply of nutrition at an "early" time in the ICU (~ 1100 -1600 NGP kcals / first 3 days) plays a decisive role in lowering mortality.

CONCLUSION

- Age and initial SOFA score affect mortality in ICU patients, and cannot be influenced.
- WE CAN, however, influence nutritional treatment (NPG energy) to reduce ICU mortality.

The Relationship Between Nutritional Intake and Clinical Outcomes in Critically Ill Patients: Results of an Internat. Multicenter Observational Study

C. Alberda, L. Gramlich, N. Jones, KN. Jeejeebhoy, AG. Day, R. Dhaliwal, DK. Heyland
Intensive Care Med. 2009, 35: 1728-37

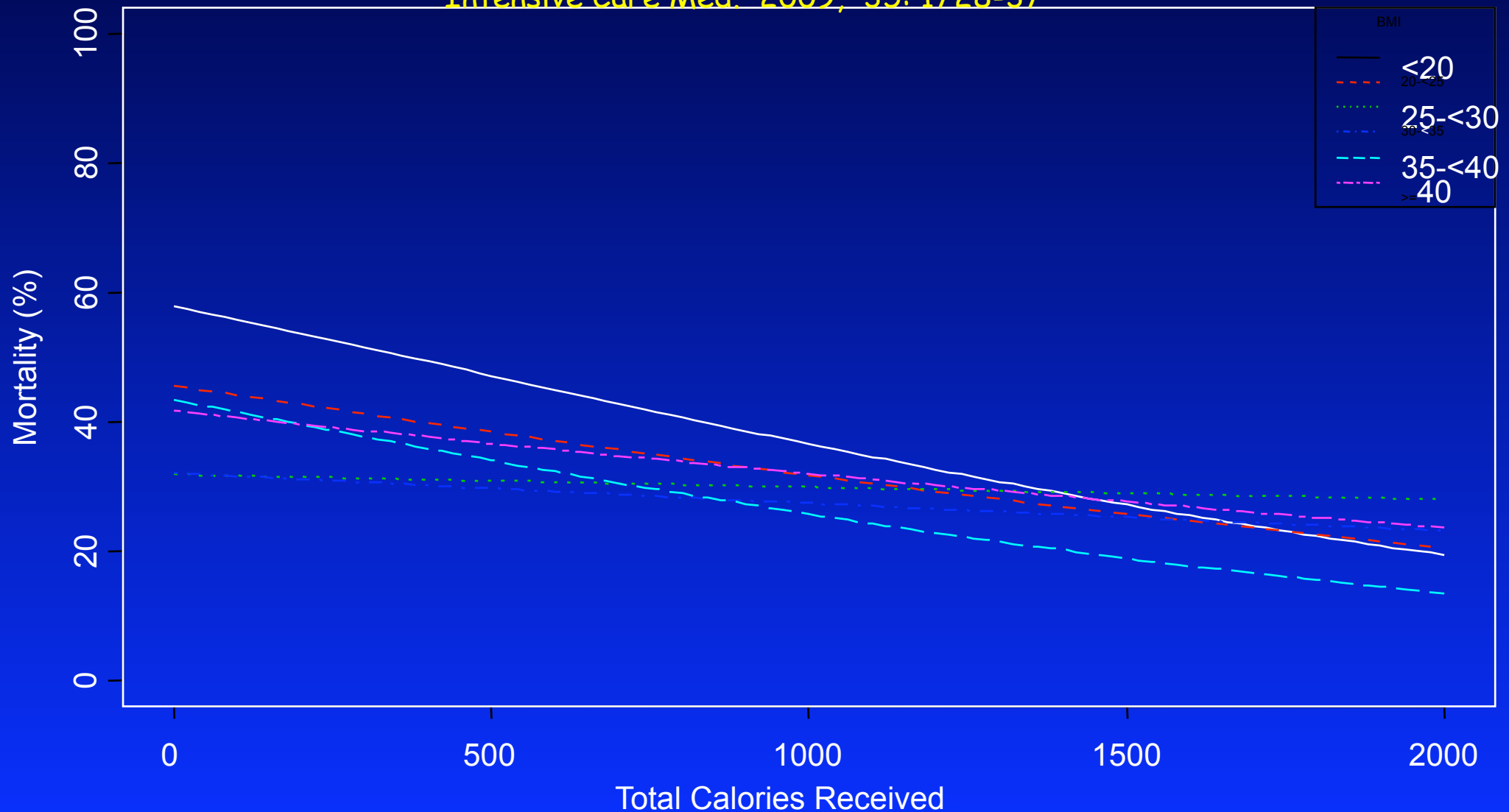
2772 mechanically ventilated patients :
167 ICU's / 37 countries

... patients received 1034 kcal/d. An increase of 1000 kcal/d was associated with a reduction in **mortality** (OR 0.79, p=0.02) and an increase in **ventilator-free days** (2.47, p=0.01).

