



Alimentation Parentérale en Réanimation : Etat des lieux et recommandations ?

**DR ASMA MEHDI
RÉA MED CHU LA RABTA**





Efficacité



Capacité à mesurer l'impact de nos interventions devant un patient critique

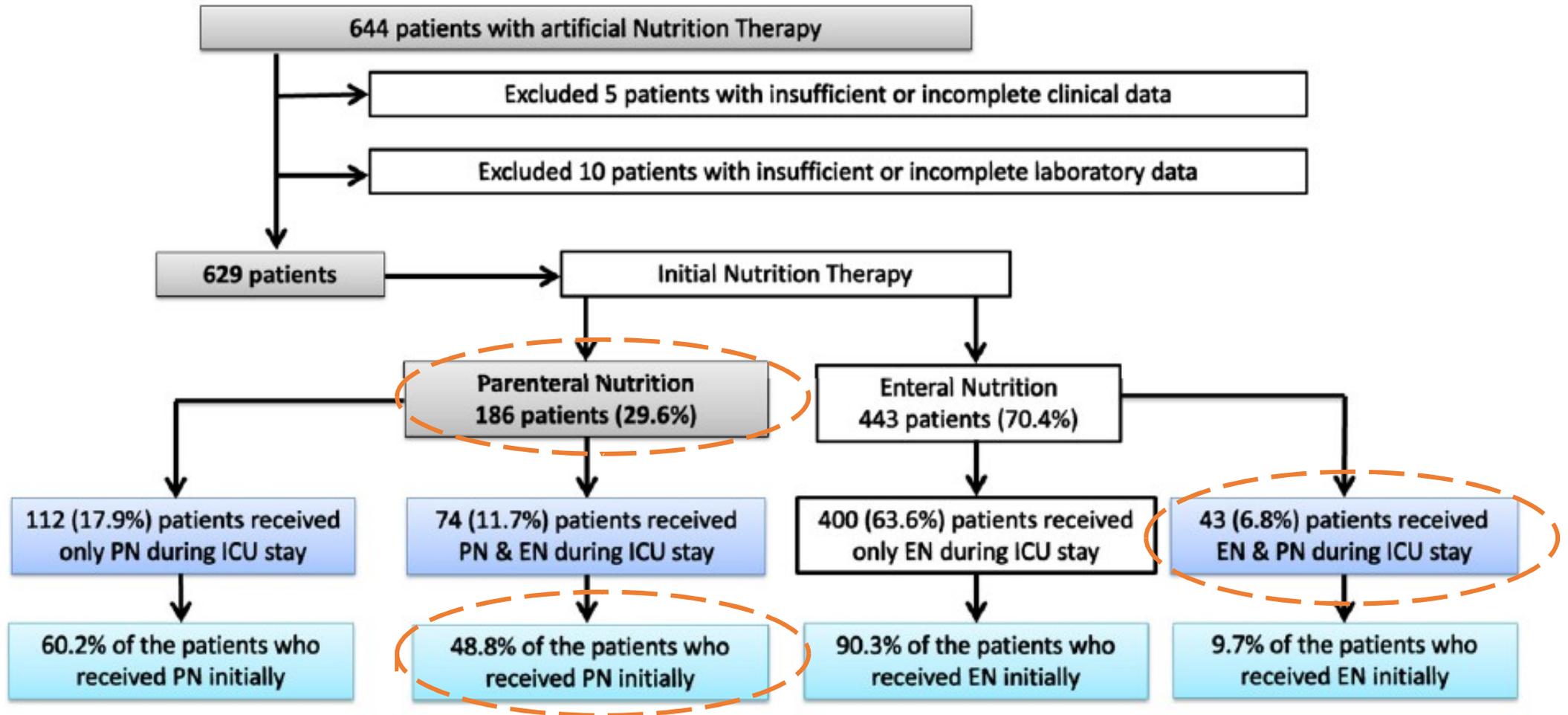
Kelvin's statement : *"When you can **measure** what you are speaking about, **express it in numbers, you know something about it; but when you cannot measure numbers, your knowledge is meager and unsatisfactory; it may be beginning of knowledge, but you have scarcely...advanced to stage of science***



Défi : PEC nutritionnelle en ICU Objective + Mesurable



AP : Pratiques et état des lieux ?



EN: Enteral Nutrition; PN: Parenteral Nutrition

Prescription AP ȳ temps dans **36,4%**

Indication AP ?

us paralytique après chirurgie majeure (44%)

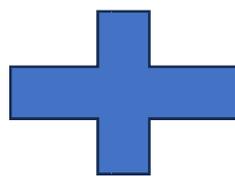
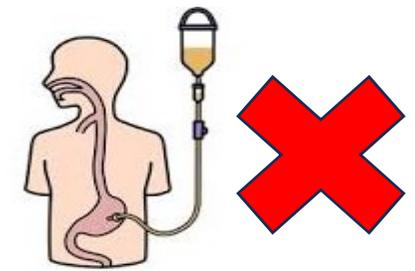
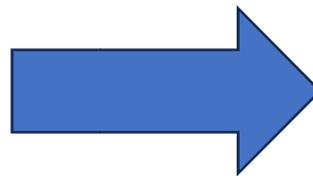
ncréatite aiguë/ Malade de chron (17%)

tule digestive (14,5%)

clusion digestive (8,6%)

èle court (3,2%)

tabilité hémodynamique, Hémorragie digestive active (3%)



- PN précoce <48 h → 75,3%
- Accès vasculaire : KTVC ++

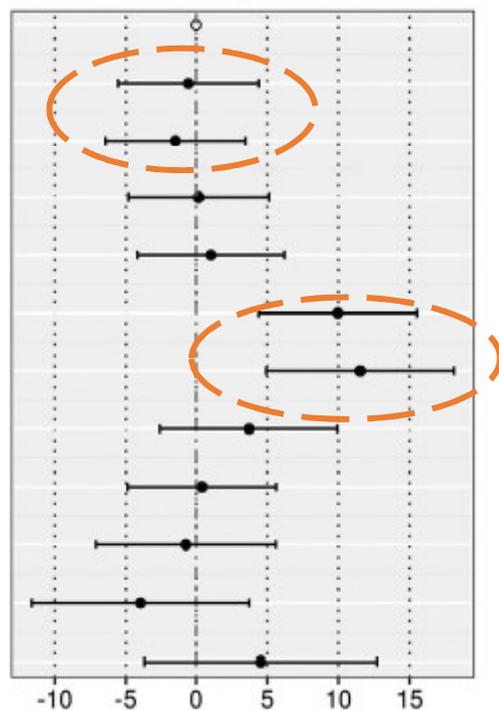
	All Patients <i>n</i> = 186	Only PN <i>n</i> = 112	PN-EN <i>n</i> = 74	<i>p</i> -Value
Patient with malnutrition (based on SGA), <i>n</i> (%)	110 (59.1)	65 (58.0)	45 (60.8)	0.76
mNUTRIC score, mean ± SD	4.55 ± 1.94	4.39 ± 1.98	4.78 ± 1.85	0.18
Patient at risk based on mNUTRIC score, <i>n</i> (%)	90 (48.4)	52 (46.4)	38 (51.3)	0.76

