NUTRITION ARTIFICIELLE EN REANIMATION
MENU A LA CARTE

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INTRODUCTION

1- Concept de « Nutrition therapy » bien codifié

ESPEN Guidelines on Parenteral Nutrition: Intensive care 2006 & 2009

2- USI: population hétérogène

- ✓ Age? Comorbidité?
- ✓ Nature diverse des agressions
  - Chirurgicales: traumatisme, chirurgie cardiaque...
  - Médicale: défaillance respiratoire, circulatoire...
- ✓ Etat nutritionnel antérieur: 30 à 50 % de dénutrition

CONCEPT DE NUTRITION THERAPY

1- Apport adéquat en micro et macronutriments

2- Nutrition précoce (24 - 48 premières heures)

3- Contrôle glycémique

APPORT ADÉQUAT?

Between necessity and side effects: effects of over and undernutrition

- **Apport insuffisant < 10 Kcal/kg / j**

  1- ↗ Le risque de mortalité prédite au-delà de j7

  2- Atrophie musculaire:

  - Toute la masse maigre
  - Muscles du cœur

APPORT ADÉQUAT?

Between necessity and side effects: effects of over and undernutrition

- **Jeune ou Traumatisme (24 h)**

  Baisse des réserves hépatiques en glycogène

  50 % de glycogène de foie

  1 % de masse musculaire.

- **Jeune > 3 j**

  1- Insulinorésistance → hyperglycémie

  « source d'energie pour le cerveau »

  2- Déviation du métabolisme des protéines vers la production de glucose

APPORT ADÉQUAT?

Between necessity and side effects: effects of over and undernutrition

- **Apport excessif > besoins**

↗ VCO_2 du travail respiratoire

↗ Stokage hépatique: 500Kcal → + 33% travail respiratoire

↗ Hyperglycémie

APPORT ADEQUQT?

A la phase aiguë:

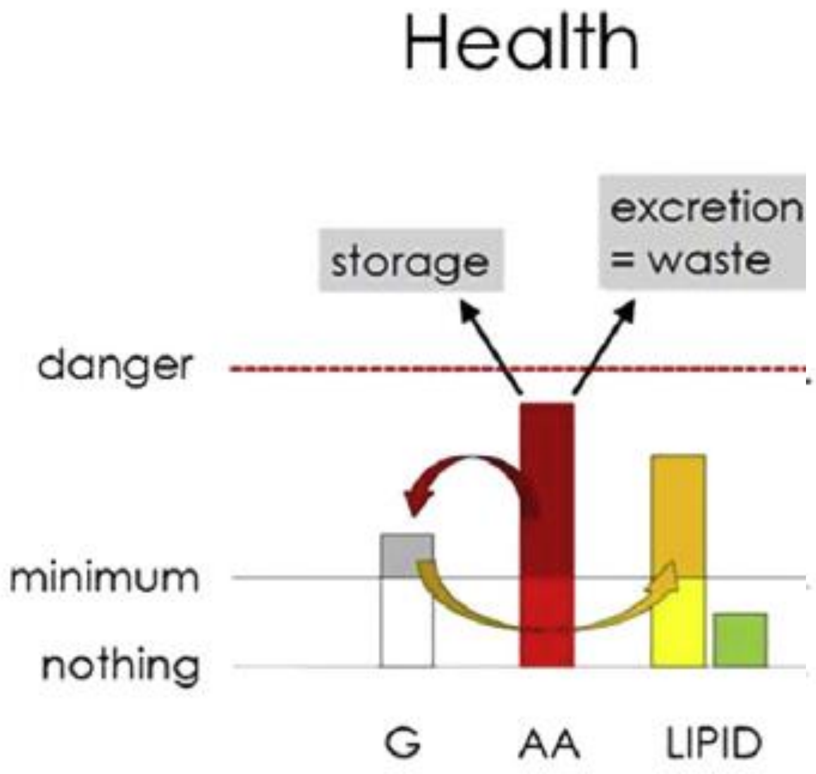
Mobilisation endogène des substrat ↗

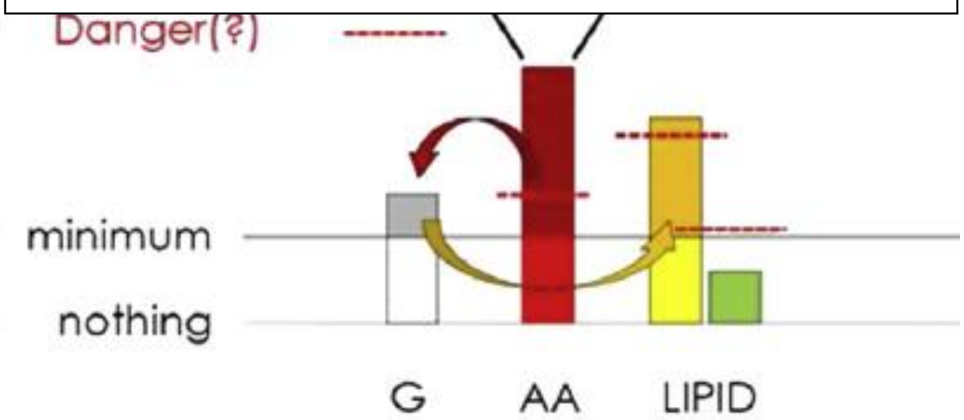
Excrétion déchet s diminuée ↘

→ Apport excessif à éviter

↗ Travail respiratoire

↗ Complications





APPORT ADEQUQT?

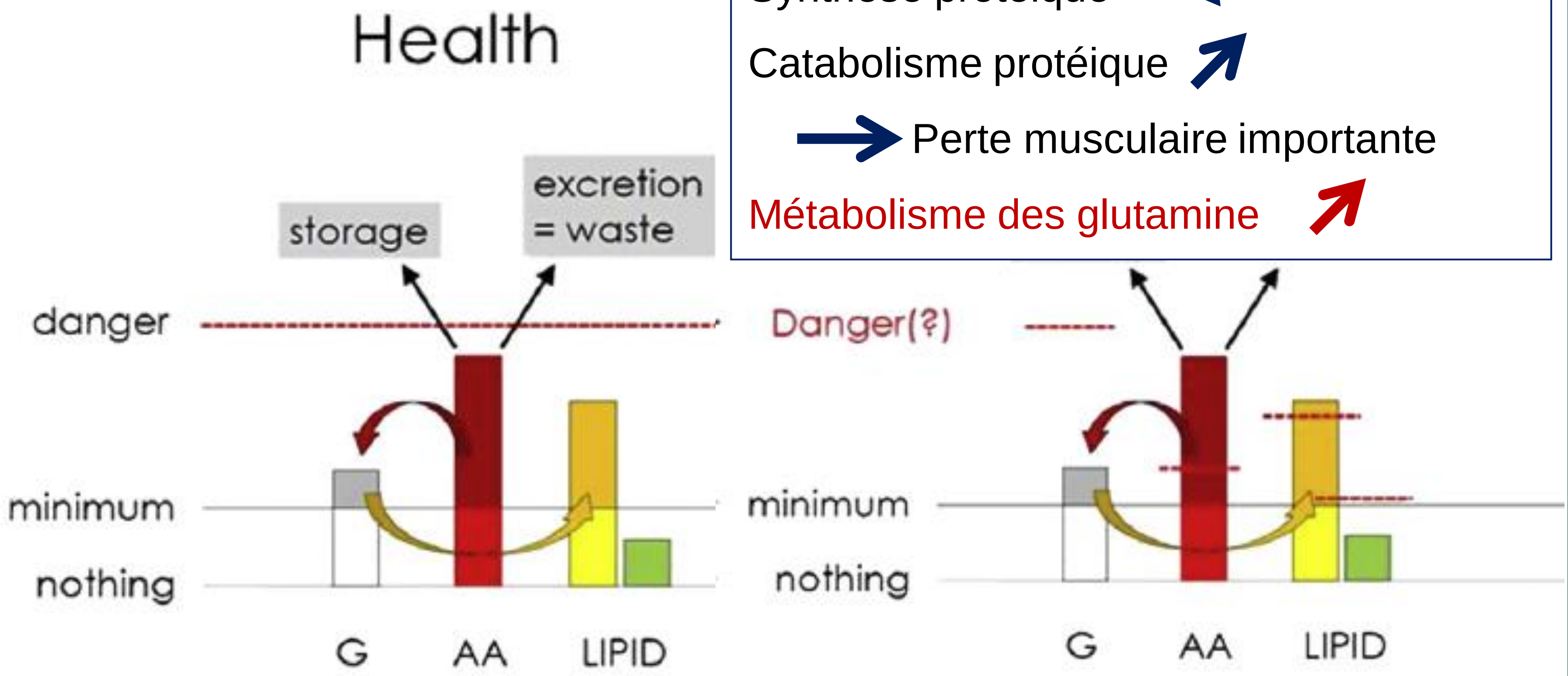
A la phase aiguë:

Synthèse protéique ↘

Catabolisme protéique ↗

→ Perte musculaire importante

Métabolisme des glutamine ↗



COMMENT CALCULER L'APPORT ADEQUQT ?

DÉPENSES ÉNERGÉTIQUES?

1- Calorimétrie indirecte

BMI bas

- Apport prescrit bas/ besoins réels
- Tolérance plus

2- Poids corporel actuel

3- Poids idéal?

FACTEURS INFLUENCANT LES BESOINS ?

DÉPENSES ÉNERGÉTIQUES?

