Nutrition & trauma Crânien pédiatrique

Comment optimiser?

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Chirurgie - Traumatologie

Mars 2017

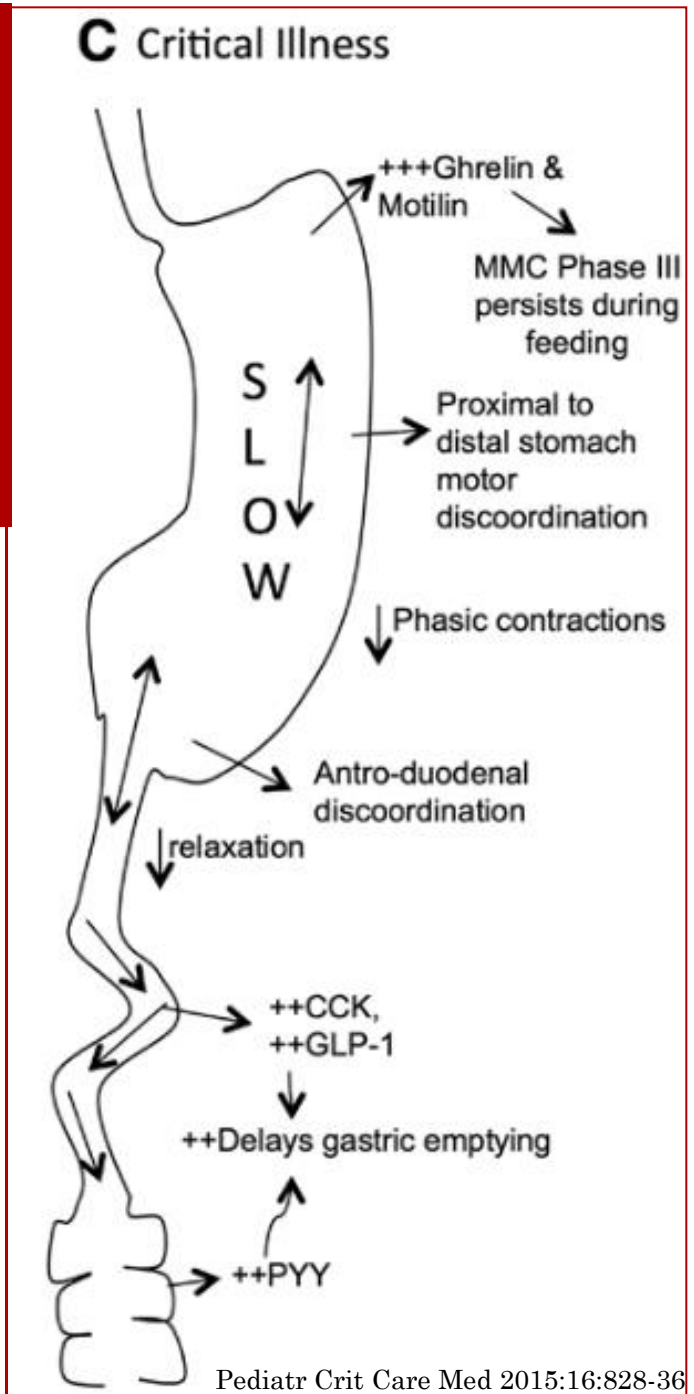
CHU Sainte-Justine
Le centre hospitalier universitaire mère-enfant
Université de Montréal

Plan

- Théorie
- Évaluation des Pratiques à Ste-Justine (04-2014 à 10-2016)
- Recommandations ASPEN/SCCM
  - Initiation NE
  - Protéine
  - Énergétique
  - Post-Pylorique Vs Gastrique
  - Immunonutrition
- Facteurs limitants
- Pistes de solution

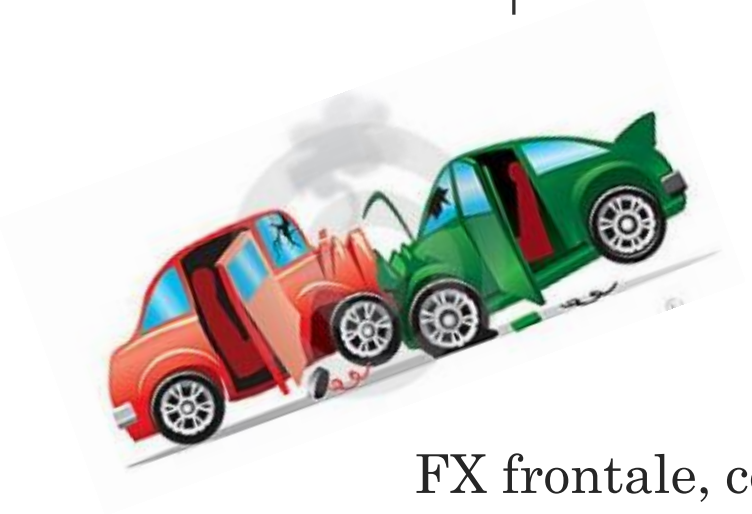
TCC
CONDITION HYPERCATABOLIQUE

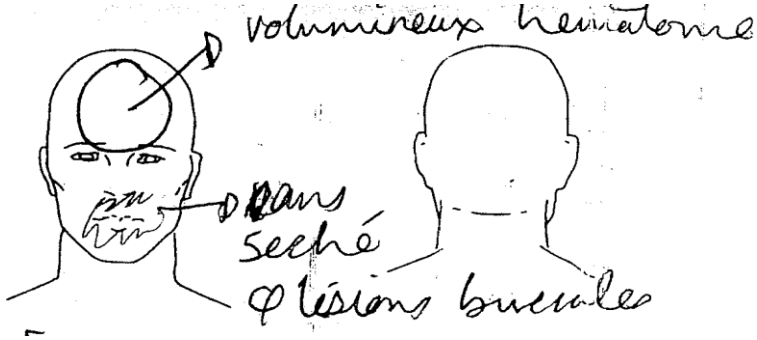
Énergivore et Dysfonction Gastrique



Pediatr Crit Care Med 2015:16:828-36

♀ 13ms TCC Modéré





FX frontale, contusion bifrontale, HSD
déchirure dure-mère, œdème ….