Original article

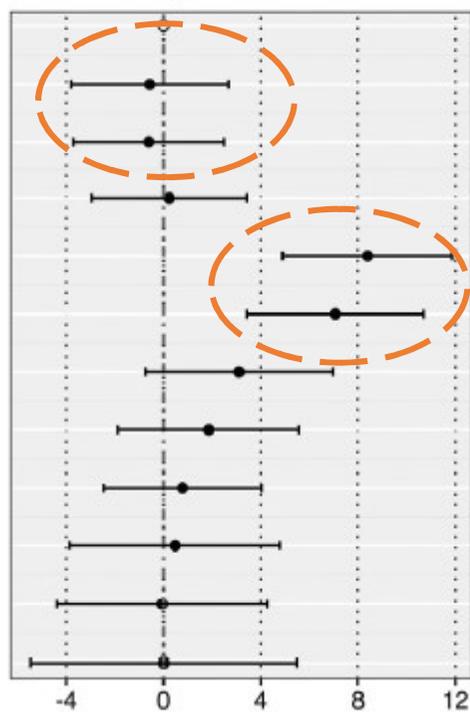
Timing of parenteral nutrition in ICU patients: A transatlantic controversy



EN+PN start day

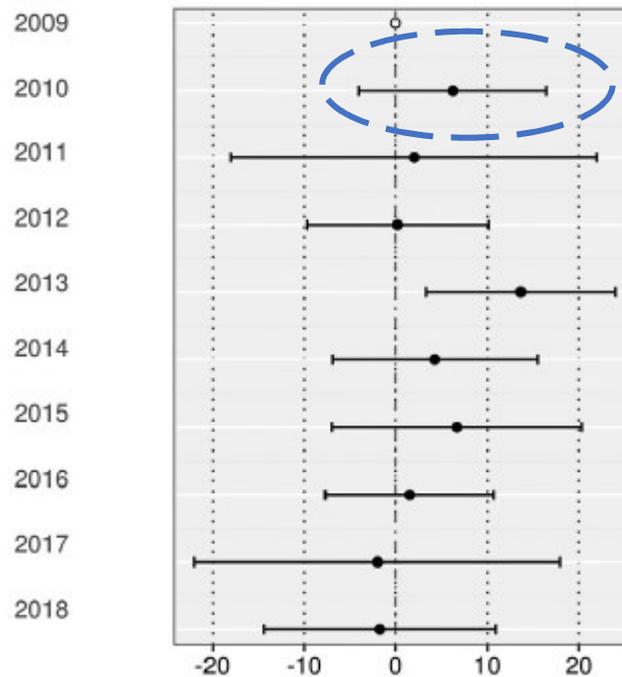


PN start day

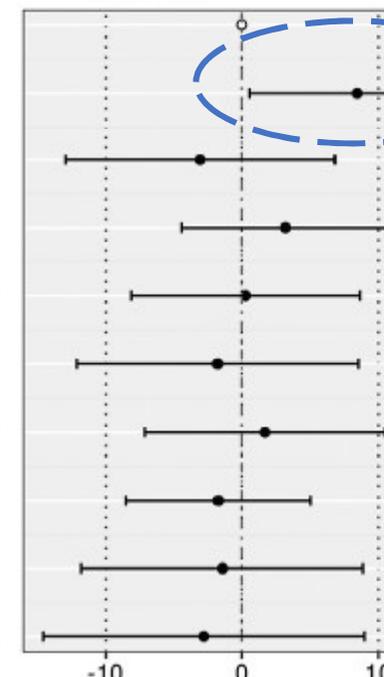


EUROPE

EN+PN start day



PN start day



Hors EUROPE

Administration of artificial nutrition over the years.

EN		PN	
European countries n(%)	Non-European countries n(%)	European countries n(%)	Non-European countries n(%)
300 (48)	—	173 (27)	—
376 (45)	—	307 (36)	—
506 (49)	73 (44)	346 (34)	19 [11]
508 (53)	249 (53)	307 (32)	53 [11]
430 (58)	97 (52)	224 (30)	17 [9]
413 (61)	311 (46)	191 (28)	87 [13]
249 (52)	210 (43)	130 (27)	39 [8]
340 (56)	197 (46)	167 (28)	29 [7]
433 (43)	183 (40)	284 (29)	30 [6]
193 (50)	295 (38)	108 (28)	284 (37)
127 (42)	101 (39)	74 (24)	13 [5]
82 (45)	128 (59)	49 (27)	15 [7]



Prescriptions of EN and PN in European and Non-European countries per year were depicted above.

EN enteral nutrition, PN parental nutrition, n number.

**Proportion toujours <AE (Gold standard)
Prescription > Europe**

Nutrition Support in Intensive Care: Which Practices?



Achwak Mehrez^{1*}, Om kalthoum Sallem², Imen Bannour¹ and Ali majdoub²

¹Intensive care department, University Hospital of Mahdia, Mahdia, Tunisia

²Nutrition-Gastrology department, University Hospital of Monastir, Monastir, Tunisia

Questionnaire auprès des services de soins intensifs

Indications AP: SGI , Intolérance digestive réfractaire aux pro-kinétiques , Obstruction digestive ,
ischémie digestive , fistule digestive → 81% si AE impossible / insuffisante

Accès vasculaires: KTVC (74%)

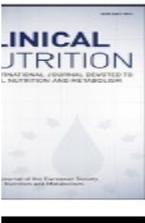
Mal adaptation : Accès et osmolarité du produit administré (31%) : VVP + Hyperosmolaire ?



AP: Indications et Timing ?