OBÉSITÉ

BMI élevé

- Apport énergétique moindre
- Apport protidique plus

AGE

Plus vulnérable à l'hypernutrition

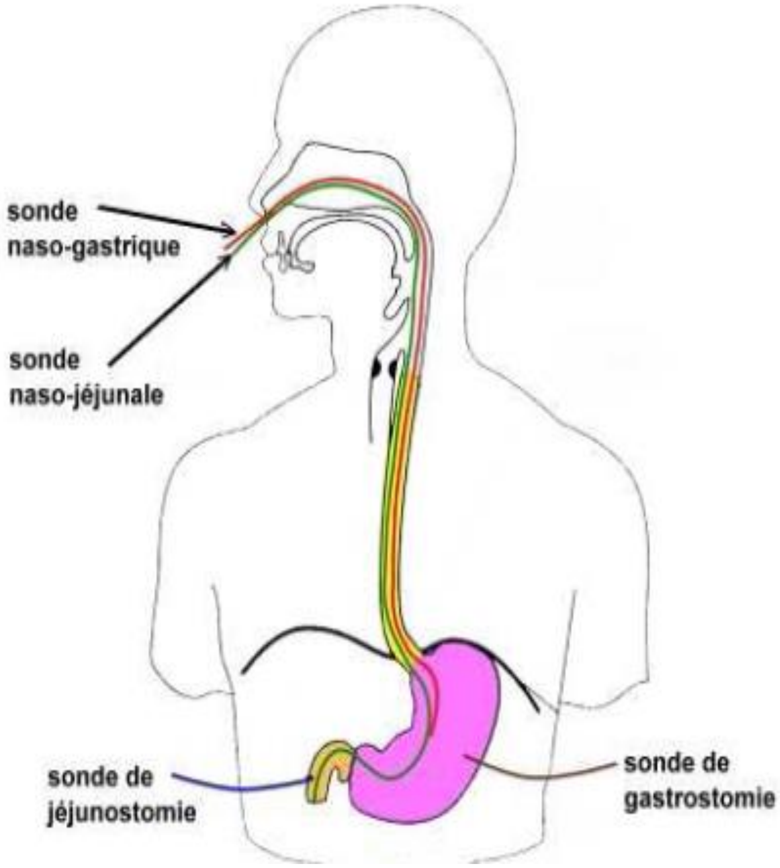
- Masse musculaire faible
- Métabolisme réduit (sarcopenie)

→ Besoins énergétiques faible

COMMENT NOURRIR ?

1- Nutrition entérale

- Maintien de l'intégrité fonctionnelle et morphologique du TD
- Favorise la motilité digestive, et la reprise de la nutrition orale
- Réduction de la translocation bactérienne, du SIRS
- Meilleure utilisation des substrats
- Meilleure tolérance au glucose
- Réduction des infections



MOMENT DE NOURRIR ?

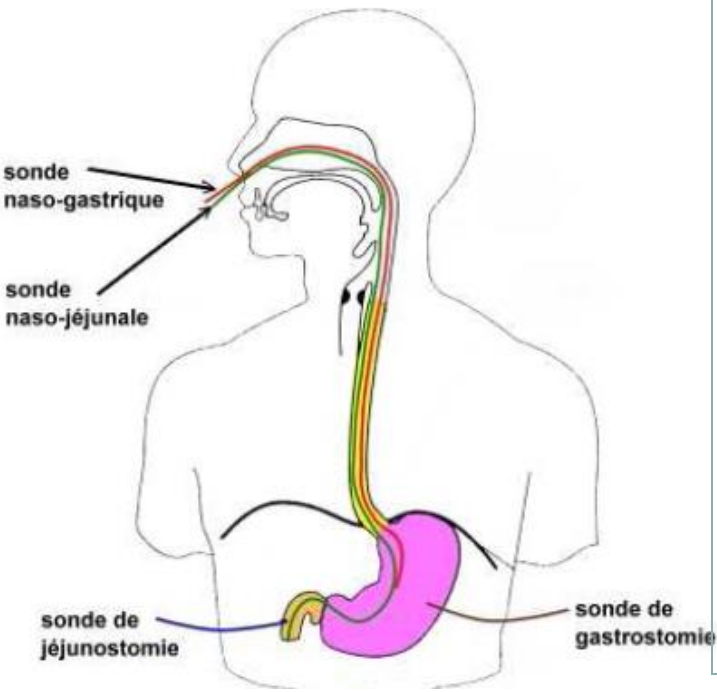
Recommandation forte:

Introduction **précoce** de la NE :

- Dans les 48 heures suivant l'admission (Canada)
- Idem, si malnutrition préalable ou état hautement catabolique (ESCIM)
- Et même dans les 12 heures suivant l'admission <u>pour les brûlés, polytraumatisés et opérés de chirurgie viscérale majeure</u> (SRLF)

COMMENT NOURRIR ?

1- Nutrition entérale precoce



Apport calorique

EN précoce même en quantité minime

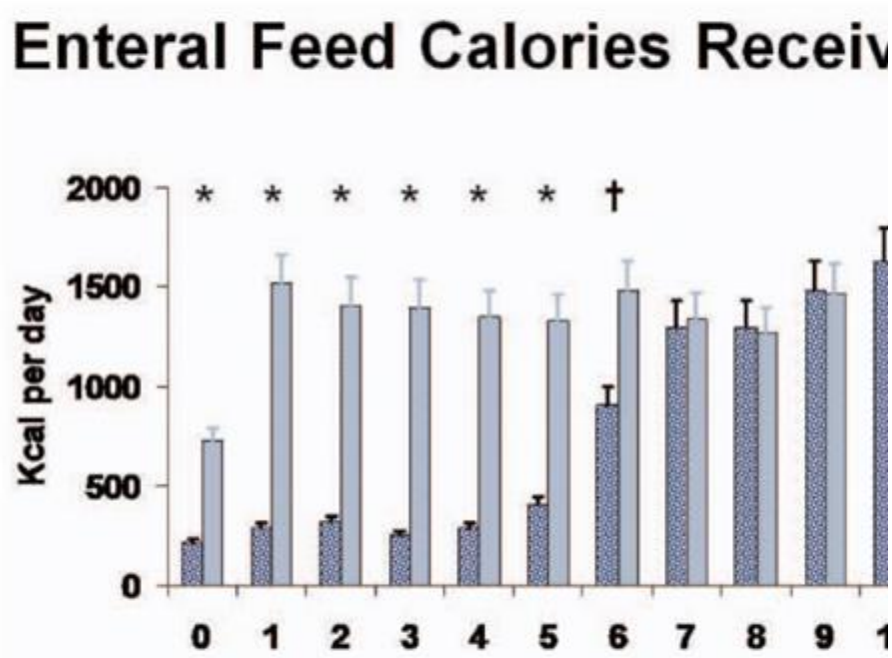
- **↗ progressivement à partir de j2**
- **Apport < 500 Kcal/kg**

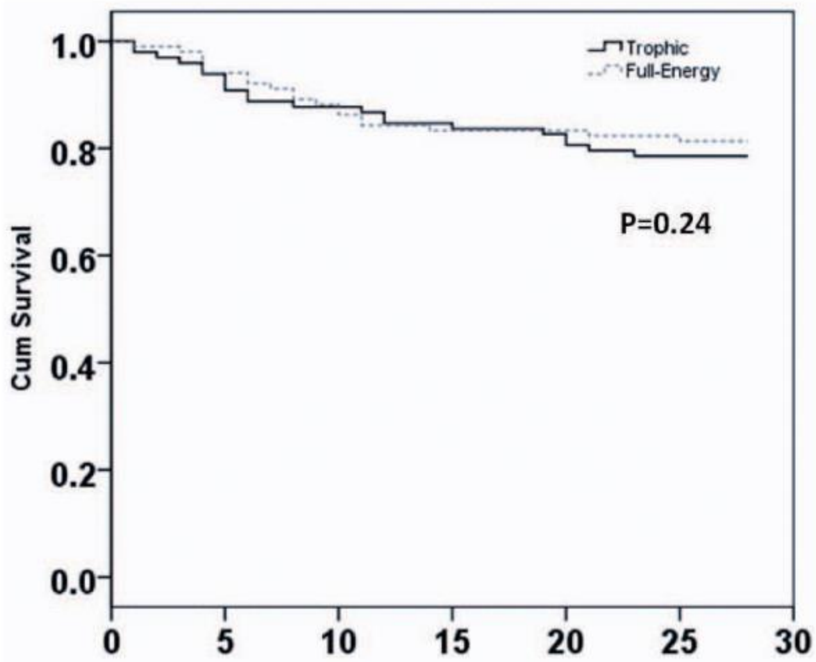
  Vitamines, oligoéléments, AA, ….

A Randomized Trial of Initial Trophic versus Full-Energy Enteral Nutrition in Mechanically Ventilated Patients with Acute Respiratory Failure

Interventions—Patients were randomized to receive either initial trophic (10 ml/hr) or full-energy enteral nutrition for the initial 6 days of ventilation.

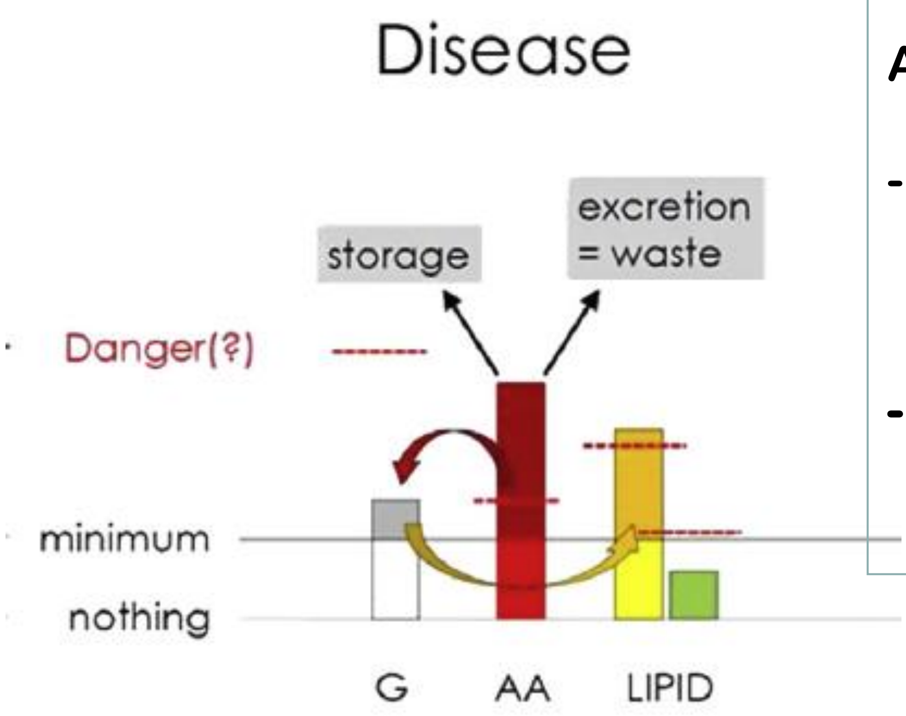
102 groupe control **98 groupe study**





groups had a similar number of days alive and free from mechanical ventilation

COMMENT NOURRIR?



A la phase aigue du stress:

- Apport protidique 1,3-1,5 g/kg/j

baisse du catabolisme

- Apport d'AA → Stimulation synthèse

Apport protidique: facteur pronostique indépendant

COMMENT NOURRIR ?

NE précoce et adéquate ????