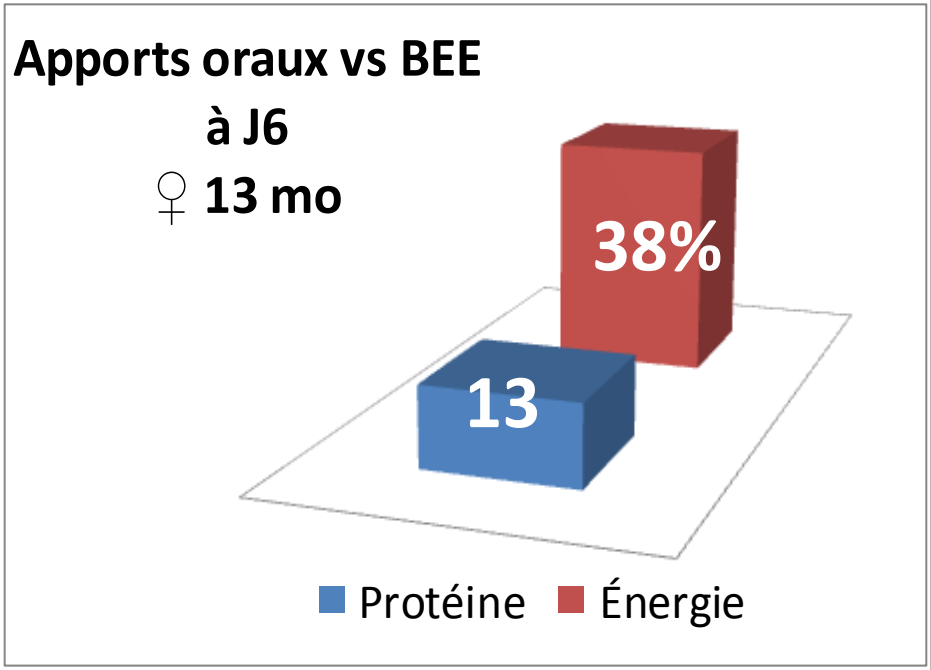
J2 – Extubée / **Reprise per os?**
J5 IRM + SOP

Pat	Âge	GCS	ISS	S.Int #Jr	Hosp #Jr	Poids Kg /perc	Complications
20	1,1	9	18	4	12	12,9 / **90**	**3 Plaies de pression**

Suivi nutrition

- **P adm- 12,9 kg (>95ep)**
- **P J 12- 10,9 kg (↓16%)**

  (P vs T > 85e > 90ep)



- Hémiparésie G/ Oedème visage ..**texture adaptée**
- Acceptation limitée des suppléments protéinés
- J12 Post-op #8 ½ parésie G - **fatigabilité**