Increasing nutrition support in the early phase of the ICU stay to minimize protein-energy deficit
-> improved clinical outcomes (? lean and obese)

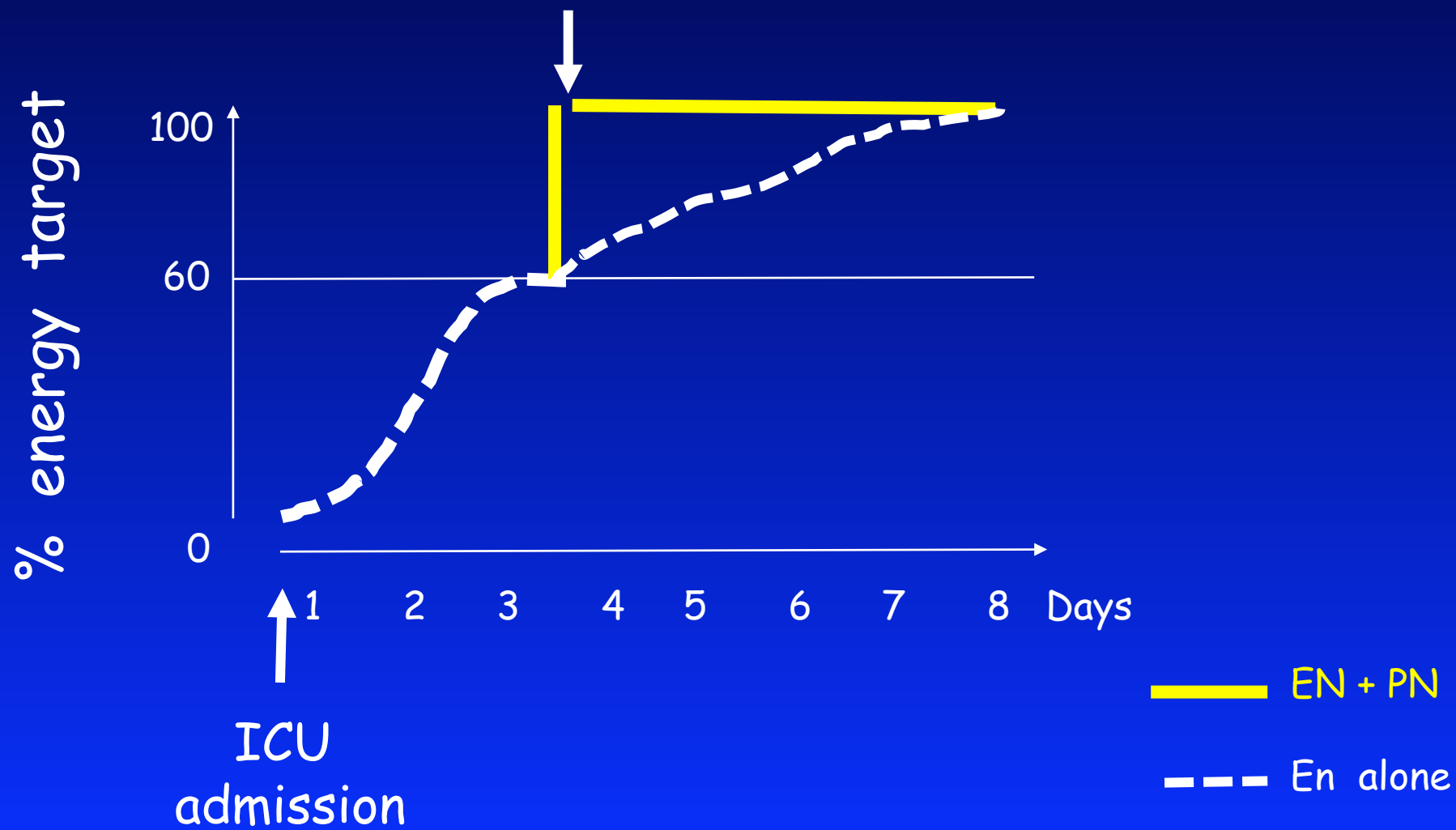
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Intensive Care Med. 2009, 35: 1728-37



PRCT Design

Randomisation D3



SPN Study design: PRCT

Inclusion

- expected LOS > 5 days
- expected survival > 7 days
- no contraindication to EN
- informed consent

Exclusion

- refusal of consent, age < 18 years
- short bowel syndrome, significant persistent GI dysfunction : ileus, proximal fistula (> 1,5 liter/d)
- patients on PN

Nutrition

- 3rd after admission, if energy input < 60% → randomized (EN alone) or (EN + PN) to reach 100% of their predicted RMR
- glycemic control (6.0 -8.3 mmol/l)

Study design: PRCT

Endpoints:

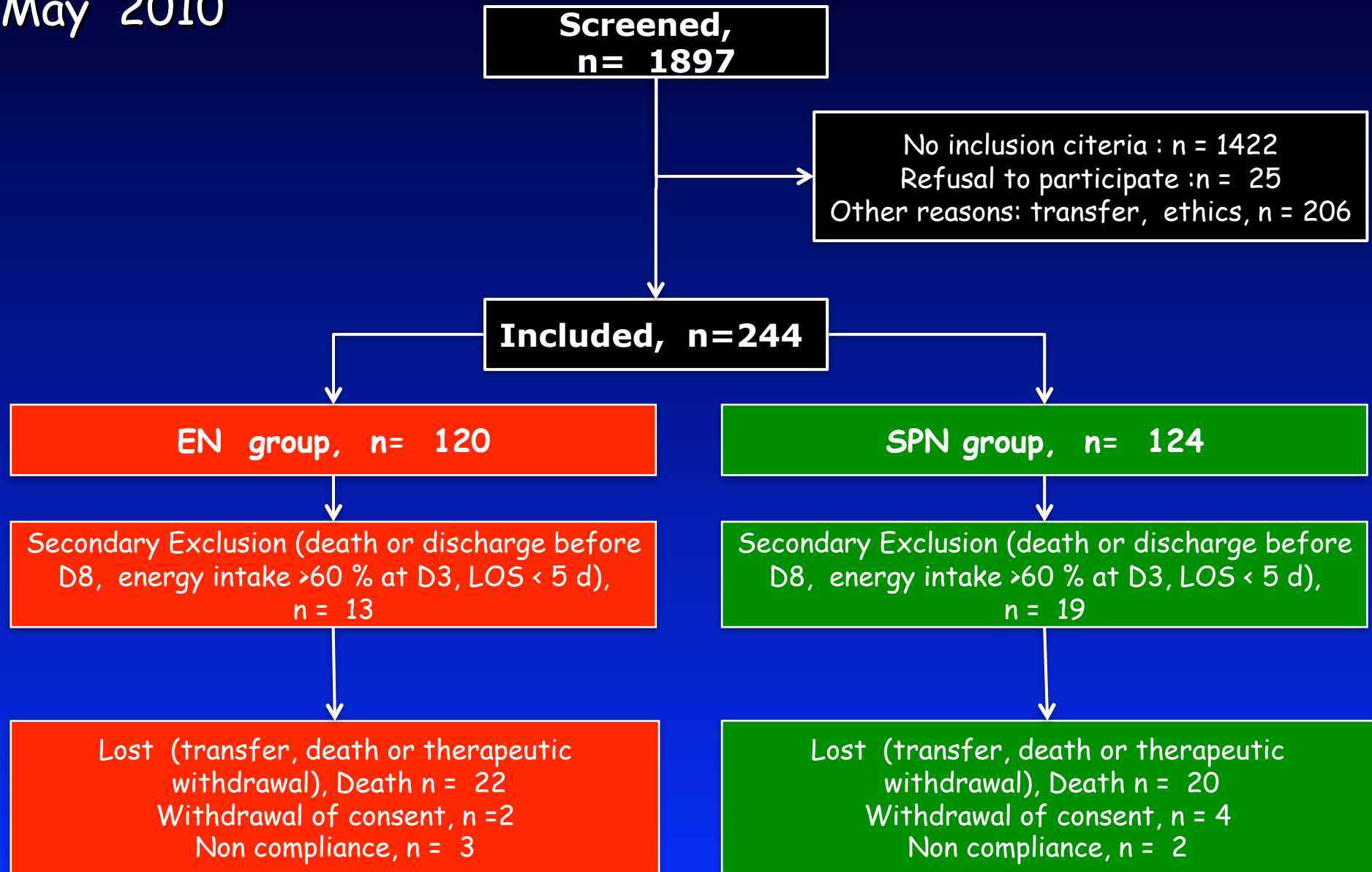
Primary:

- infection rate (CDC criteria)

Secondary:

- Mechanical ventilation free days
- ICU and hospital length of stay
- Antibiotic free days
- ICU complications (extra-renal epuration, neurological, cardiac and respiratory complications)
- Energy and protein balance
- 28 and 60 d clinical outcome after hospital discharge
- Quality of life at 3 months after hospital discharge

SPN Study - May 2010



Is it now time to promote mixed enteral and parenteral nutrition for critically ill patients ?