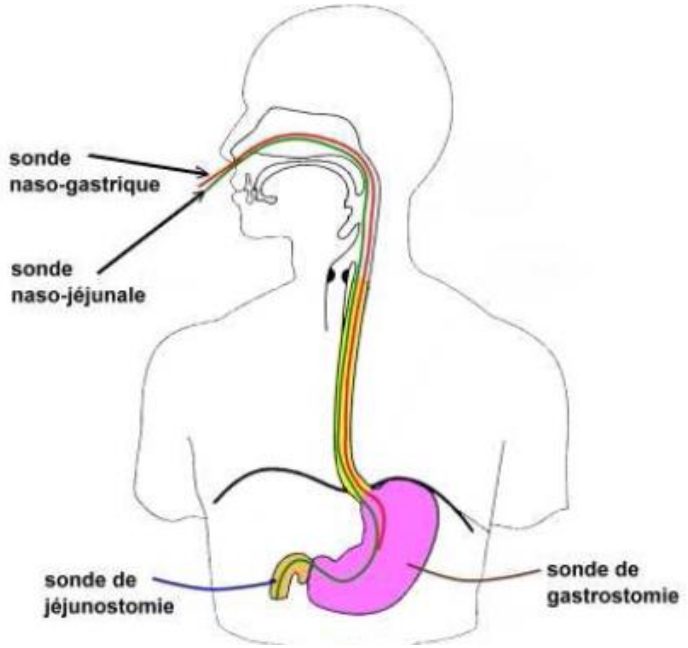
Majorité des PRCTs:

Apport insuffisant [j1-j4]

(énergie, protides)

- **Sepsis , choc septique**
- **Phénomène d'ischémie- reperfusion**
- **Altération de la motilité gastrique/ intolérance gastro intestinale**

Sedatifs, opioids, catécholamines



Apport calorique < 60%

Enteral nutrition in critically ill patients with severe hemodynamic failure after cardiopulmonary bypass

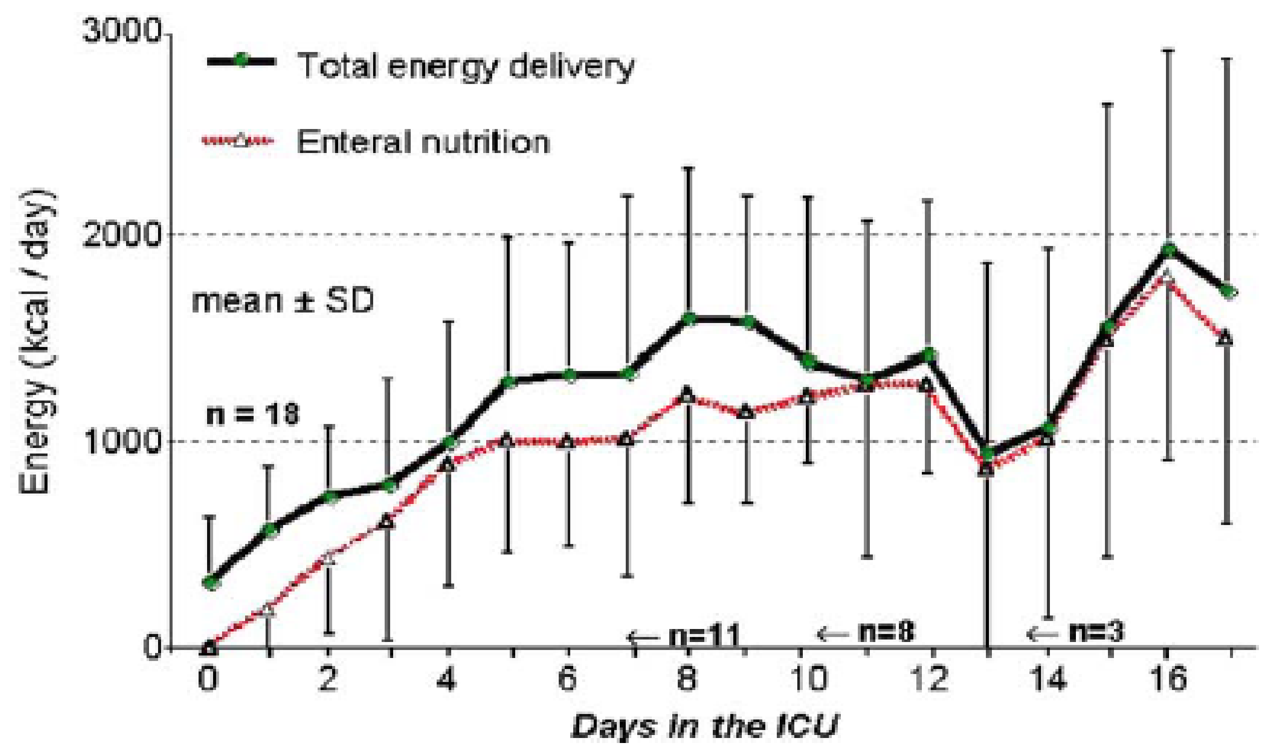


Figure 3 Mean total energy delivery (full line) with the detail of energy provided by enteral nutrition (dotted line) in 18 patients with intra-aortic balloon pump.

Clinical Nutrition (2006) 25, 51–59

ELSEVIER

Clinical Nutrition

http://intl.elsevierhealth.com/journals/clnu

ORIGINAL ARTICLE

Enteral nutrition delivery and energy expenditure in medical intensive care patients

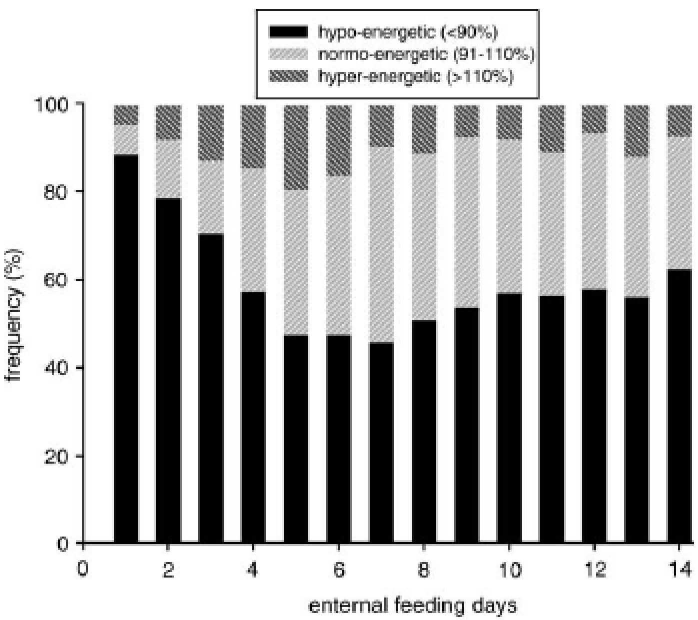


Figure 2 The day-to-day relationship between the amount of enteral caloric supply and energy expenditure classified into three categories based on the study by McClave et al.[26] (<90%: hypo-energetic; 91–110%: normo-energetic; >110%: hyper-energetic).

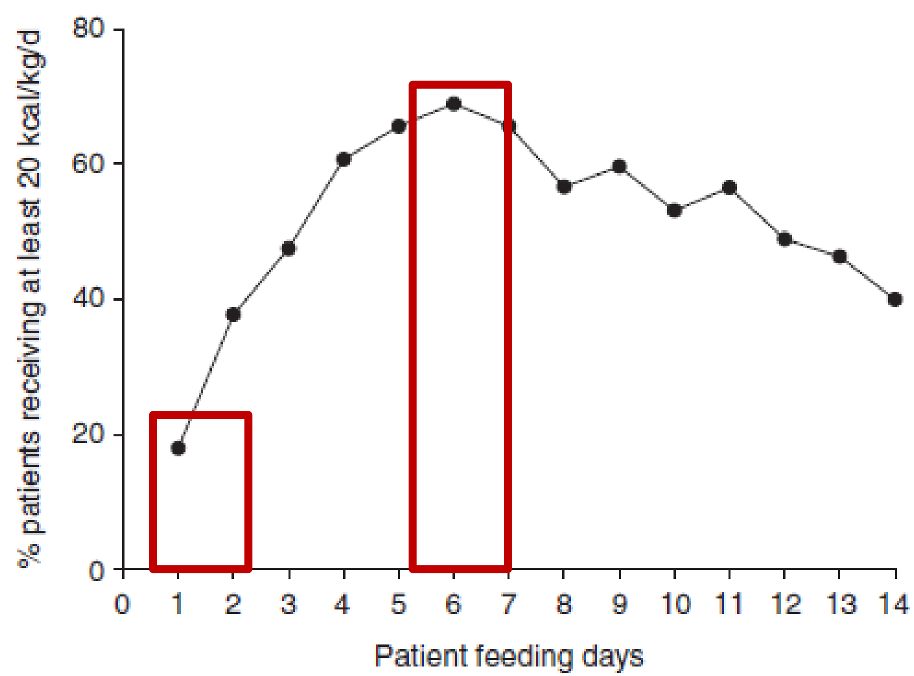


Figure 1 Proportion of patients who received a daily enteral supply of at least 20 kcal/kg.

ORIGINAL ARTICLE

Clinical Nutrition (2005) **24**, 502–509

Negative impact of hypocaloric feeding and energy balance on clinical outcome in ICU patients

ELSEVIER

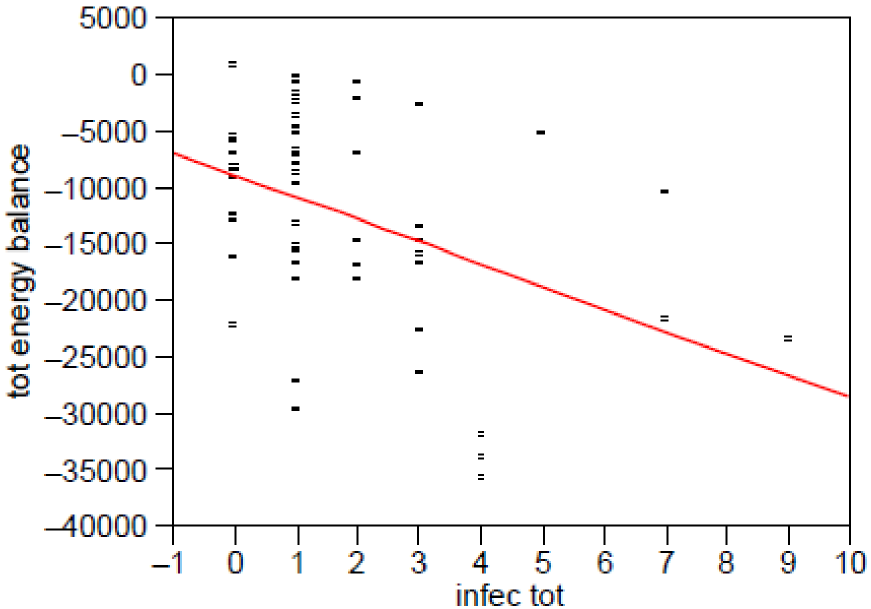


Figure 2 Relation between the progressive negative energy balance and the number of infectious complications.