Plaies de pression
J 8

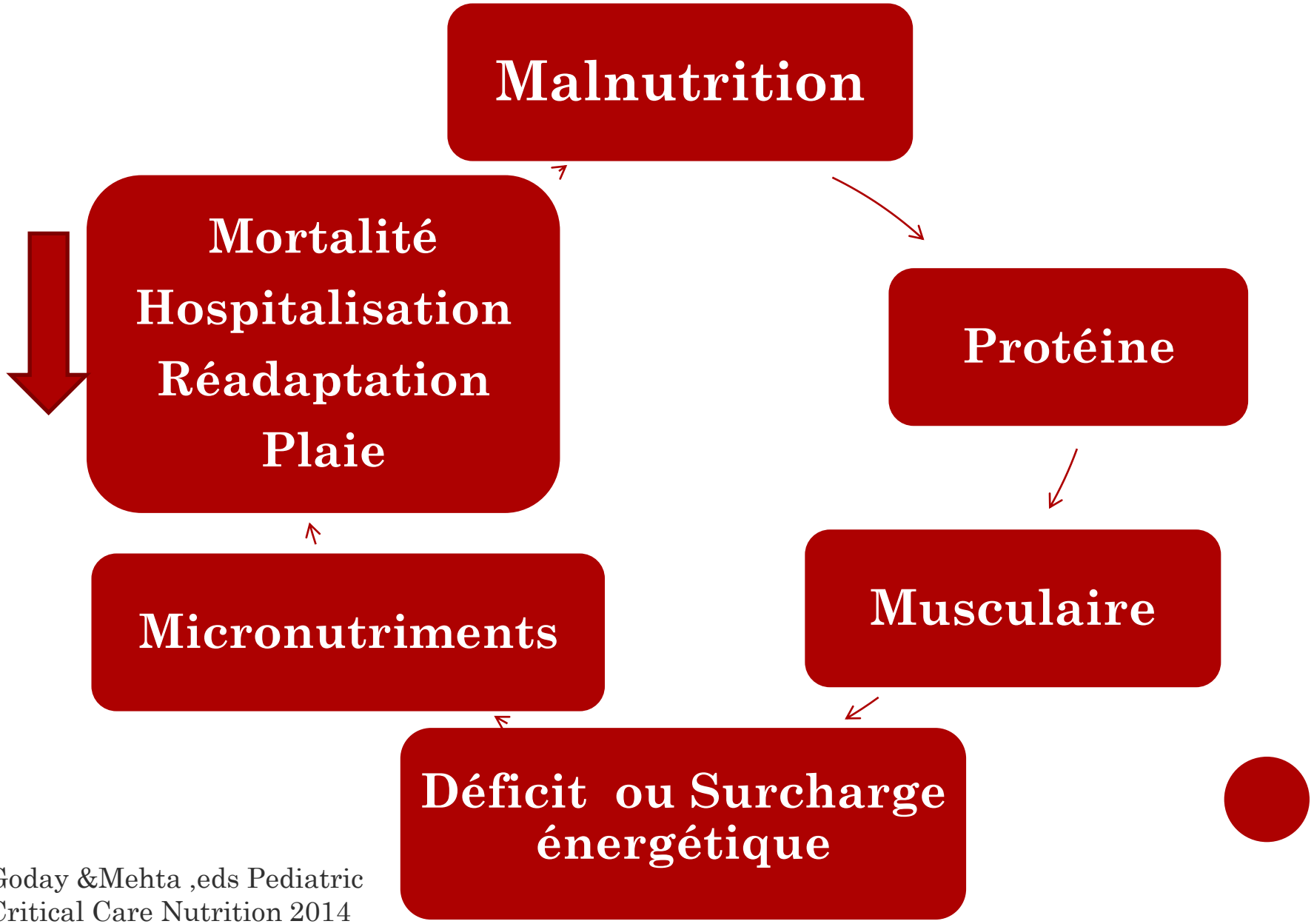
♀ 13ms TCC modéré / sévère

Malnutrition Sévère
En contexte aigu

Faire mieux ?

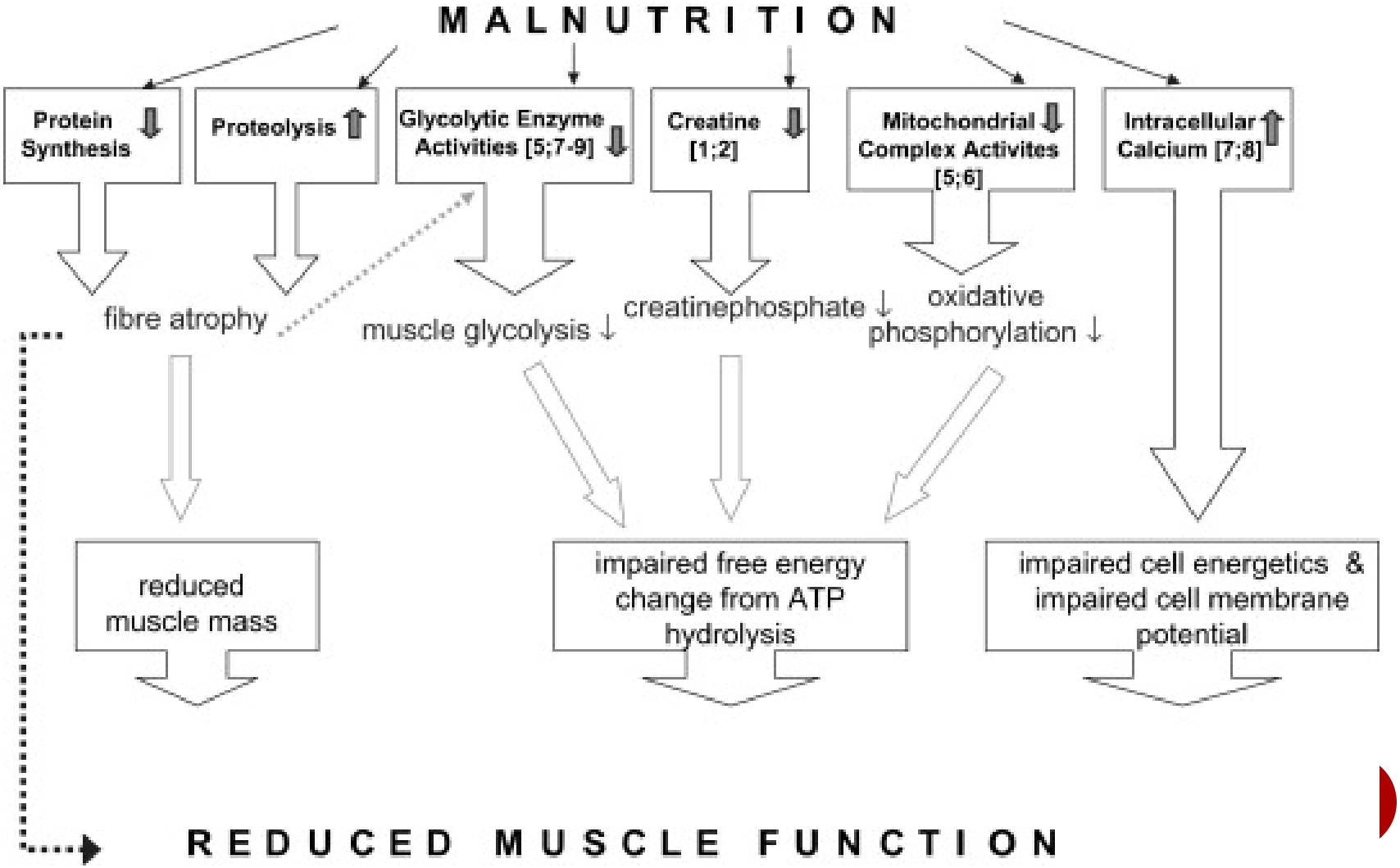
?
 # Jrs NPO
#Jrs en déficit P-E
Voie de nutrition TCC
Solution entérale
?