Heidegger C.P. et al. Int Care Med 2007, 33: 963-969



Malnutrition is likely

Oral intake possible

Yes

Start oral diet

No

EN possible

No

Consider PN

Initiate EN within 24 hr

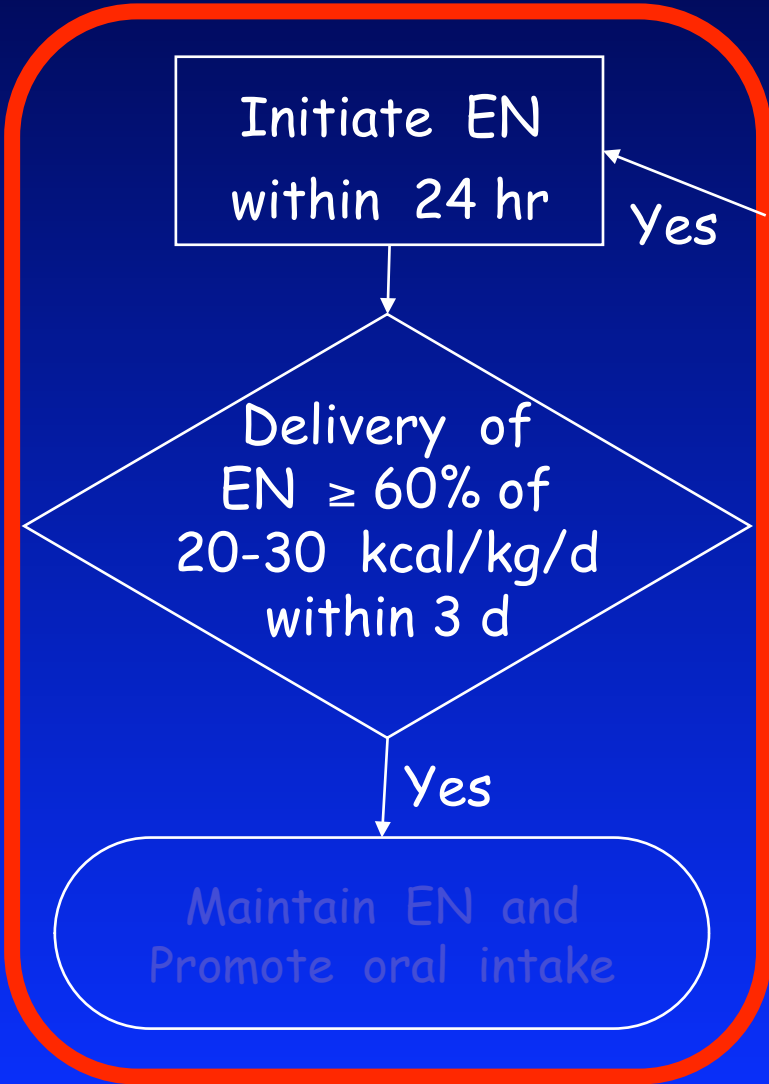
Yes

Delivery of EN \geq 60% of 20-30 kcal/kg/d within 3 d

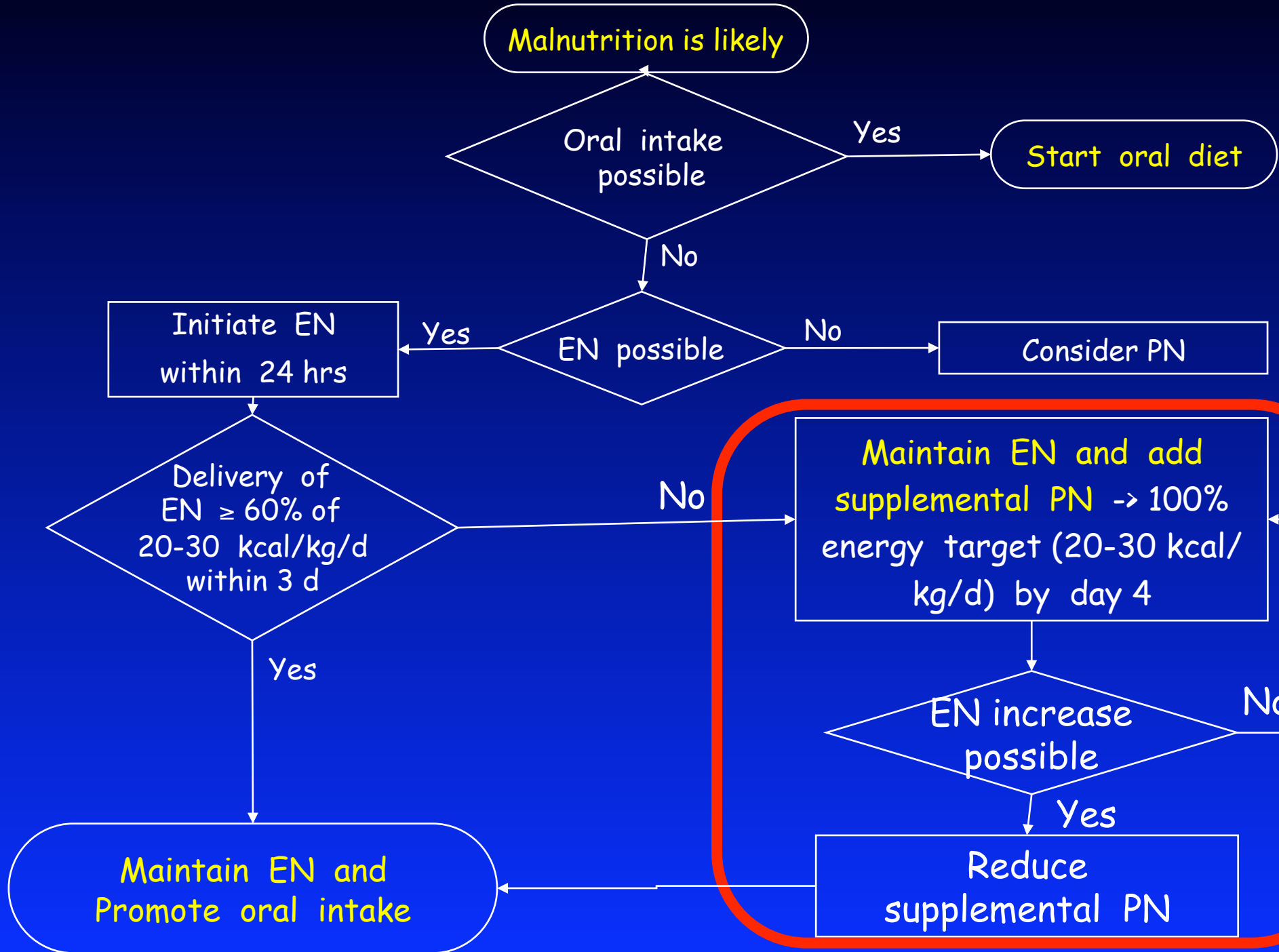
Yes

Maintain EN and Promote oral intake

Tight Glycemic Control



Tight Glycemic Control

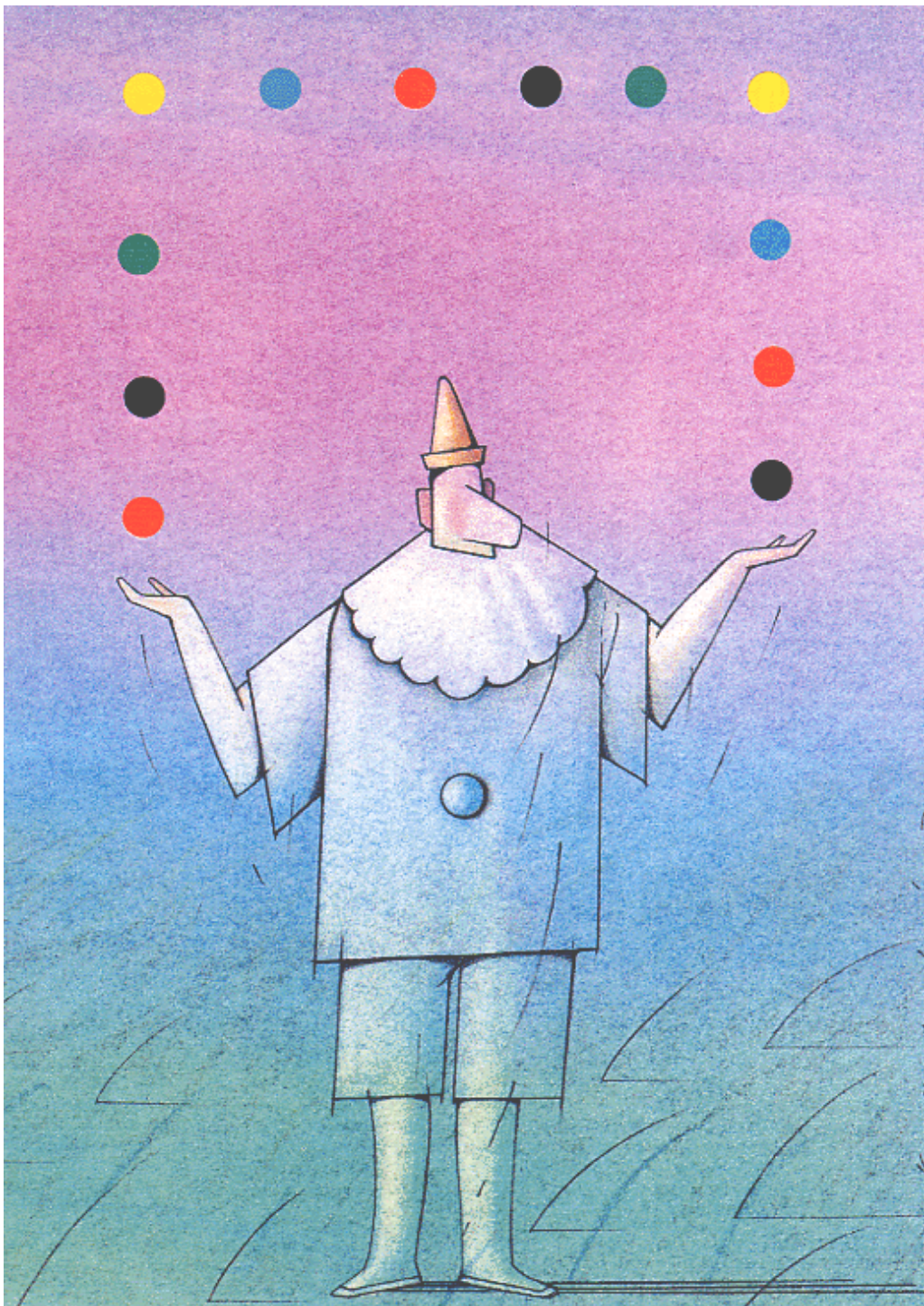


Résumé



Nutrition en réanimation

- Risque élevé d'avoir / aggraver une malnutrition
- NE suboptimale fréquente
- Nutrition insuffisante -> durée de séjour et surmorbidity
- Couverture énergétique précoce : mortalité réduite
- Contrôle glycémique
 - Nutrition parentérale complémentaire



Conclusion



Nutrition
Entérale

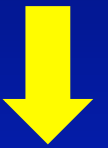
ET

Nutrition
Parentérale
Complémentaire





Si la NE
fait la $\frac{1}{2}$
du travail:



Nutrition
Parentérale
Complémentaire

Yves Dupertuis

Ursula Kyle

Véronique Karsegard

Gaëlle Benais-Pont

Ghita Benzakour

Linda Belabed

Fang Cai

Patrice Darmon

Ariane Paoloni

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Nathalie Jacquelin-Ravel

Michel Kossovsky

Maike Kruseman

Didier Hans

Maryse Jaunin

Noury Mensi

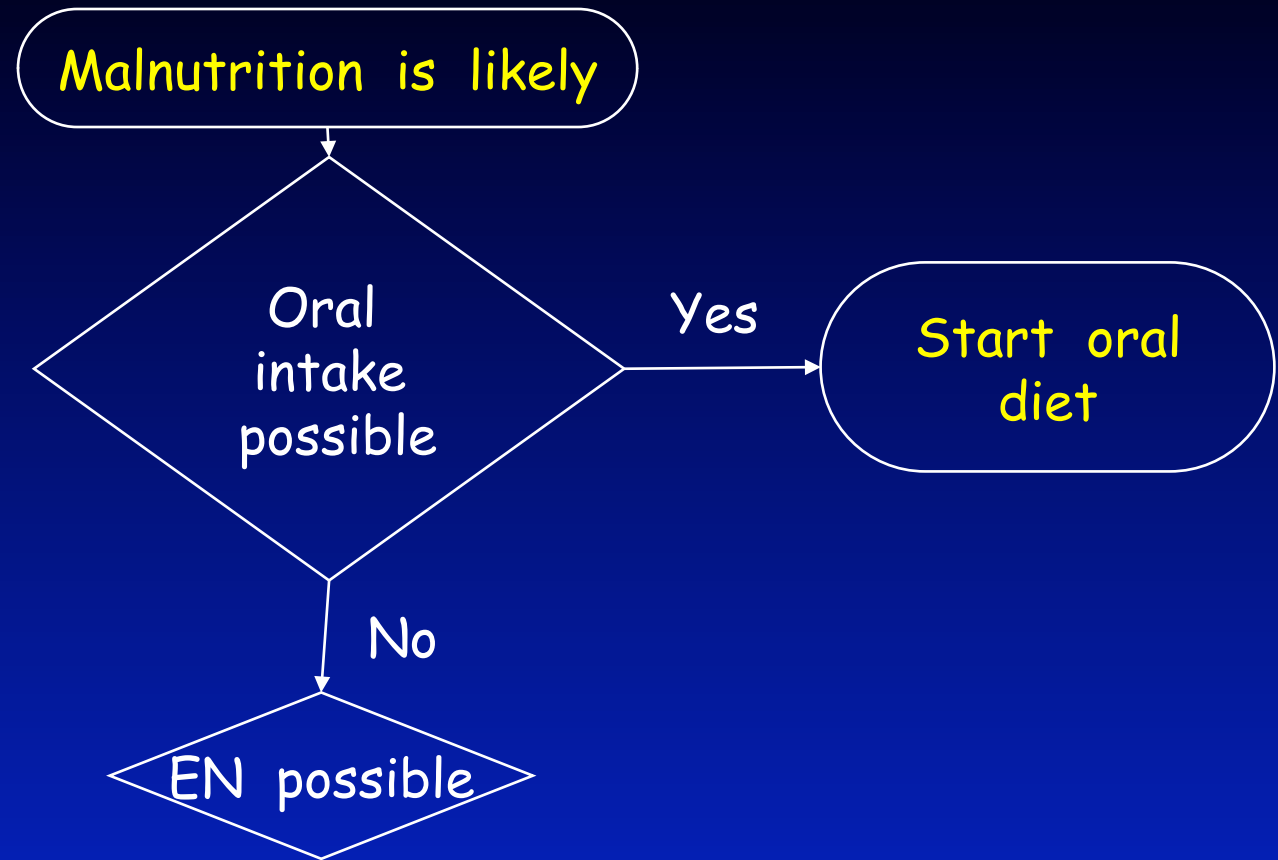
Sophie Namy

Dominique Wohlwend

Merci

Merci





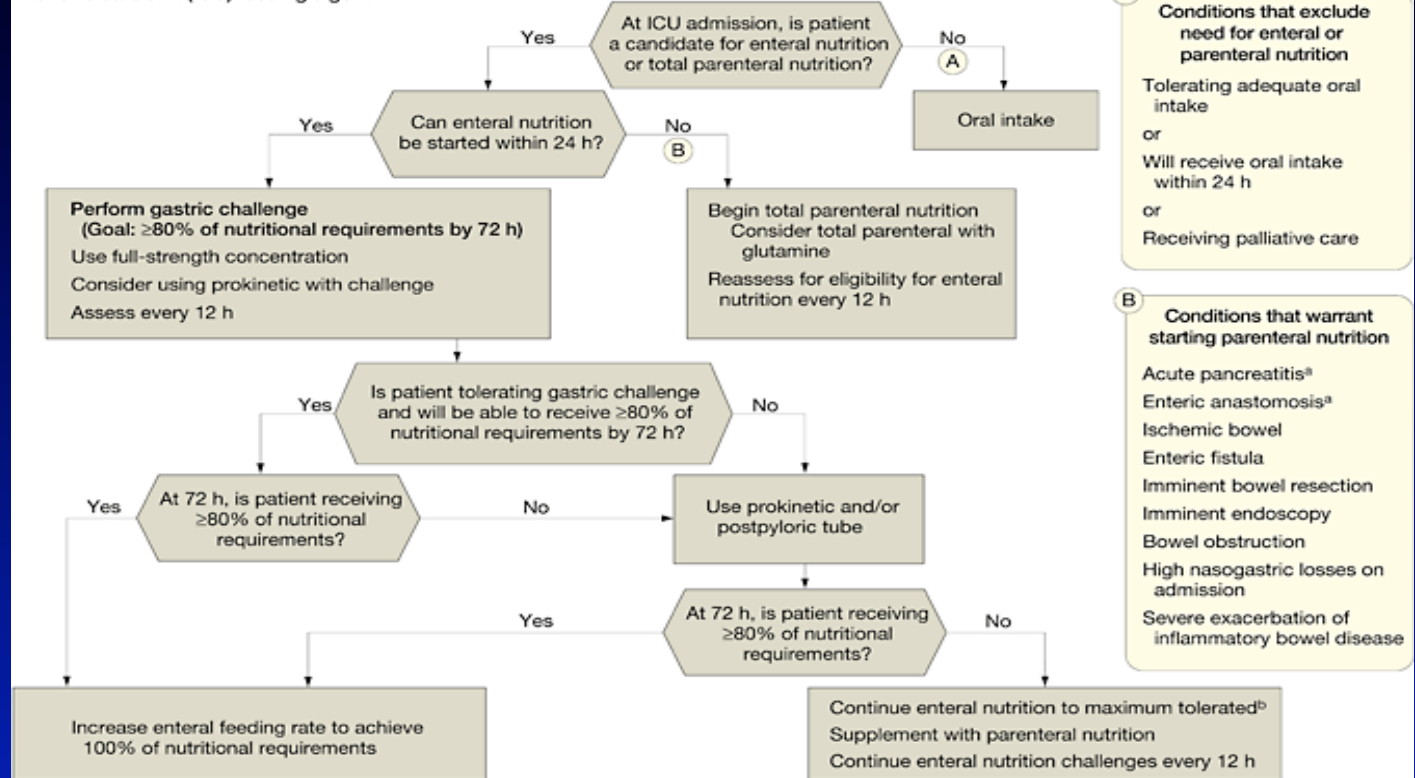