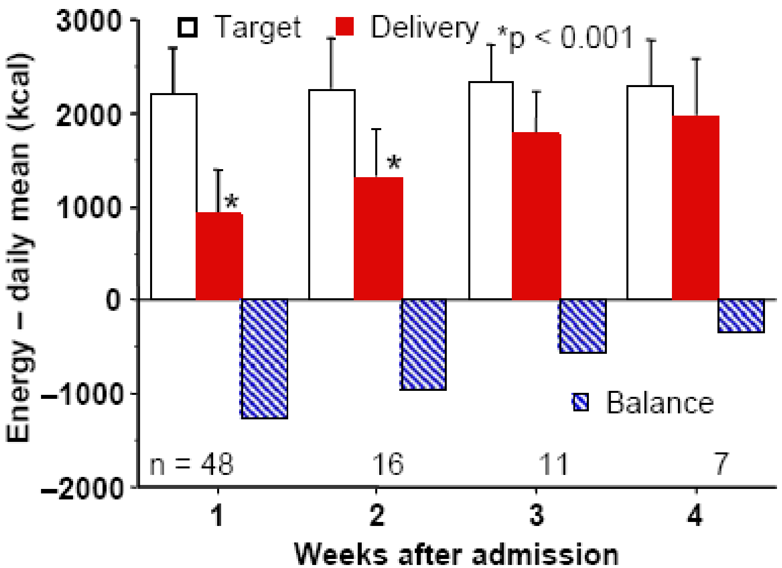


Figure 1 Progression of energy delivery compared to energy target over 4 weeks: the figure shows that energy delivery increases with time, reducing daily deficit.

ESPEN Guidelines on Parenteral Nutrition: Intensive care

Pierre Singer[a], Mette M. Berger[b], Greet Van den Berghe[c], Gianni Biolo[d], Philip Calder[e], Alastair Forbes[f], Richard Griffiths[g], Georg Kreyman[h], Xavier Leverve[i], Claude Pichard[j]

The European Society for Parenteral and Enteral Nutrition guidelines for parenteral nutrition in intensive care recommend the administration of supplemental parenteral nutrition within 2 days after ICU admission to patients who cannot be fed sufficiently via the enteral route .

Early use of supplemental parenteral nutrition in critically ill patients: Results of an international multicenter observational study

Crit Care Med 2011 Vol. 39, No. 12

Jim Kutsogiannis, MD, MHS; Cathy Alberda, MSc, RD; Leah Gramlich, MD; Naomi E. Cahill, MSc, RD; Miao Wang, MSc; Andrew G. Day, MSc; Rupinder Dhaliwal, BASc, RD; Daren K. Heyland, MD, MSc

Table 1. Characteristics of participating intensive care units

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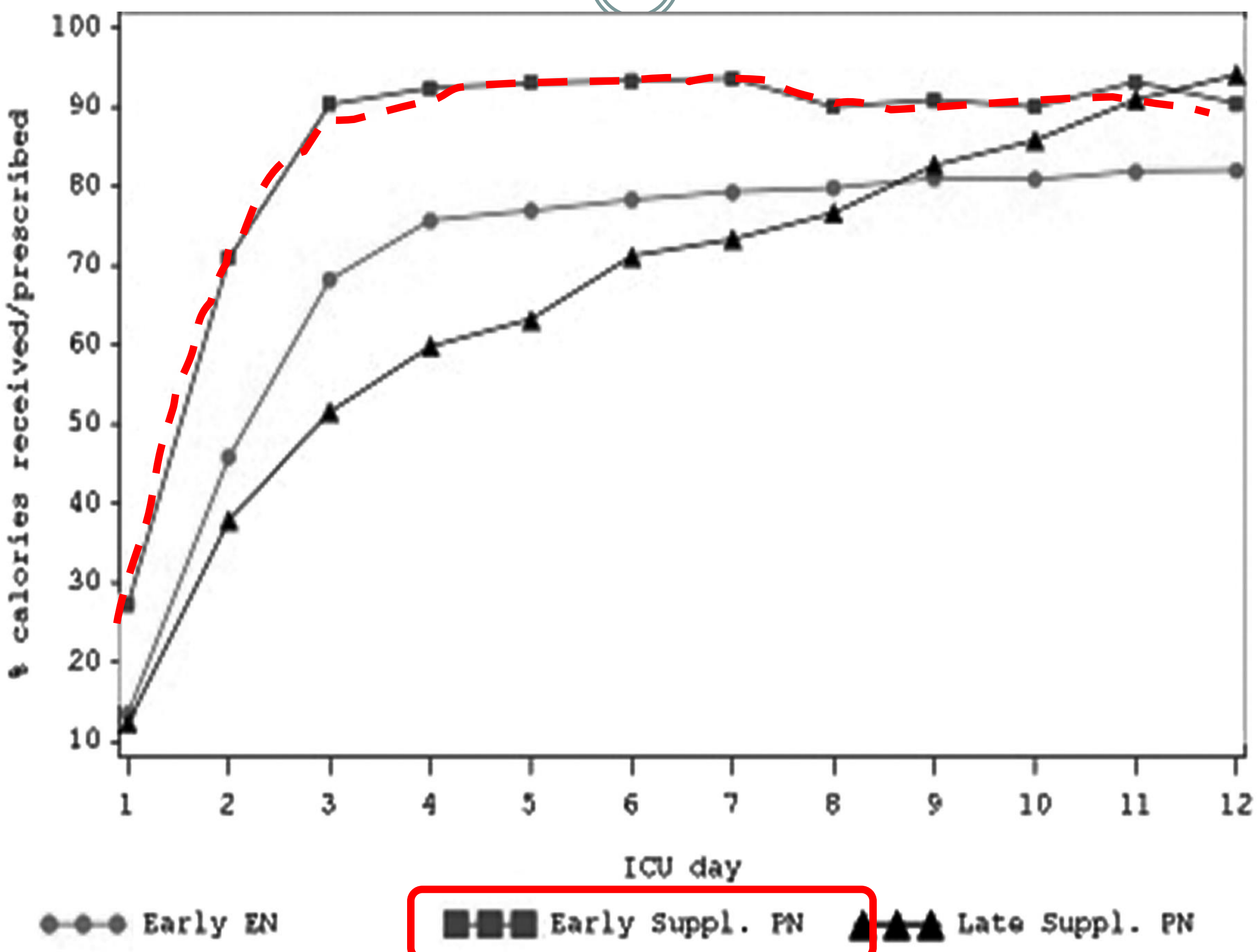
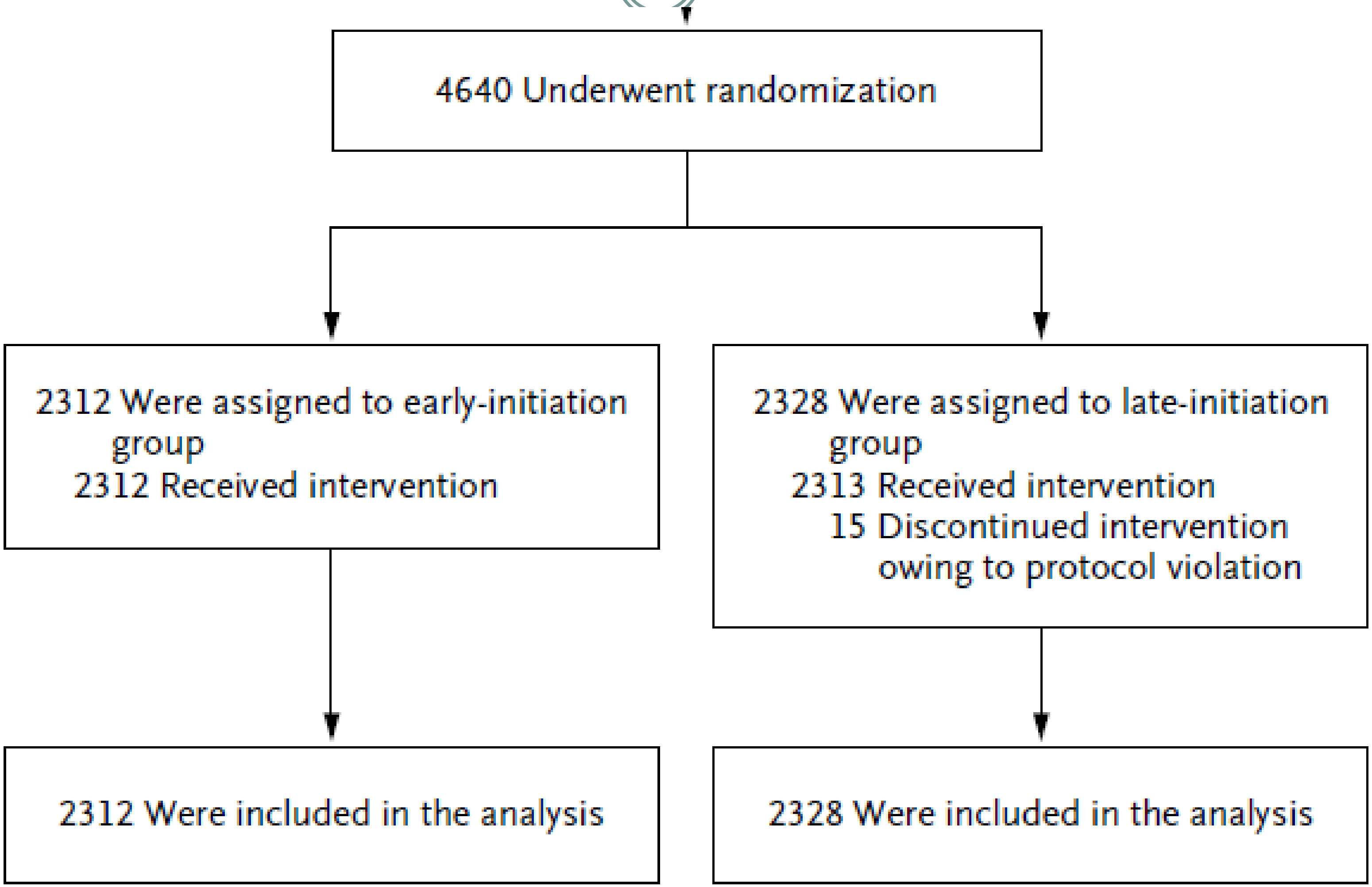
classified the remaining patients according to three methods of nutritional delivery: 1) early EN alone, 2) early EN and early PN (up to and including 48 hrs from ICU admission), and 3) early EN and late PN (after 48 hrs from ICU admission). Our primary objective was to compare the characteristics, nutritional processes, and clinical outcome variables (ICU/hospital length of stay and mortality) between these three groups of patients.