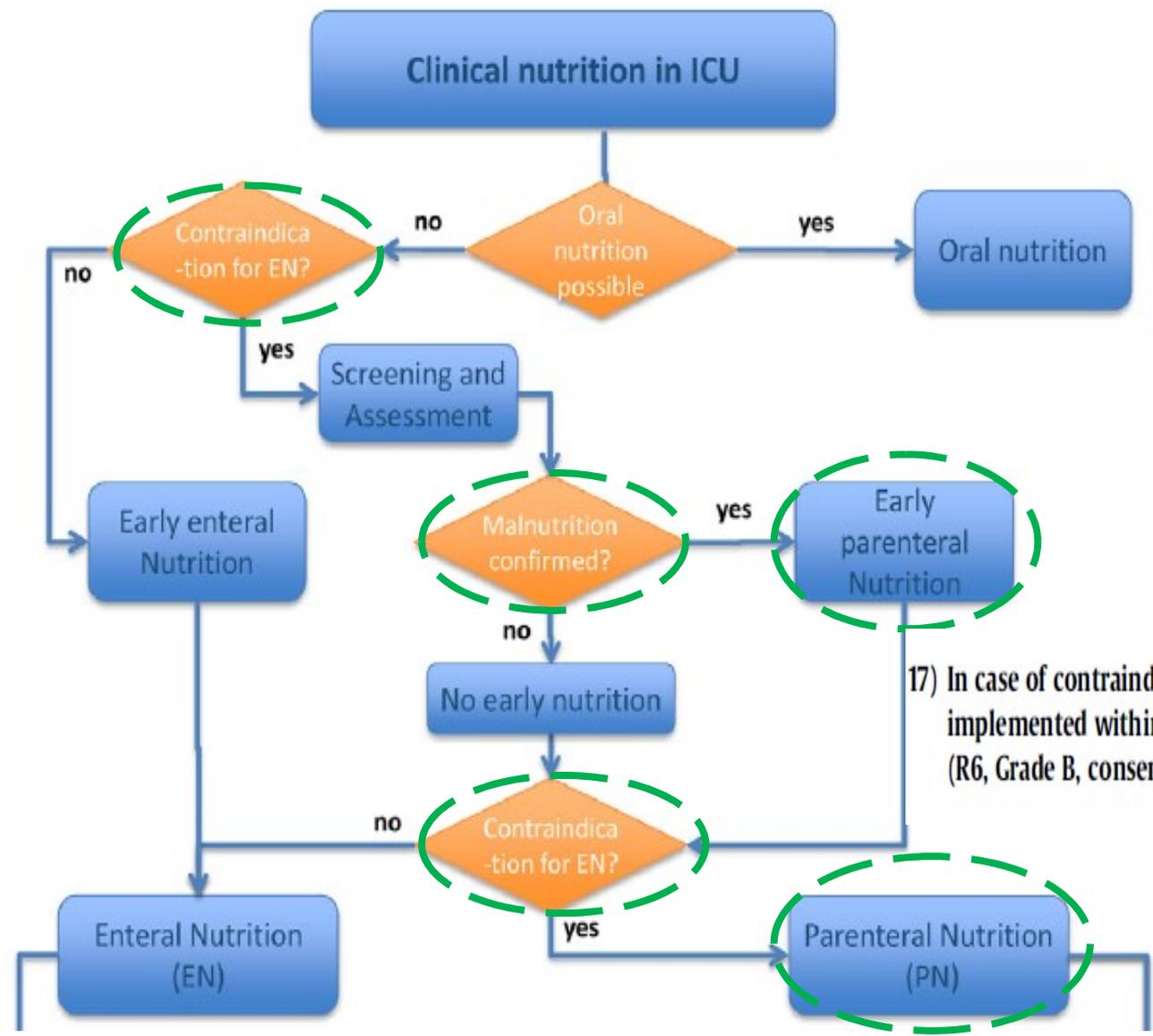


ESPEN
ESPEI
the ir



Early Nutrition
(low dose feeding)

Delayed Nutrition
(start slowly)



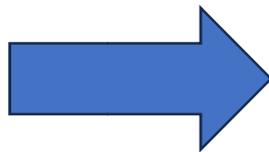
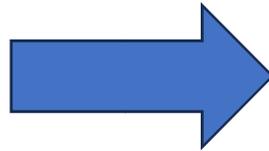
17) In case of contraindications to oral and EN, PN implemented within three to seven days. (R6, Grade B, consensus 89%)

Delayed EN?

EN should be delayed if shock is uncontrolled and hemodynamic and tissue perfusion goals are not reached, whereas low dose EN can be started as soon as shock is controlled with fluids and vasopressors/inotropes, while remaining vigilant for signs of bowel ischemia; in case of uncontrolled life-threatening hypoxemia, hypercapnia or acidosis, whereas EN can be started in patients with mild hypoxemia, and compensated or permissive hypercapnia and acidosis; in patients suffering from active upper gastrointestinal bleeding, whereas EN can be started when the bleeding has stopped and no signs of re-bleeding are observed; in patients with overt bowel ischemia; in patients with high-output intestinal fistula if reliable feeding access distal to the fistula is not achievable; in patients with abdominal compartment syndrome; and if gastric aspirate volume is above 500 mL/6 h. (R39, B, 100%)

12) Low dose EN should be administered

- in patients receiving therapeutic hypothermia and increasing the dose after rewarming;
- in patients with intra-abdominal hypertension without abdominal compartment syndrome, whereas temporary reduction or discontinuation of EN should be considered when intra-abdominal pressure values further increase under EN; and
- in patients with acute liver failure when acute, immediately life-threatening metabolic derangements are controlled with or without liver support strategies, independent on grade of encephalopathy. (R39, B, 96%)



- **EDC non contrôlé** → Risque d'ischémie aiguë mésentérique
- **Hypoxémie, Hypercapnie, Acidose sévère**
- **Hémorragie digestive haute active et non contrôlable**
- **Ischémie mésentérique.**
- **Fistule digestive avec un accès entérique au-delà de la fistule impossible**
- **Syndrome compartimental**
- **Résidu gastrique > 500 cc over 6 heures**

- Hypothermie thérapeutique
- Hyperpression abdominale
- IHC

Limited EN ?

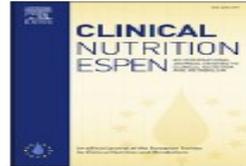
AP: Timing au fil des années ?