Thérapie nutritionnelle - Buts



Goday &Mehta ,eds Pediatric Critical Care Nutrition 2014

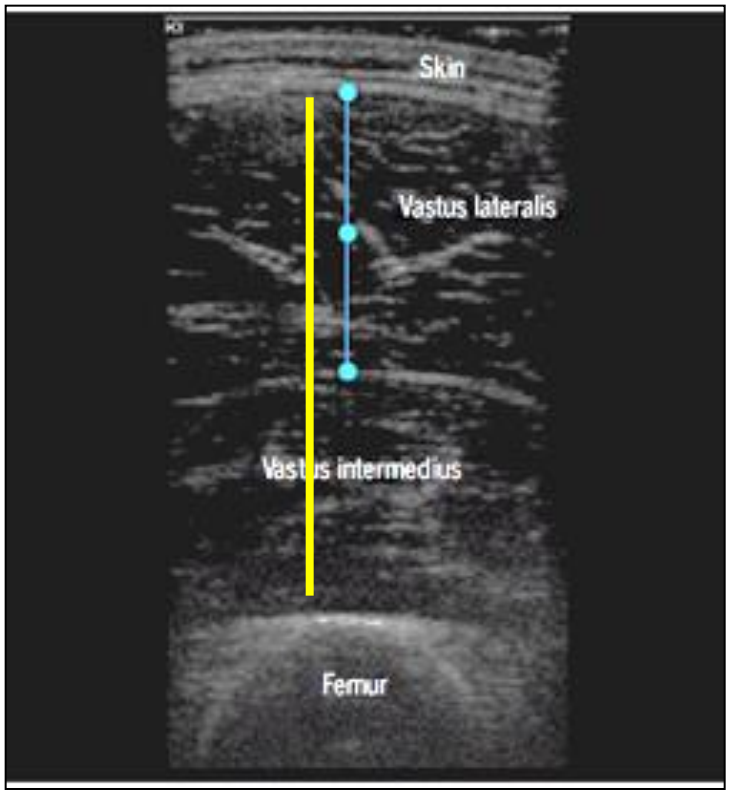
HYPOTHÈSE DE LA MALNUTRITION SUR LA FONCTION MUSCULAIRE

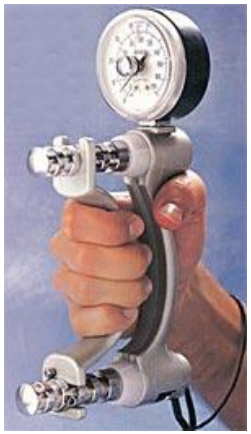


Clin Nutr. 2005;24:143-150

Masse musculaire mesurée

- Examen physique nutritionnel (NFPE)
- Échographie
  Épaisseur du quadriceps fémoral
- CT scan L3-L4
- Force de préhension > 6ans





LIGNES DIRECTRICES

Évidence faible
D –E
?

Nutrition Therapy in Critically Ill Infants & Children

Heather E. Skillmann & Paul E. Wischmeyer
JPEN Vol 32, No 5, Sept/Oct 2008

A.S.P.E.N. Clinical Guidelines:
Nutrition Support of the Critically Ill Child

Nilesh M. Mehta, MD, DCH1; Charlene Compher, PhD, RD, CNSD2
JPEN Vol. 33, No. 3, May/June 2009

Juin 2017
SCCM & ASPEN

Lignes directrices TCC pédiatriques 2012

Évidence faible

Acute Medical Management - Pediatric Crit Care Med 2012, vol 13 no1(Suppl)

- Énergie ↑ + Croissance
- Énergie mesurée *(CI)* vs calculée – ***135% à 146%***

  4 sem. post-accident
- ***Class 2 & 3*: 100% énergie au 7ième j post-accident**
- 3: Naso-jéjunal, continu: + Énergie /tolérance
- *2*: *NE* initiée à 12H
- Immunonutrition: + Balance *N*

LIGNES DIRECTRICES

Level IIA: MB au moins **5e jr**, et au plus au **7e** , afin de diminuer la mortalité.

Level 11B: **Post-Pylorique (jéjunal)** afin de réduire l'incidence des pneumonies associées à l'assistance ventilatoire

Chourdakis,2012 (*class2*) ***NE*** **24-48H** peut diminuer la réponse inflammatoire

INESSS-ONF, 2015: Niveau d'évidence : A

- Lorsqu'appropriée, la **nutrition entérale précoce** est recommandée pour réduire l'incidence des infections, la dépendance au ventilateur mécanique et le séjour à l'unité des soins intensifs, de même que pour améliorer le profil hormonal et potentiellement contribuer à une évolution plus favorable chez les personnes ayant subi un traumatisme craniocérébral.
  - RÉF : Evidence-Based Review of Moderate To Severe Acquired Brain Injury (ERABI) (2016)

- L'alimentation devrait être débutée au cours des **24 à 48 heures suivant l'admission**, si le patient est stable hémodynamiquement. En contrepartie, il est recommandé d'attendre si de fortes doses de catécholamine sont administrées,…(C)
  - RÉF : McClave et al. (2016

CHU Sainte-Justine

Le centre hospitalier universitaire mère-enfant

Objectif: Évaluation de nos pratiques vs recommandations
Rétrospective 04-2014 à 10-2016

1) Voies d'alimentation
2) Initiation *NE*
3) Apports vs Besoins
4) Solution initiale

SOUTIEN NUTRITIONNEL AUX S.INT CHEZ LES TCC MODÉRÉS OU SÉVÈRES

Objectif: Évaluation de nos pratiques vs recommandations
Rétrospective *04-2014* à *10-2016*

53
patients

(- TNA & GCS 15)
44

S.Int. >3jrs
23

15 ♀ / 29 ♂
#TCC modéré: 18
sévère : 26
#Dcd: 4
Âge: 6 (0,4-16a)
GCS: 7,5 (3-12)
ISS: 23 (2-50)
#Jrs S.Int.: 4 (1-27)
 # Jrs total: 9,5 (1-54)

SOUTIEN NUTRITIONNEL AUX SOINS INTENSIFS
TCC MODÉRÉS OU SÉVÈRES

S.Int. >3jrs

23 pat.