Early use of supplemental parenteral nutrition in critically ill patients: Results of an international multicenter observational study

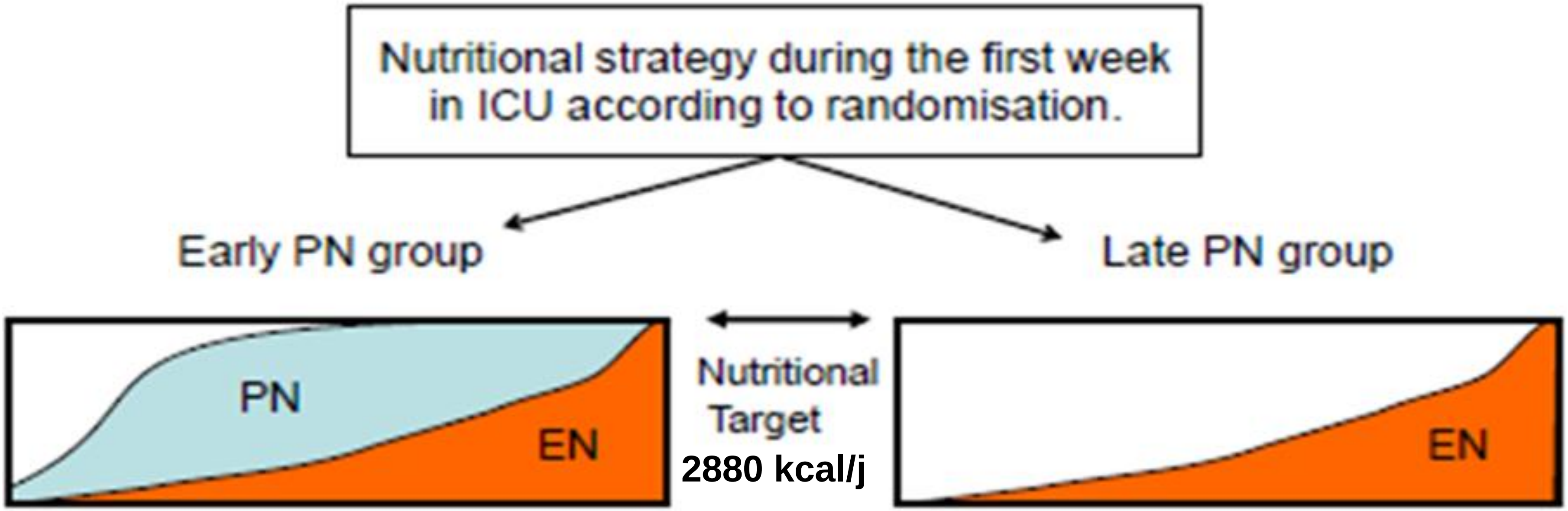
Jim Kutsogiannis, MD, MHS; Cathy Alberda, MSc, RD; Leah Gramlich, MD; Naomi E. Cahill, MSc, RD; Miao Wang, MSc; Andrew G. Day, MSc; Rupinder Dhaliwal, BASc, RD; Daren K. Heyland, MD, MSc



Early versus Late Parenteral Nutrition in Critically Ill Adults



Early versus Late Parenteral Nutrition in Critically Ill Adults



Early PN initiated the second morning in ICU When (NRS ≥ 3)

EN < 80% of calculated caloric needs at day7, initiated PN

When EN covers 80% of calculated caloric needs, ⇒ **PN is stopped.**

Early versus Late Parenteral Nutrition in Critically Ill Adults

- 1- The primary efficacy endpoint for this RCT is the time to discharge alive from ICU.
- 2- Secondary efficacy endpoints

- Time to discharge alive from the hospital
- Time to final (alive) weaning from mechanical respiratory support
- Proportion of patients in need for renal replacement therapy (RRT) during ICU stay
- Need for pharmacological or mechanical hemodynamic support during ICU stay, and duration of such need.
- Need for a tracheostomy during ICU stay.
- Occurrence of infections during ICU stay

Early versus Late Parenteral Nutrition in Critically Ill Adults

Table 2. Outcomes.*

Variable	Late-Initiation Group (N=2328)	Early-Initiation Group (N=2312)	P Value
Safety outcome			
Vital status — no. (%)			
Discharged live from ICU within 8 days	1750 (75.2)	1658 (71.7)	0.007
Death			
In ICU	141 (6.1)	146 (6.3)	0.76
In hospital	242 (10.4)	251 (10.9)	0.63
Within 90 days after enrollment†	257 (11.2)	255 (11.2)	1.00
Nutrition-related complication — no. (%)	423 (18.2)	434 (18.8)	0.62
Hypoglycemia during intervention — no. (%)‡	81 (3.5)	45 (1.9)	0.001
Primary outcome			
Duration of stay in ICU§			
Median (interquartile range) — days	3 (2–7)	4 (2–9)	0.02
Duration >3 days — no. (%)	1117 (48.0)	1185 (51.3)	0.02
Hazard ratio (95% CI) for time to discharge alive from ICU	1.06 (1.00–1.13)		0.04

Early versus Late Parenteral Nutrition in Critically Ill Adults

Secondary outcome			
New infection — no. (%)			
Any	531 (22.8)	605 (26.2)	0.008
Airway or lung	381 (16.4)	447 (19.3)	0.009
Bloodstream	142 (6.1)	174 (7.5)	0.05
Wound	64 (2.7)	98 (4.2)	0.006
Urinary tract	60 (2.6)	72 (3.1)	0.28
Inflammation			
Median peak C-reactive protein level during ICU stay (interquartile range) — mg/liter	190.6 (100.8–263.2)	159.7 (84.3–243.5)	<0.001
Mechanical ventilation			
Median duration (interquartile range) — days	2 (1–5)	2 (1–5)	0.02
Duration >2 days — no. (%)	846 (36.3)	930 (40.2)	0.006
Hazard ratio (95% CI) for time to definitive weaning from ventilation	1.06 (0.99–1.12)		0.07
Tracheostomy — no. (%)	134 (5.8)	162 (7.0)	0.08

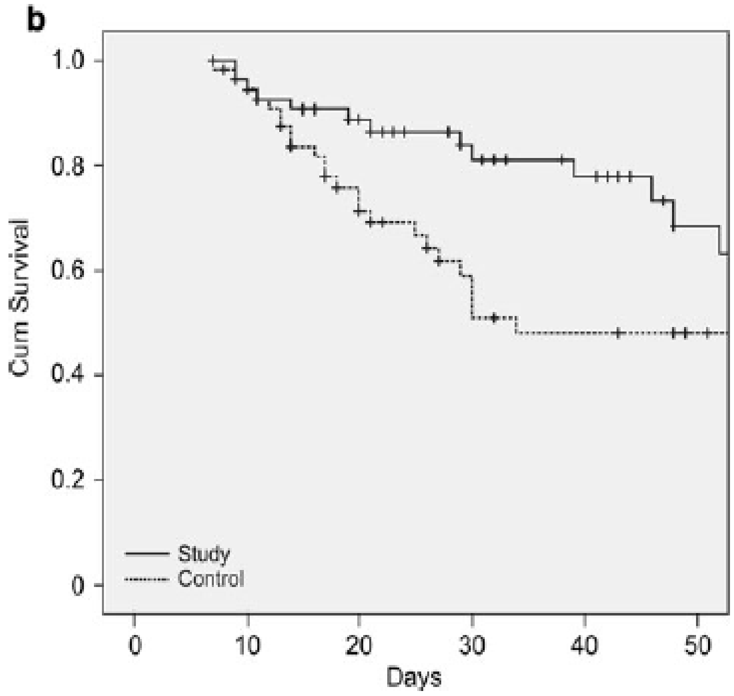
The tight calorie control study (TICACOS): a prospective, randomized, controlled pilot study of nutritional support in critically ill patients

130 patients

Parameter	Study group ($n = 56$)	Control group ($n = 56$)	p
Mean REE (kcal/day)	1,976 ± 468	1,838 ± 468	0.6
Mean energy delivered/day (kcal/day)	2,086 ± 460	1,480 ± 356	0.01
Mean enterally delivered energy/day (kcal/day)	1,515 ± 756	1,316 ± 456	0.09
Mean parenterally delivered energy/day (kcal/day)	571 ± 754	164 ± 294	0.001
Route of administration (n)			
Enteral	34	48	
Parenteral	3	1	
Enteral and parenteral	19	7	
Mean protein delivered/day (g/day)	76 ± 16	53 ± 16	0.001
Mean daily energy balance (kcal)	186 ± 206	−312 ± 481	0.001
Cumulative energy balance (kcal)	2,008 ± 2,177	−3,550 ± 4,591	0.01
Maximum negative energy balance (kcal)	15.7 ± 883	−3,895 ± 4,144	0.01
Daily mean blood glucose (mg/dL)	119.6 ± 21.8	127.3 ± 33.7	0.82