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Clinical Nutrition ESPEN

journal homepage: <http://www.clinicalnutritionespen.com>



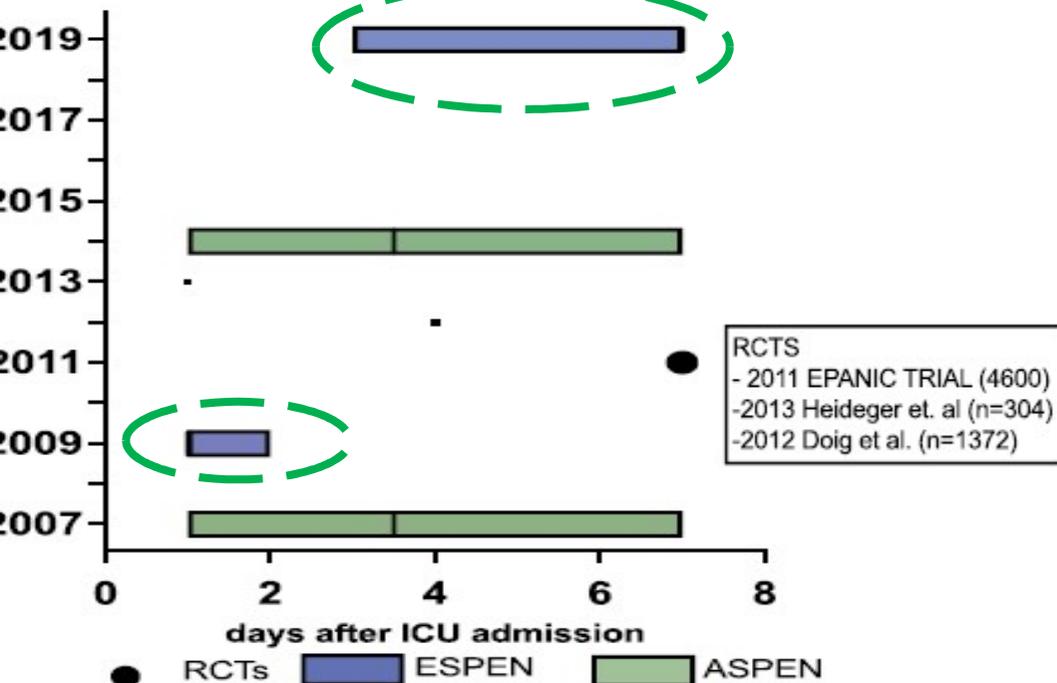
Original article

Timing of parenteral nutrition in ICU patients: A transatlantic controversy



2025

Timing of PN according to RCTs and guidelines



Society	Start SPN*	Start PN	Protein g/kg/day	Energy Kcal/kg/day
ASPEN	After 6 days	Any time	1.2-2.0	12-25 (up to 7-10 day)
ESPEN	Within 3-7 days	Within 3-7 days	1.3	Not exceeding 70% of EE** (day 1-3) After day 3: 80-100% EE**

* SPN, supplemental PN; ** EE, estimated energy, calculated by indirect calorimetry.

Hors dénutrition sévère!!

SPN : Indications et Timing?

EPaNIC study

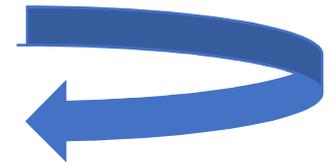
The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Early versus Late Parenteral Nutrition in Critically Ill Adults