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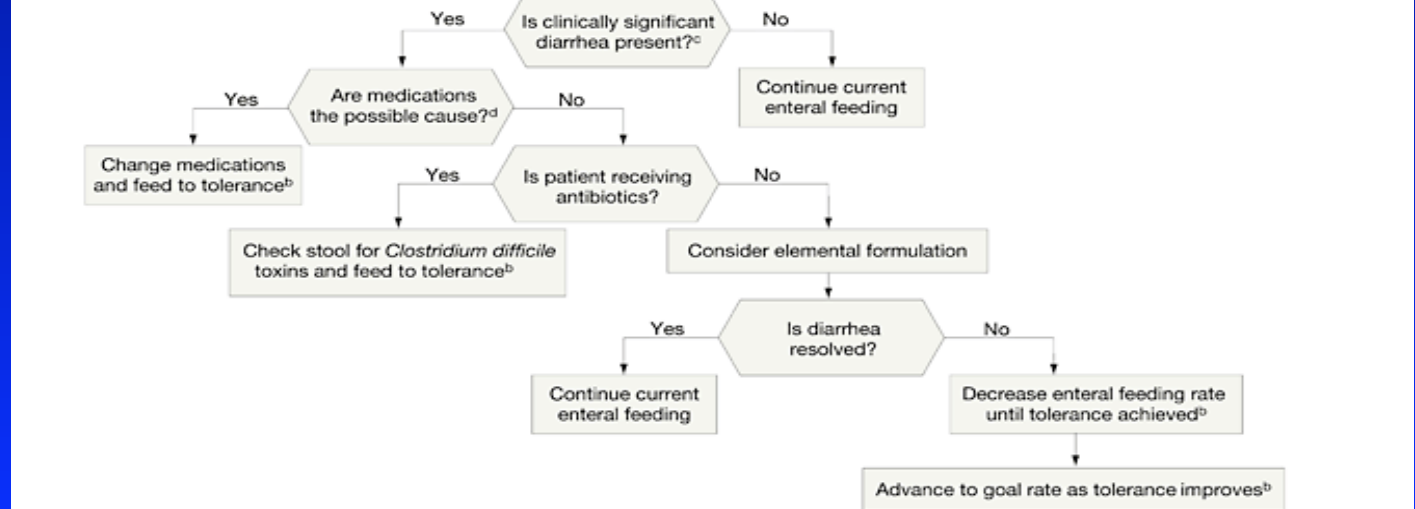
Algorithm of Evidence-Based Feeding Guideline

Doig, G. S. et al. JAMA 2008;300:2731-2741

Intensive care unit (ICU) feeding algorithm

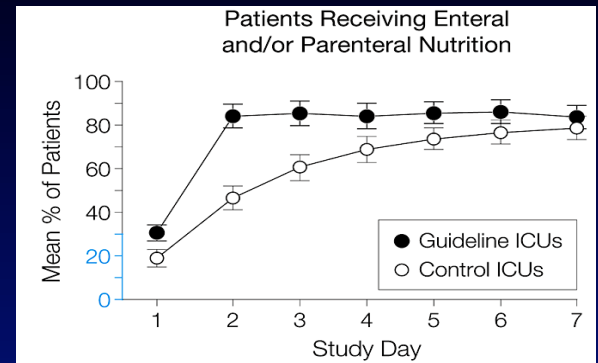


Tube feeding-associated diarrhea algorithm



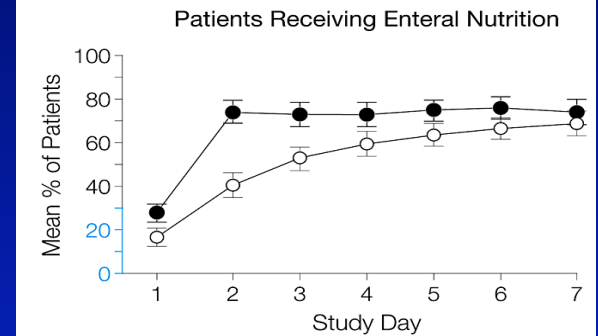
Nutritional Support Delivered by Study Day During the Guideline Evaluation Phase