REE resting energy expenditure, *kcal* kilocalories

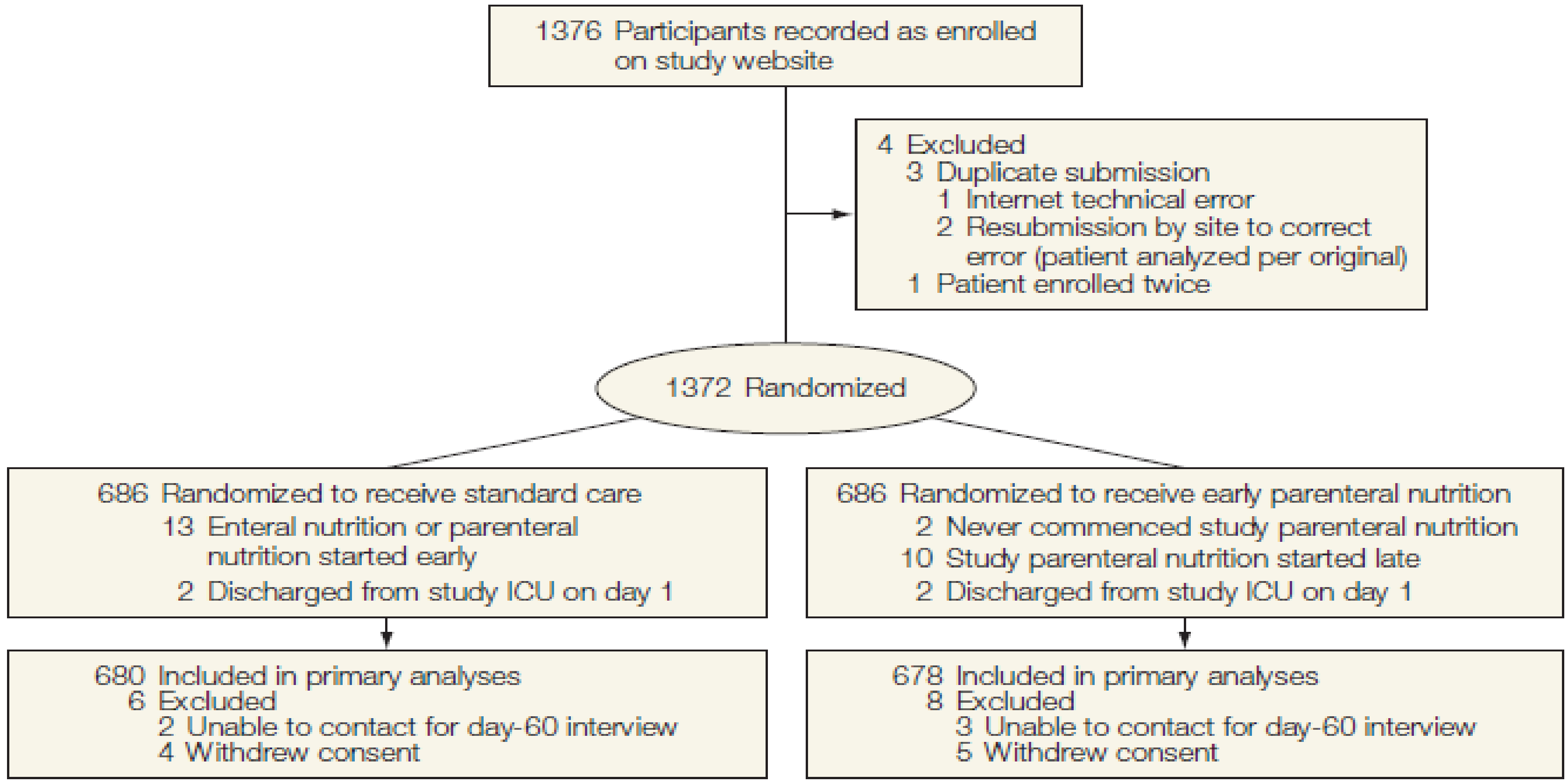
The tight calorie control study (TICACOS): a prospective, randomized, controlled pilot study of nutritional support in critically ill patients



Variable	Study group ($n = 65$)	Control group ($n = 65$)	p value
Duration hospital stay (days)			
Mean	33.8 ± 22.9	31.8 ± 27.3	0.33
Median (range)	29 (4–101)	21 (4–142)	
Infectious complications (n)	37	20	0.05
VAP (%)	18 (27.7%)	9 (13.8%)	0.08
Bacteremia (%)	13 (20.0%)	8 (12.3%)	0.33
Urinary tract infections (%)	0	1 (1.5%)	1.0
Wound infections (%)	5 (7.7%)	1 (1.5%)	0.21
Abdominal infections (%)	1 (1.5%)	1 (1.5%)	1.0

Early Parenteral Nutrition in Critically Ill Patients With Short-term Relative Contraindications to Early Enteral Nutrition

A Randomized Controlled Trial



The study budget was not sufficient to support the collection of complete information on all patients screened for eligibility into the trial at each site. The total number of screened patients, and reasons they were not enrolled, are not available. ICU indicates intensive care unit.

Early Parenteral Nutrition in Critically Ill Patients With Short-term Relative Contraindications to Early Enteral Nutrition

A Randomized Controlled Trial

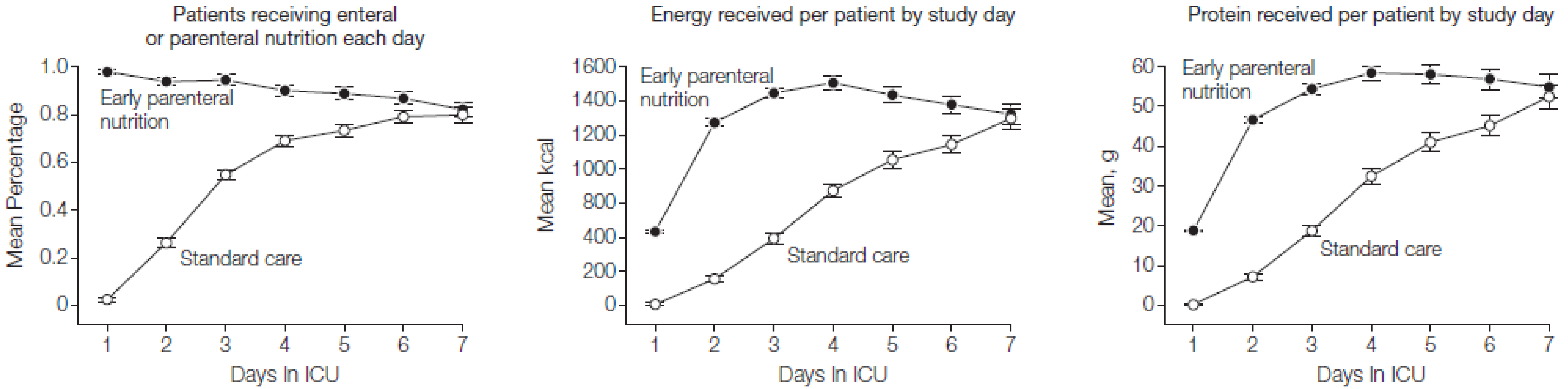
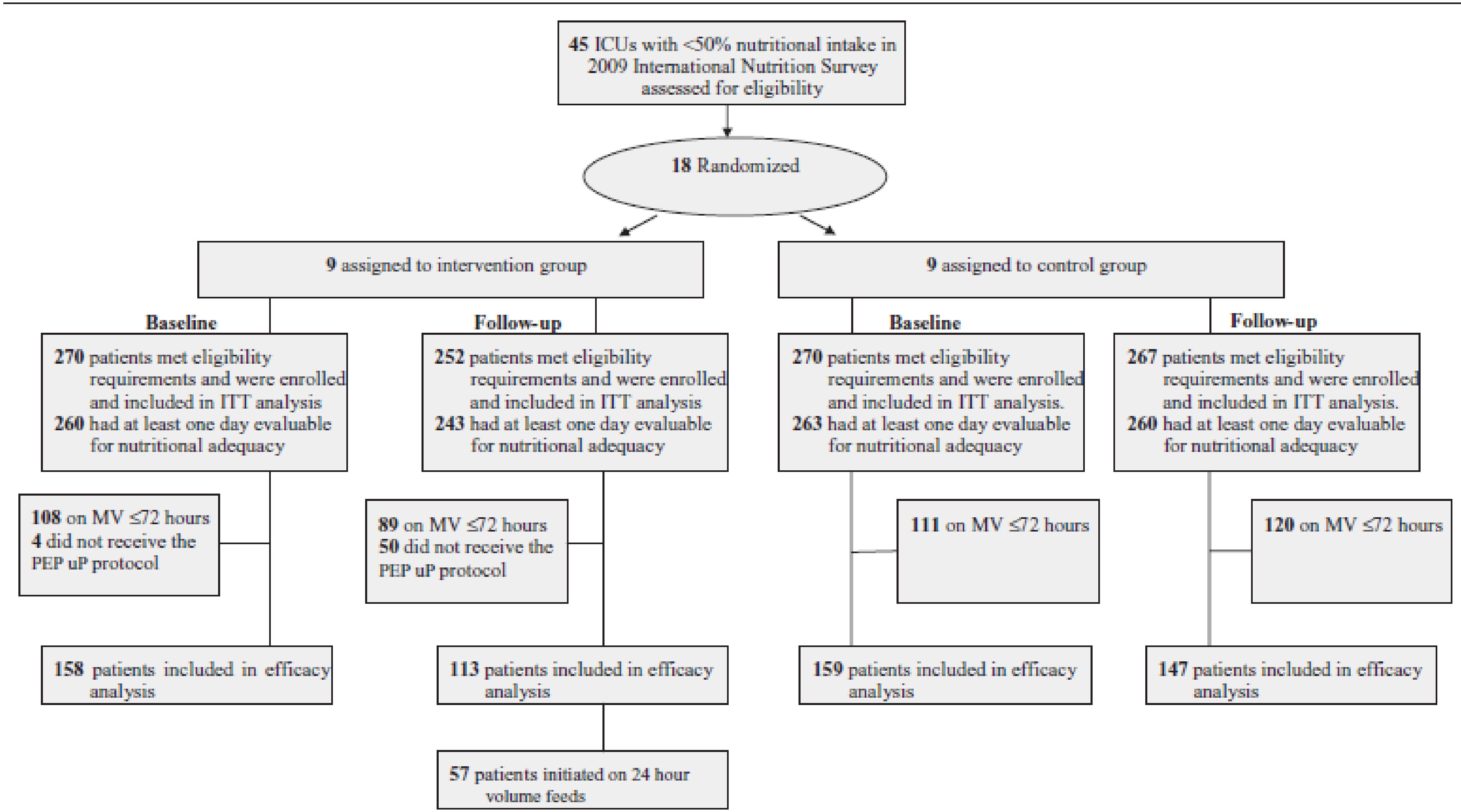