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

↑ 6,3% → Likelihood of being discharged earlier from ICU



Secondary outcome			
New infection — no. (%)			
Any	531 (22.8)	605 (26.2)	0.008

↓↓ risque infectieux lié à la nutrition parentérale



The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812

OCTOBER 30, 2014

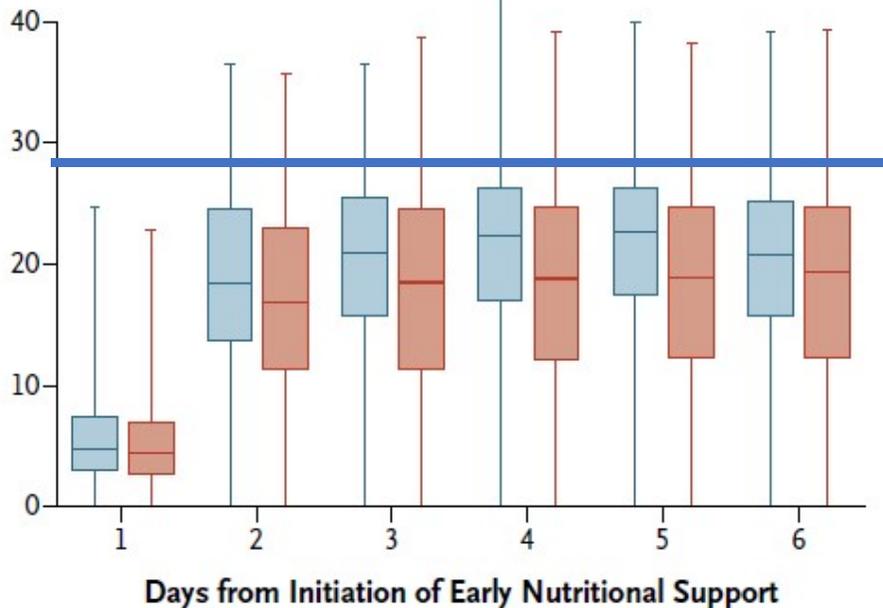
VOL. 371 NO. 18

Trial of the Route of Early Nutritional Support in Critically Ill Adults

CALORIES trial

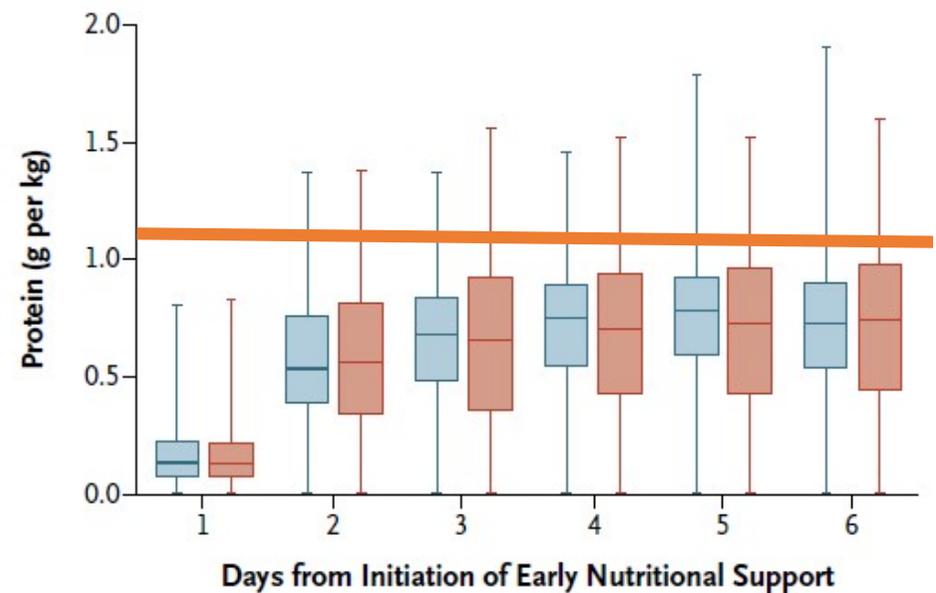
Caloric Intake

Parenteral route Enteral route



B Protein Intake

Parenteral route Enteral route



Supplemental Parenteral Nutrition: Review of the Literature

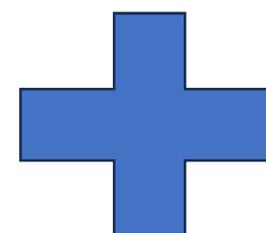
Current Nutrition Guidelines

Nutrition in Clinical Practice
Volume 33 Number 3
June 2018 359–369
© 2018 American Society for Parenteral and Enteral Nutrition
DOI: 10.1002/ncp.10096
wileyonlinelibrary.com

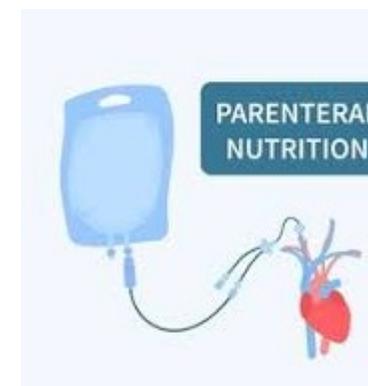
SCCM/ASPEN Guidelines⁶

When to use
SPN

G3. We recommend that, in patients at either low or high nutrition risk, use of SPN be considered after 7–10 days if unable to meet 60% of energy and protein requirements by the enteral route alone. Initiating before this period does not improve outcomes and may be detrimental to the patient. (QOE: moderate)



- ✓ <60 % des BE par AE seule
- ✓ j07-j10
- ✓ Y statut nutritionnel



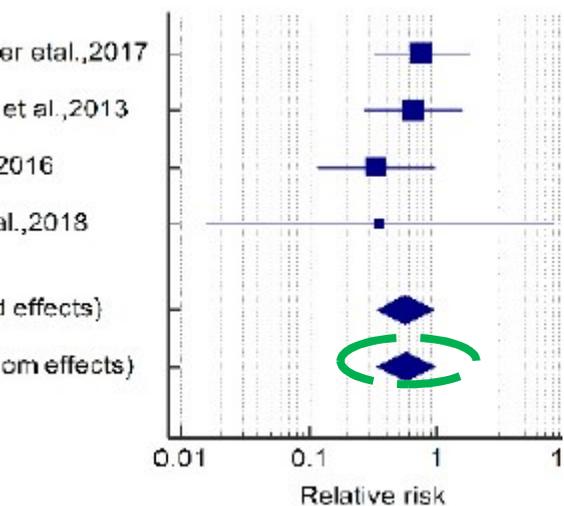


Review

Effect of Supplemental Parenteral Nutrition Versus Enteral Nutrition Alone on Clinical Outcomes in Critically Ill Adult Patients: A Systematic Review and Meta-Analysis of Randomized Controlled Trials

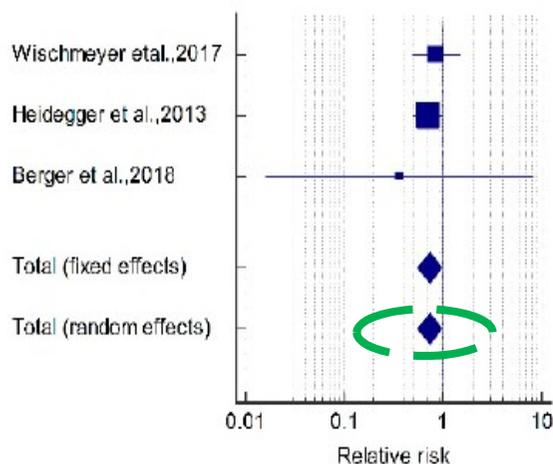
SPN précoce < j04

(a) ICU mortality



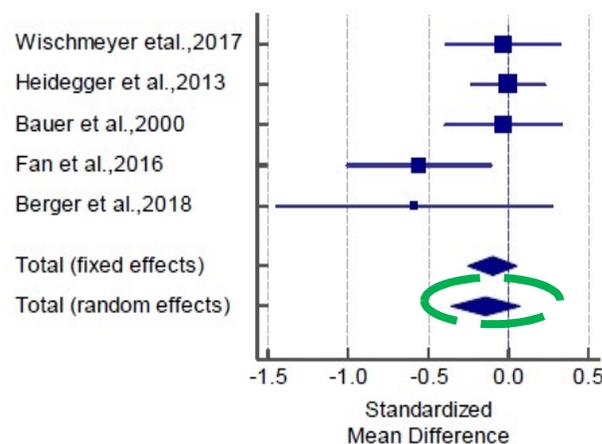
↓ Risque de mortalité
RR=0,56

(b) Presence of infection



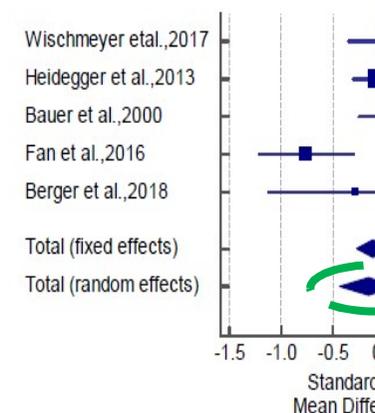
↓ Risque infectieux
RR=0,73

(b) Length of ICU stay



Pas de ↑ de DS / DVM

(c) Duration of mechanical ventilation



Study	SPN + EN		N2	EN Mean (SD)	SMD	95% CI	t-Value	p-Value	Weight (%)	
	N1	Mean (SD)							Fixed	Random
Energy intake										
Wischmeyer et al., 2017	52	95 (13)	73	69 (28)	1.124	0.740 to 1.507			23.93	31.13
Heidegger et al., 2013	153	28 (5)	152	20 (7)	1.313	1.065 to 1.561			56.66	40.37
Bauer et al., 2000	60	24.6 (4.9)	60	14.2 (6.5)	1.795	1.369 to 2.222			19.41	28.50
Total (fixed effects)	265		285		1.361	1.175 to 1.547	14.352	<0.001	100.00	100.00
Total (random effects)	265		285		1.391	1.054 to 1.729	8.097	<0.001	100.00	100.00