8 ♀ / 15 ♂

#TCC mod: 10

sév.: 13

Âge: 10 (1-16a)

GCS: 8 (3-12)

ISS: 24 (11-50)

#Pat >3≤7J: 15

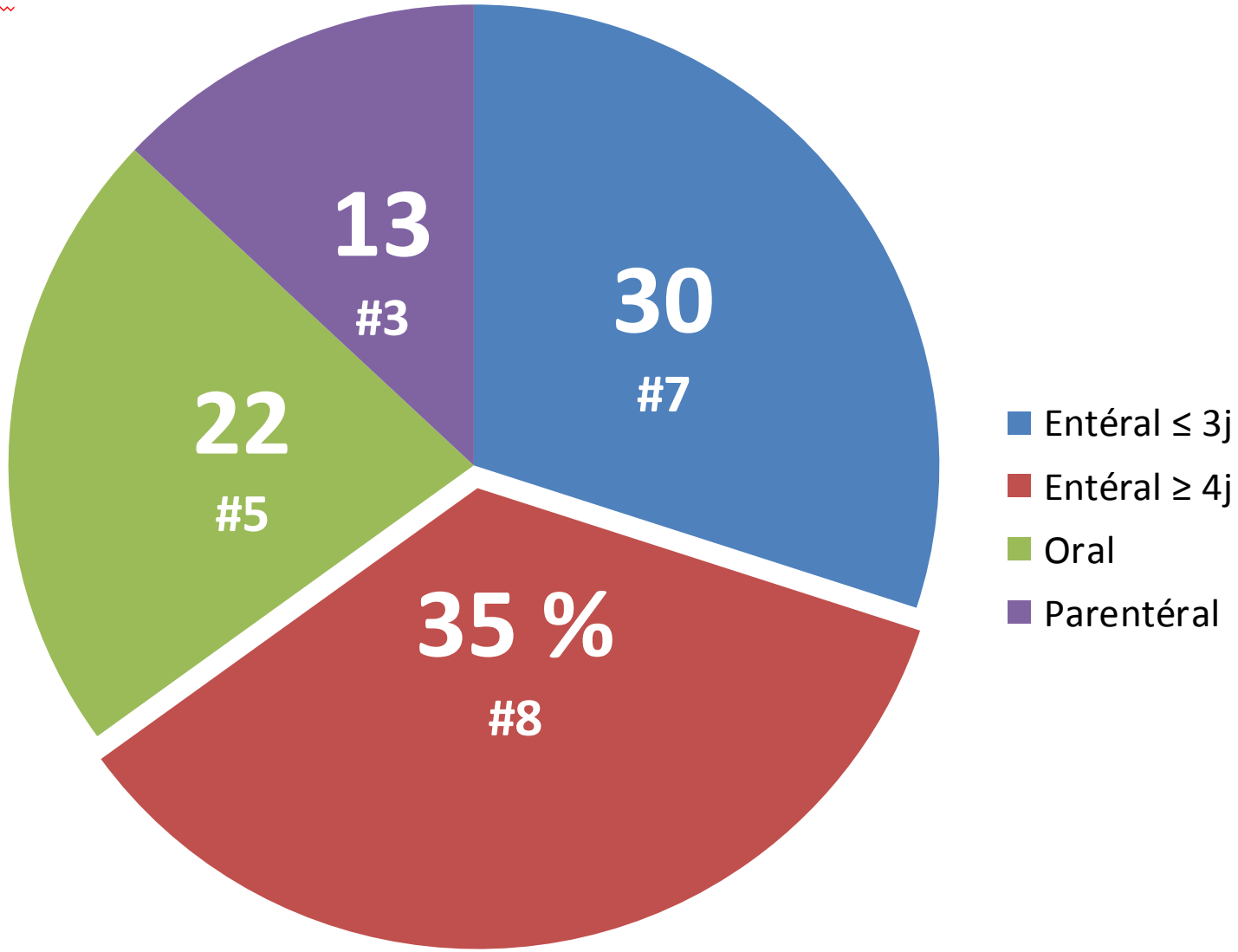
 # Pat >7J: 8

Évaluation nutritionnelle 20/23

J-*méd* 3,5 (1 -10)

Voie de nutrition - initiale

N=23



Malakouti- Nutrition support & deficiencies in children with severe *TBI*.