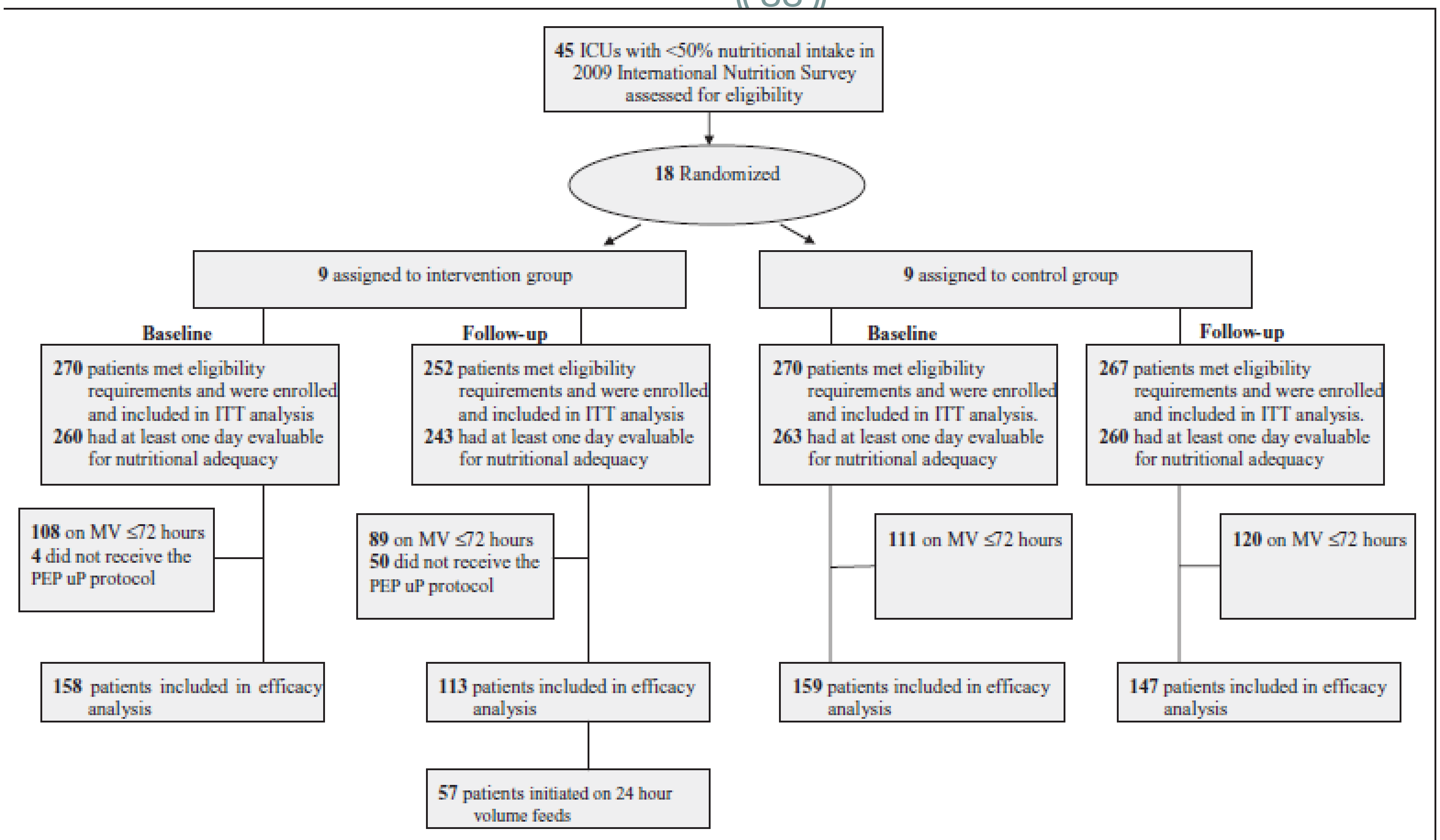
Table 2. Mortality, Quality of Life, and Length of Stay

	Standard Care (n = 680)[a]	Early PN (n = 678)[a]	Risk Difference, % (95% CI)	Odds Ratio (95% CI)	*P* Value
Deaths before study day 60, No. (%)	155 (22.8)	146 (21.5)	−1.26 (−6.6 to 4.1)	0.93 (0.71 to 1.21)	.60
Covariate-adjusted deaths before study day 60[b]			0.04 (−4.2 to 4.3)	1.00 (0.76 to 1.31)	>.99
Quality of life and physical function, mean (SD)[c]	**(n = 525)**	**(n = 532)**	**Difference (95% CI)**		
RAND-36 general health status[d]	45.5 (26.8) (n = 516)	49.8 (27.6) (n = 525)	4.3 (0.95 to 7.58)		.01

Baisse du nombre de jours sans ventilation invasive

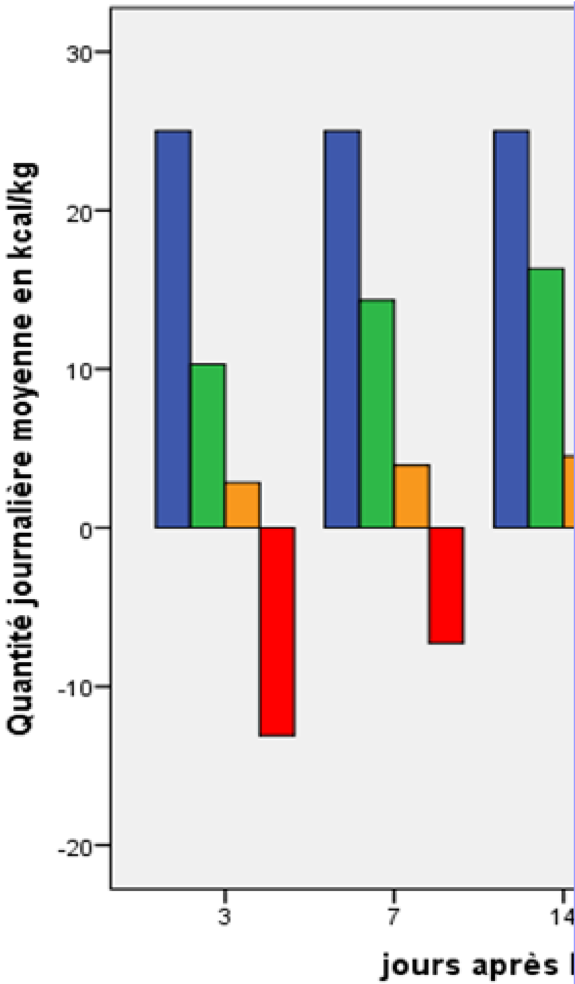
Enhanced Protein-Energy Provision via the Enteral Route Feeding Protocol in Critically Ill Patients: Results of a Cluster Randomized Trial*

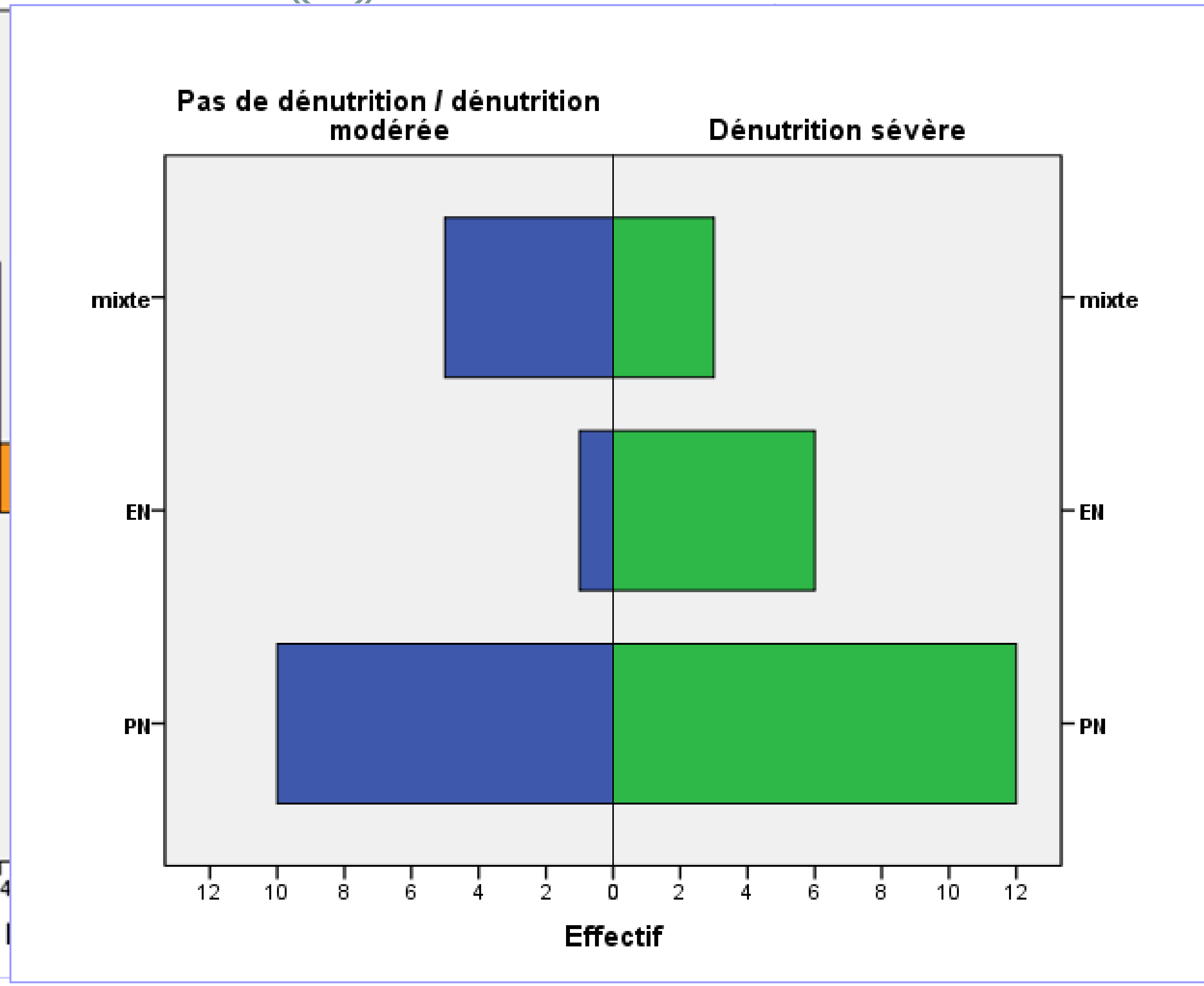



45 ICUs with <50% nutritional intake in 2009 International Nutrition Survey assessed for eligibility
18 Randomized
9 assigned to intervention group
9 assigned to control group
Baseline
Follow-up
Baseline
Follow-up
270 patients met eligibility requirements and were enrolled and included in ITT analysis
260 had at least one day evaluable for nutritional adequacy
252 patients met eligibility requirements and were enrolled and included in ITT analysis
243 had at least one day evaluable for nutritional adequacy
270 patients met eligibility requirements and were enrolled and included in ITT analysis.
263 had at least one day evaluable for nutritional adequacy
267 patients met eligibility requirements and were enrolled and included in ITT analysis.
260 had at least one day evaluable for nutritional adequacy
108 on MV ≤72 hours
4 did not receive the PEP uP protocol
89 on MV ≤72 hours
50 did not receive the PEP uP protocol
111 on MV ≤72 hours
120 on MV ≤72 hours
158 patients included in efficacy analysis
113 patients included in efficacy analysis
159 patients included in efficacy analysis
147 patients included in efficacy analysis
57 patients initiated on 24 hour volume feeds