Protein intake										
Wischmeyer et al., 2017	52	86(16)	73	64 (26)	0.976	0.599 to 1.353			31.96	47.23
Heidegger et al., 2013	153	1.2(0.2)	152	0.8 (0.3)	1.566	1.309 to 1.823			68.04	52.77
Total (fixed effects)	205		225		1.377	1.166 to 1.589	12.782	<0.001	100.00	100.00
Total (random effects)	205		225		1.287	0.708 to 1.866	4.371	<0.001	100.00	100.00



SPN avant j 04



Article

Parenteral Nutrition: Current Use, Complications, and Nutrition Delivery in Critically Ill Patients

Juan Carlos Lopez-Delgado ^{1,2,*}, Teodoro Grau-Carmona ^{3,4}, Esther Mor-Marco ⁵, Maria Luisa Bordeje-Laguna ⁵, Esther Portugal-Rodriguez ⁶, Carol Lorenzo-Cabrera ⁷, Paula Vera-Artazcoz ⁸, Laura Macaya-Redin ⁹, Beatriz Llorente-Ruiz ¹⁰, Raquel Sanchez-Mirallas ¹¹, Diana Monge-Donaire ¹², Juan Francisco Martinez-Carmona ¹³, Laura Garcia-Gonzalez ¹⁴, Monica Crespo-Gomez ¹⁶, Cristina Leon-Cinto ¹⁷, Jose Luis Flordeelis ¹⁸ and on behalf of the ENPIC Study Group [†]

Day	All Patients n =	PN-EN n = 74	p-Value
1	14.46 ± 6.57	0.73 ± 0.51	0.88
2	19.92 ± 8.45	0.99 ± 0.60	0.94
3	20.82 ± 7.21	1.04 ± 0.45	0.11
4	21.18 ± 7.21	1.08 ± 0.48	0.13
5	21.19 ± 7.91	1.10 ± 0.51	0.07
6	21.41 ± 8.69	1.12 ± 0.49	0.05
7	21.99 ± 8.97	1.15 ± 0.52	0.04
Mean 1st week	15.56 ± 6.57	13.62 ± 4.89	16.84 ± 7.21
		0.001	0.99 ± 0.40
		0.94 ± 0.42	1.07 ± 0.37

SPN → Balance Energétique et protéique (+)

Right Time : Controversé ?

Mean 1st week

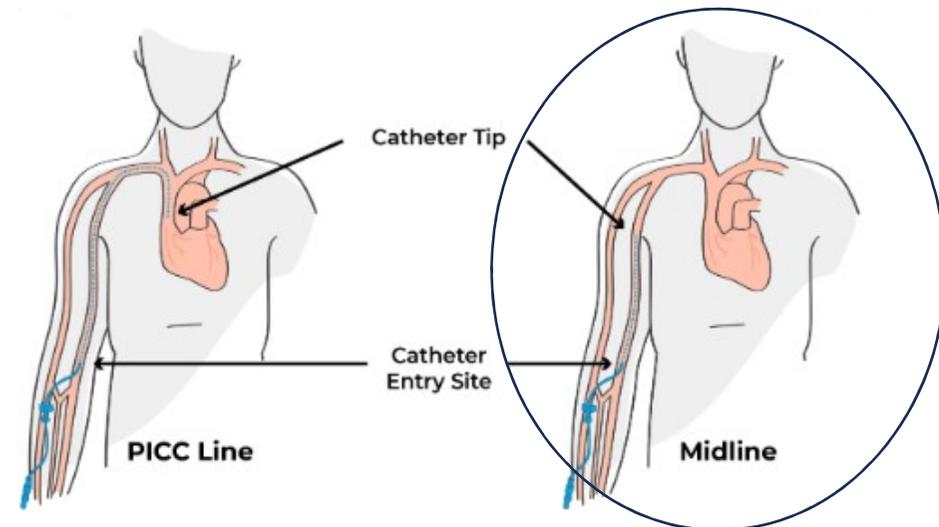
0.001

PN-EN
n = 74

0.04

AP : Accès vasculaires?

Type of VAD	Placement	Limitations	Advantages
Short peripheral catheter	Percutaneous peripheral insertion.	Infusion < 600 mOsm/L, high risk of phlebitis.	Easy to place, cost, lower infection risk.
Midline	Percutaneous peripheral insertion.	Not appropriate for infusions > 900 mOsm/L (needs central access).	Lasting 2–4 weeks.



PICC

Percutaneous placement via a peripheral vein (basilic, cephalic or brachial vein).

Self-care difficult, uncomfortable for long periods, placement needs trained personnel.