Doig, G. S. et al. JAMA
2008;300:2731-2741



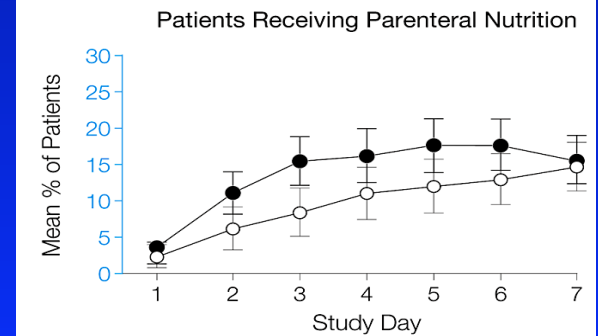
Total patients

Guideline	561	559	544	510	487	469	450
Control	557	556	540	520	494	470	454



Total patients

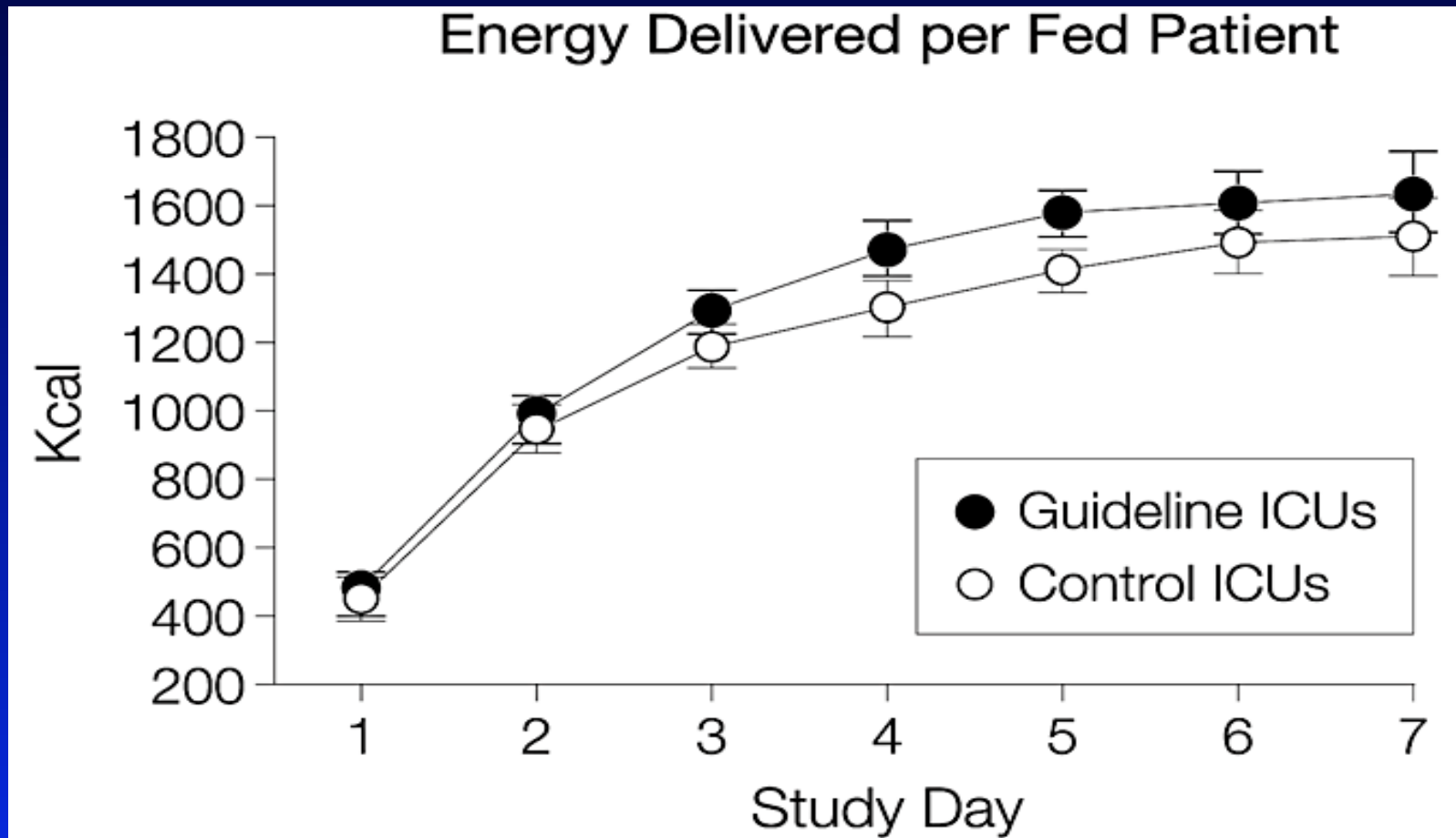
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Total patients

Guideline	561	559	544	510	487	469	450
Control	557	556	540	520	494	470	454

Mean Energy Delivered per Fed Patient by Study Day During the Guideline Evaluation Phase
 Doig, G. S. et al. JAMA 2008;300:2731-2741



Total patients

Guideline	171	471	465	428	417	404	376
Control	105	257	326	358	365	360	358