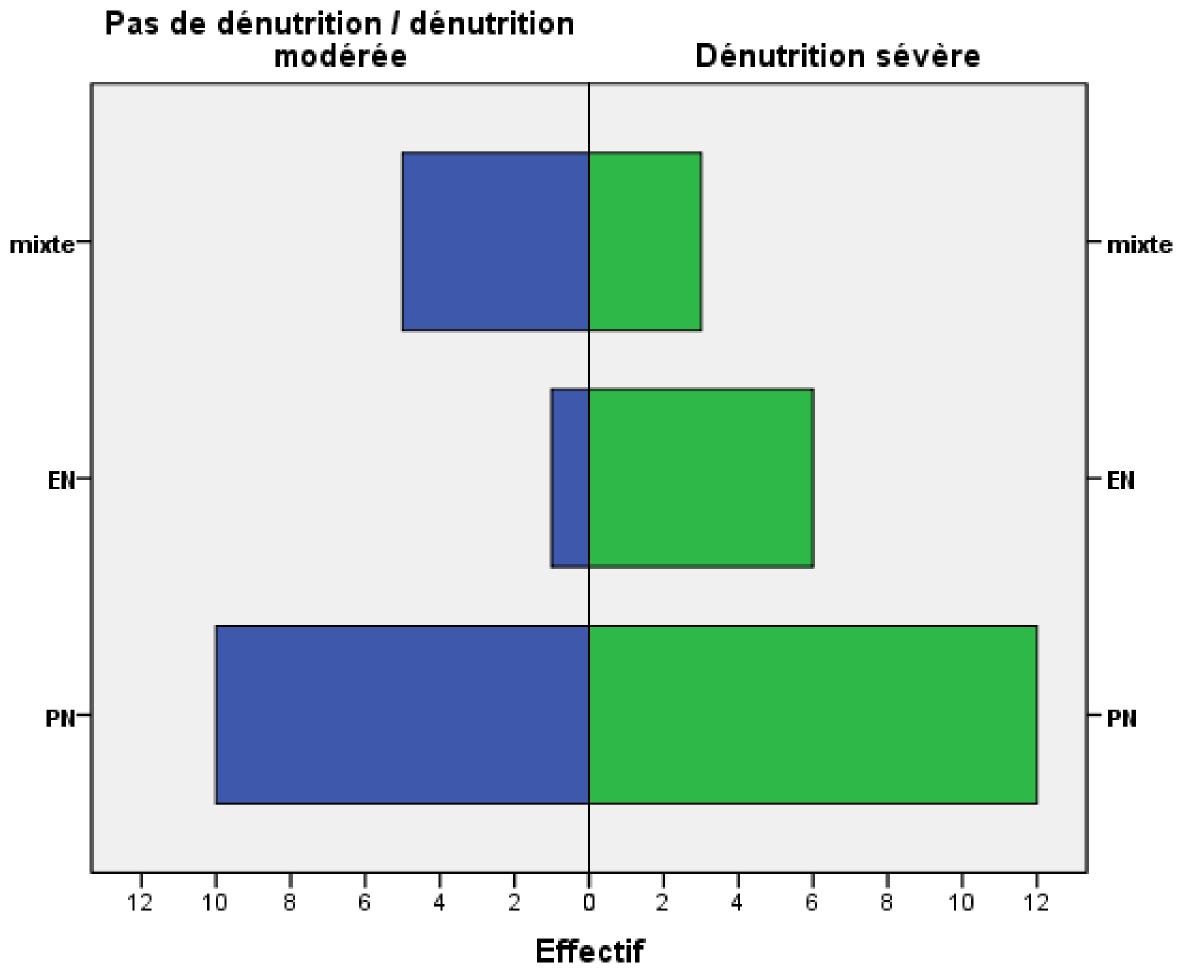
Variable	Intervention		Control		p^a
	Baseline	Follow-Up	Baseline	Follow-Up	
n	270	252	270	267	
ICU mortality (%)	47 (17.4)	35 (13.9)	49 (18.1)	42 (15.7)	0.57
Died within 60 d of ICU admission (%)	70 (25.9)	68 (27.0)	65 (24.1)	63 (23.6)	0.53
Length of stay among 60-d survivors					
Days on mechanical ventilation	3.7 (1.6, 9.1)	4.3 (1.3, 9.9)	3.1 (1.4, 8.4)	3.0 (1.4, 7.3)	0.57
Days in ICU	6.1 (3.4, 11.4)	7.2 (3.4, 11.1)	6.4 (3.3, 12.6)	5.7 (2.8, 11.8)	0.35
Days in hospital	14.2 (8.1, 29.8)	13.5 (8.1, 28.4)	16.7 (7.5, 27.7)	13.8 (7.1, 26.6)	0.73

Etude CAMU


Quantité journalière moyenne en kcal/kg
30
20
10
0
-10
-20
3
7
14
jours après l


Pas de dénutrition / dénutrition modérée
Dénutrition sévère
mixte
EN
PN
12 10 8 6 4 2 0 2 4 6 8 10 12
Effectif

Etude CAMU



Pas de dénutrition / dénutrition modérée
Dénutrition sévère
mixte
EN
PN
12
10
8
6
4
2
0
Effectif

CONCLUSION

- Patients de Réanimation:

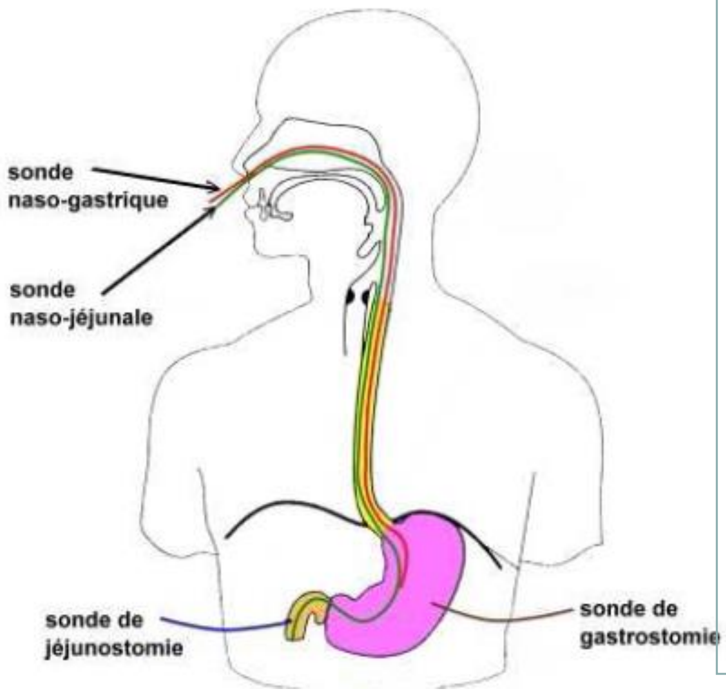
  - Problème d'intolérance digestive

  - Haut risque de dénutrition/NRS > 3

- NE indiscutable/ insuffisante chez certains patients
- Supplémentation précoce par une NP + vitamines, AA, oligoéléments

CONCLUSION

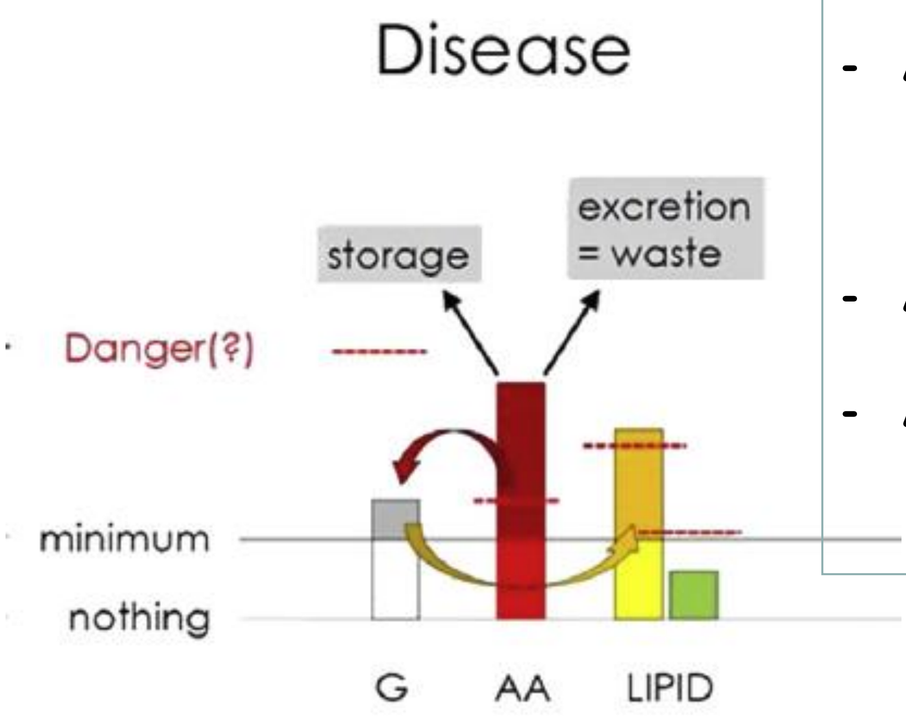
1- Nutrition entérale precoce



EN précoce

- **A faible débit au début: 500Kcal dès j1**
- **↗ progressivement à partir de j2**
- **Supplémentation : Vitamines, AA, oligoéléments,, ...**

CONCLUSION



- Apport protidique 1,3-1,5 g/kg/j

  baisse du catabolisme

- Apport d'AA → Stimulation synthèse

- Apport excessif: risque de protéolyse

MERCI