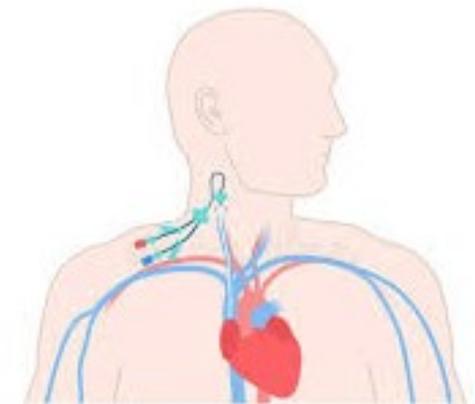
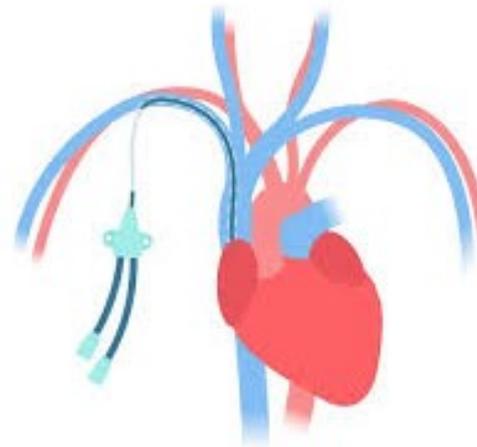
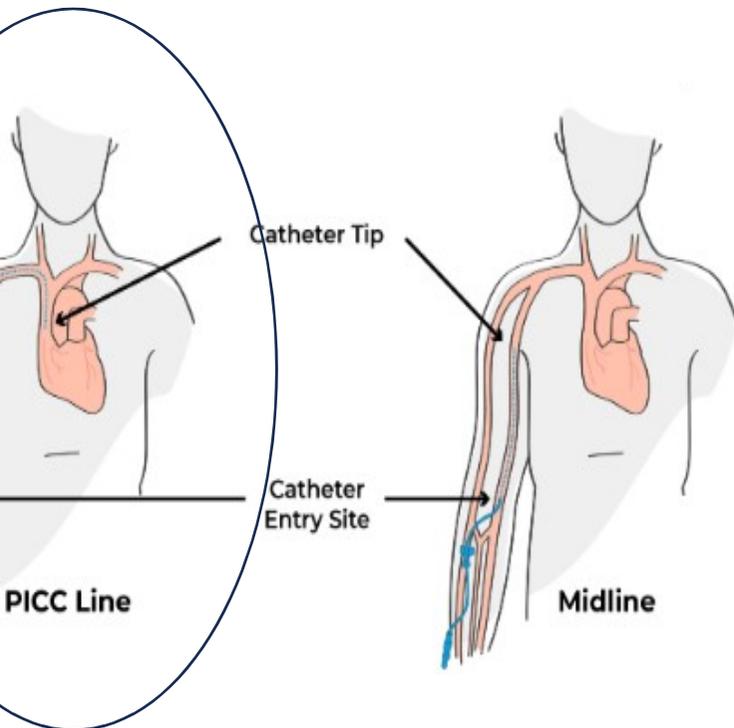
Low risk of placement complications. Used in acute and home care settings. Easy to remove. Lasting weeks to months.

Nontunneled central VAD

Subclavian, jugular or femoral vein.

Operating room or hospital setting for placement.

Long-term usage, easy self-care.



AP : Cibles énergétiques?



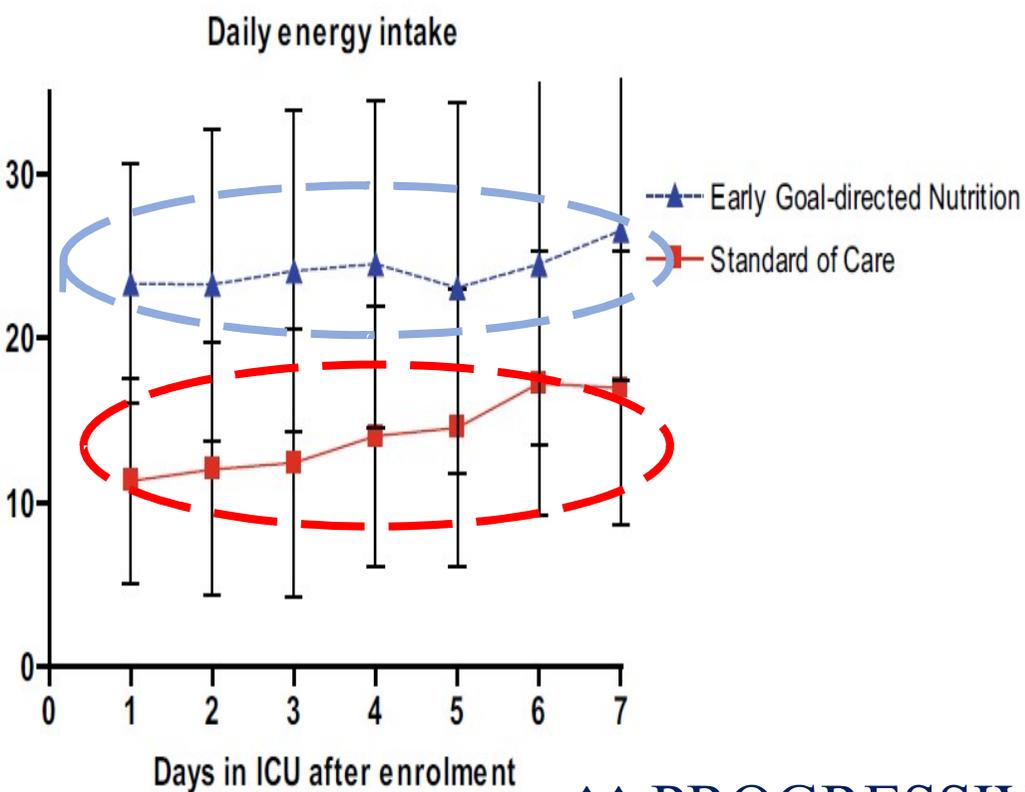
Mot de l'ESPEN



Phase critique de ICU [j01 – J07]++

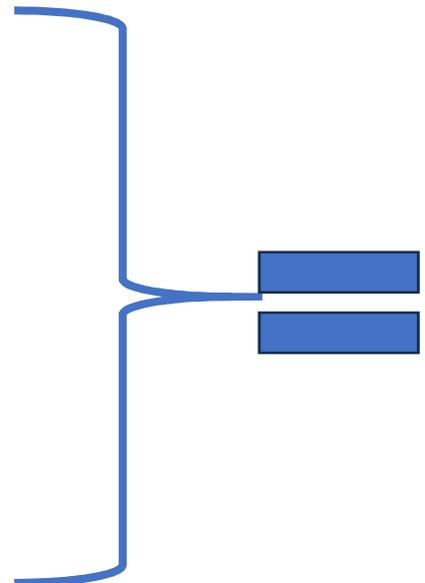
Reco 20 : En présence d'une Calorimétrie indirecte → Régime Iso-calorique avec majoration **PROGRESSIVE** au cours de S1 (R16, Grade 0, **strong consensus**, 95%)

Early goal-directed nutrition versus standard of care in adult intensive care patients: the single-centre, randomised, outcome assessor-blinded EAT-ICU trial



EGDN (CI) vs Standard of care

- Qualité de vie à 6 mois
- Mortalité
- Support d'organe
- Durée de séjour
- Risque infectieux



↑↑ PROGRESSIVE → Cibles même CI

22) If predictive equations are used to estimate the energy need, hypocaloric nutrition (below 70% estimated needs) should be preferred over isocaloric nutrition for the first week of ICU stay.