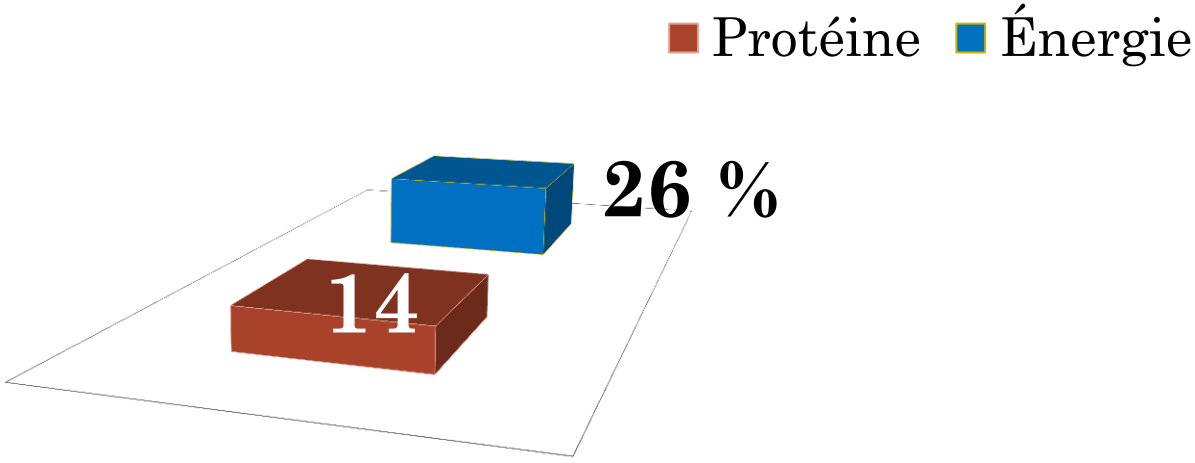
Pediatr Crit Care Med, 2012. 13(1): p. e18-24.

Enteral nutrition	101 (100)
Parenteral nutrition	13 (12)
Initiation of nutrition after PICU admission (hrs)	53 ± 20
Nutrition initiated within 48 hrs after PICU admission	51 (52)
Nutrition initiated within 72 hrs after PICU admission	83 (82)
Time to start enteral nutrition (hrs) among patients receiving a vasopressor (n = 30)	57 ± 30
Time to start enteral nutrition among patients not receiving a vasopressor (n = 71)	58 ± 29
Patients who never reached the caloric goal during 14 days	6 (6)
Patients who never reached the protein goal during 14 days	14 (14)
Days patients reached the caloric goal (%)	26 ± 16
Days patients reached protein goal (%)	18 ± 19
Weight change on PICU day 7 (%)	0.6 ± 11
Weight change on PICU day 14 (%)	−7 ± 11
Weight change at PICU discharge (%)	−5 ± 12

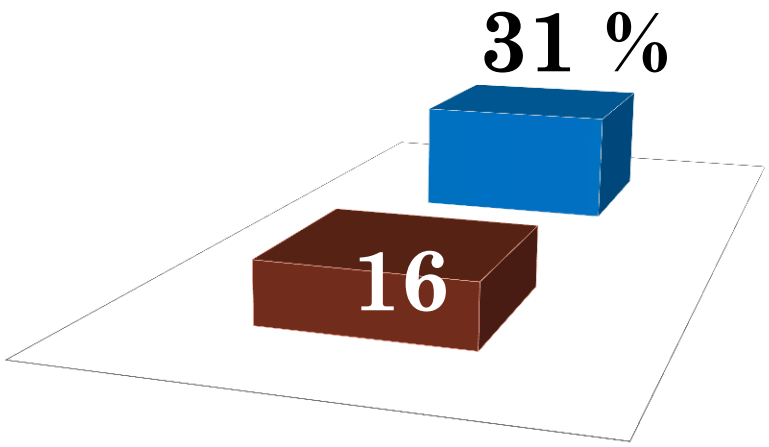
Pour nos patients, la *NE* ≤72h 30%

Apports moyens aux S.Int. 0 à7J vs Besoins

Séjours > 3J
N=15



Séjours ≥ 7J
N= 6



Malakouti, A., et al., *Nutrition support and deficiencies in children with severe TBI.*
Pediatr Crit Care Med, 2012. **13**(1): p. e18-24.

Table 3. Average caloric and protein goals met (%) by pediatric intensive care unit length of stay (n = 101)

PICU Length of Stay	Calorie Intake	Protein Intake
24 hrs after start of nutrition support	5 ± 5	1 ± 1
PICU days 0–7	49 ± 17	37 ± 19
PICU days 8–14 (n = 83)	78 ± 29	72 ± 31

PICU, pediatric intensive care unit.

Data presented as mean ± SD. $p < .01$ for differences in caloric and protein intakes among the three time intervals.

Pour nos patients
Apport moyen en Énergie 0 - 7J : 26%
en Protéine: 14%

Malakouti- Énergie & Protéine vs besoin

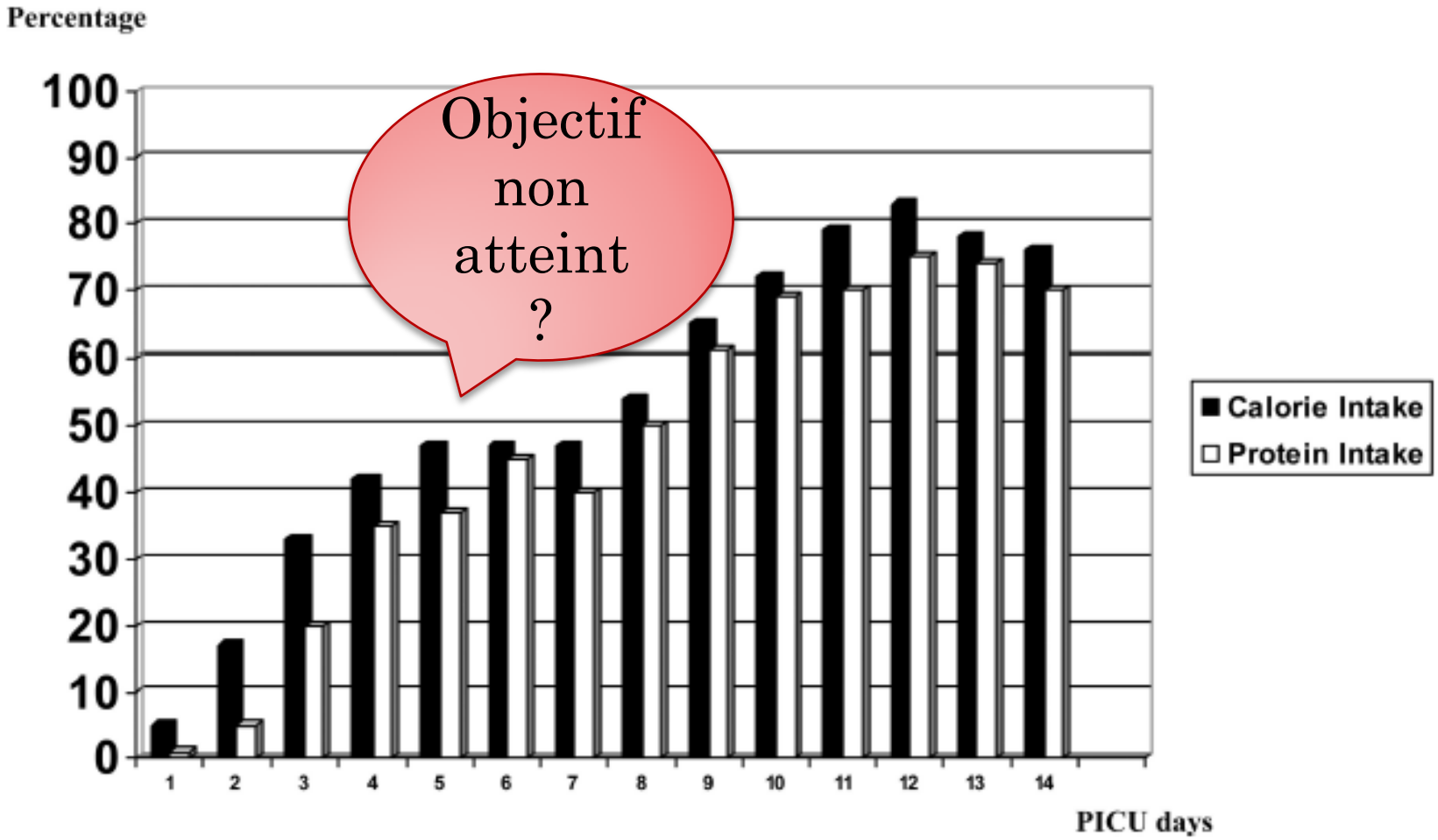
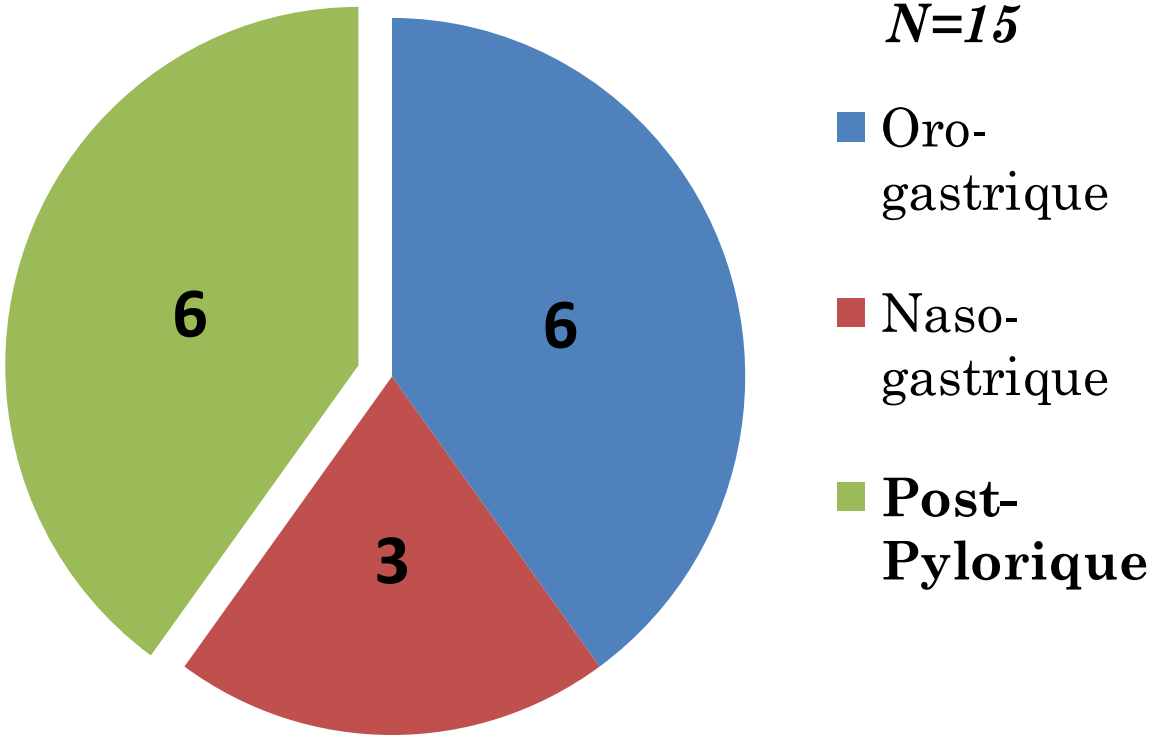


Figure 2. Nutritional goals met by pediatric intensive care unit (*PICU*) day of 101 patients admitted with severe traumatic brain injury: days 1- day 8 (n = 82), day 9 (n = 79), day 10 (n = 70), day 11 (n = 60), day 12 (n = 54), day 13 (n = 50), day 14 (n = 49).