(R19, Grade B, strong consensus, 95%)

23) Hypocaloric nutrition (not exceeding 70% of EE) should be administered in the early phase of acute illness (Fig. 5).

(R17, Grade B, strong consensus, 100%)

Cible \approx 20-25 Kcal/kg/j



80-100% des BE à partir de J 03





Low versus standard calorie and protein feeding in ventilated adults with shock: a randomised, controlled, multicentre, open-label, parallel-group trial (NUTRIREA-3)

**ICU + VMC
catécho**

E: 6 Kcal/kg/j
0.2-0.4 g/kg/j

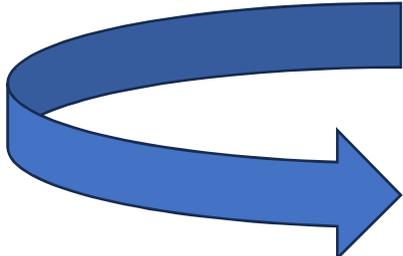
Restriction énergétique et protéique à la phase aigue ?
 les macronutriments à la phase aigue inhibent l'autophagie → Processus crucial dans la récupération cellulaire



	Low group (n=151)	Standard group (n=151)	Mean difference (95% CI)	Ratio (95% CI)	p value
Primary outcomes					
Day 90 mortality	628 (41.3%)	648 (42.8%)	-1.5 (-5.0 to 2.0)	..	0.41
Time to readiness for ICU discharge*	8.0 (5.0 to 14.0)	9.0 (5.0 to 17.0)	..	1.12 (1.02 to 1.22)	0.015



Cibles/j en protéines ?



Clinical Nutrition 42 (2023) 1671–1689

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Clinical Nutrition

journal homepage: <http://www.elsevier.com/locate/clnu>



Check for updates

PN Guideline

OPEN practical and partially revised guideline: Clinical nutrition in intensive care unit

Clinical Guidelines

Guidelines for the Provision and Assessment of Nutrition Support Therapy in the Adult Critically Ill Patient: Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.)

ing critical illness, 1.3 g/kg protein equivalents per day
be delivered progressively.
updated, Grade 0, strong consensus, 92%)

H2. We suggest that hypocaloric PN dosing (≤ 20 kcal/kg/d or 80% of estimated energy needs) with adequate protein (≥ 1.2 g protein/kg/d) be considered in appropriate patients (high risk or severely malnourished) requiring PN, initially over the first week of hospitalization in the ICU.



nutrients

Review

Parenteral Nutrition Overview

- ARA \rightarrow 0,6-0,8 g
- IRC \rightarrow 1g/kg/j
- HD \rightarrow 1,2-1,5g/k
- Hémodiaf \rightarrow 2g/k



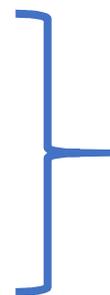
Personalized nutrition therapy in critical care: 10 expert recommendations

Paul E. Wischmeyer^{1*}, Danielle E. Bear², Mette M. Berger³, Elisabeth De Waele^{4,5},
Ronald M. Goon Gunst⁶, Stephen A. McClave⁷, Carla M. Prado⁸, Zudin Puthuchear^{9,10}, Emma J. Ridley^{11,12},
Geert Van den Berghe⁶ and Arthur R. H. van Zanten¹³

Apports protéiques élevés (> 1,2 g/kg/j) → **Aucun bénéfice**

First Week ICU :

immobilisation
résistance à l'insuline
état inflammatoire
ATP musculaire



Anabolisme **Aboli** → Pas de synthèse de **MM**



Personnalisation (Ne pas être trop pragmatique) ?

- Apport basé sur la **masse maigre** plutôt que TBW (sarcopénie?)
- Bilan azoté ? (Une balance (+) en nitrogène ≠ Synthèse musculaire)
- Apport suffisant de **calories NP** (Ratio 70/1 → 100/1) (ASPEN)

Glucose et Acides gras ?

ESPEN

The amount of glucose (PN) or carbohydrates (EN) administered to ICU patients should not exceed 5 mg/kg/min.

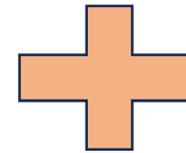
(R23, Grade GPP, strong consensus, 100%)

The administration of intravenous lipid emulsions should be generally a part of PN.

(R24, Grade GPP, strong consensus, 100%) (Fig. 6)

Intravenous lipid (including non-nutritional lipid sources) should not exceed 1.5 g lipids/kg/d and should be adapted to individual tolerance.

(R25, Grade GPP, strong consensus, 100%) (Fig. 6)



AG poly-insaturés
(Essentiels) → Eicosanoïdes
→ Pro-inflammatoires

37) Parenteral lipid emulsions enriched with EPA + DHA (Fish oil derived) 0.1-0.2 g/kg/d can be provided in patients receiving PN. (R33, updated, 0, 100%)

immunosuppressant
immunomodulateur-
oxydant



AP: Micronutriments

38) To enable substrate metabolism, micronutrients (i.e. trace elements and vitamins) **should be provided daily with PN (Fig. 6).**

(R34, Grade B, strong consensus, 100%)

Solutions de PN commercialisés → Pas de micronutriments (Stabilité ++)
→ **A adjoindre**

Mais supplémentation → **challenge** ? → Valeurs faussement ↓ si état inflammatoire

Détecter les situations à risque de déficit (CRRT++), Pertes digestives, brûlures ...

A partir de **j06-j07**

Déficit en cuivre : Marqueur pronostique (sepsis++)..



AP: Situations particulières en ICU

ESPEN 2023

SURGICAL PATIENT **AP: QUAND?**



Complications chirurgicales après une chirurgie abdominale / œsophagienne à type de **discontinuité** ou **obstruction GI** ou **syndrome compartimental**

→ **AP** (Reco 45)

Fuite anastomotique / Fistule digestive interne ou externe + Accès distal pour **AE impossible**

→ **AP** (Reco 47)

Non-intubated patients AP: QUAND?



NON!

Dysphagie + Accès oral impossible + Risque d'inhalation + AE post-pylorique impossible
→ **AP temporaire** (Reco 43)

**Dysphagie ≠ Alimentation
parentérale!!**

MERCI 

A hand-drawn graphic featuring the word "MERCI" in a bold, black, sans-serif font. To the right of the word is a solid pink heart. Below the word and heart is a thick black curved line that starts and ends with small vertical bars, resembling a wide smile.