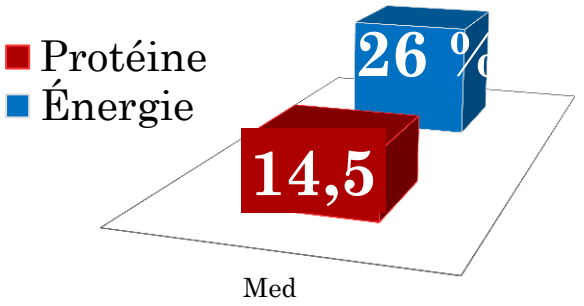
Pediatr Crit Care Med, 2012. 13(1): p. e18-24.

Gastrique Vs Post-Pylorique



Post-Pylorique initié à Jr

Apport moyen 0-7J Post-Pylorique
N= 6



5.3 Post-Pylorique Vs Gastrique (2015)

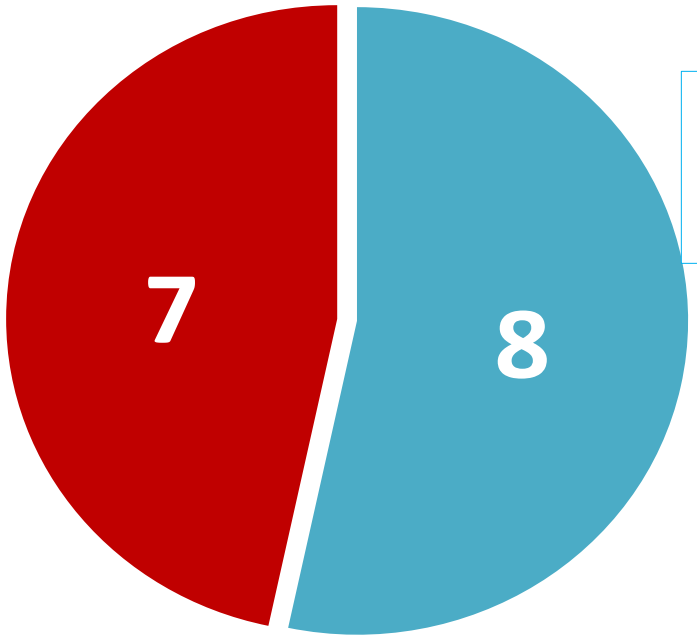
16 études / *LEVEL* 2

...may be associated with a reduction in pneumonia in critically ill patients. **In units where small bowel access is feasible, we recommend the routine use of small bowel feedings.** In units where obtaining access involves more logistical difficulties, small bowel feedings should be considered for patients at high risk for intolerance to *EN* (on inotropes, continuous infusion of sedatives, or paralytic agents, or patients with high nasogastric drainage) or at high risk for regurgitation and aspiration (nursed in supine position). Finally, where obtaining small bowel access is not feasible (no access to fluoroscopy or endoscopy and blind techniques not reliable), small bowel feedings should be considered for those select patients that repeatedly demonstrate high gastric residuals and are not tolerating adequate amounts of *EN* intragastrically.

Permet d'atteindre la cible protéino-énergétique plus rapidement.

Canadian Clinical Practices Guidelines 2015. www.criticalcarenutrition.com

Solution *NE* initiale *N=15*

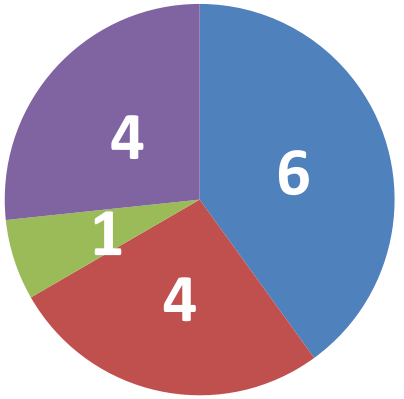


Adéquat

Non-adéquat

Vs 15kg & 16% protéine

Types de solutions



Protein requirements in critically ill children are higher than in healthy children

A.S.P.E.N.-recommended protein requirements for injured children[3]	
Age	A.S.P.E.N. Recommendations
0–2 years	2–3 g/kg/day
2–13 years	1.5–2 g/kg/day
13–18 years	1.5 g/kg/day

Balance azotée

Nutrition regimens should aim to provide 15%–20% of total calories as protein because reductions in nitrogen loss have been demonstrated at this level of intake.[11-13]

Solutions entérales spécialisées

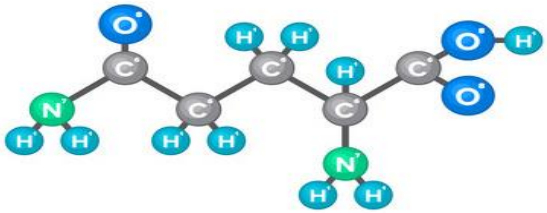
Problème:

Jr et pédiatrique 12% protéine.

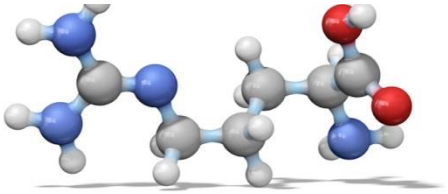
Solutions:

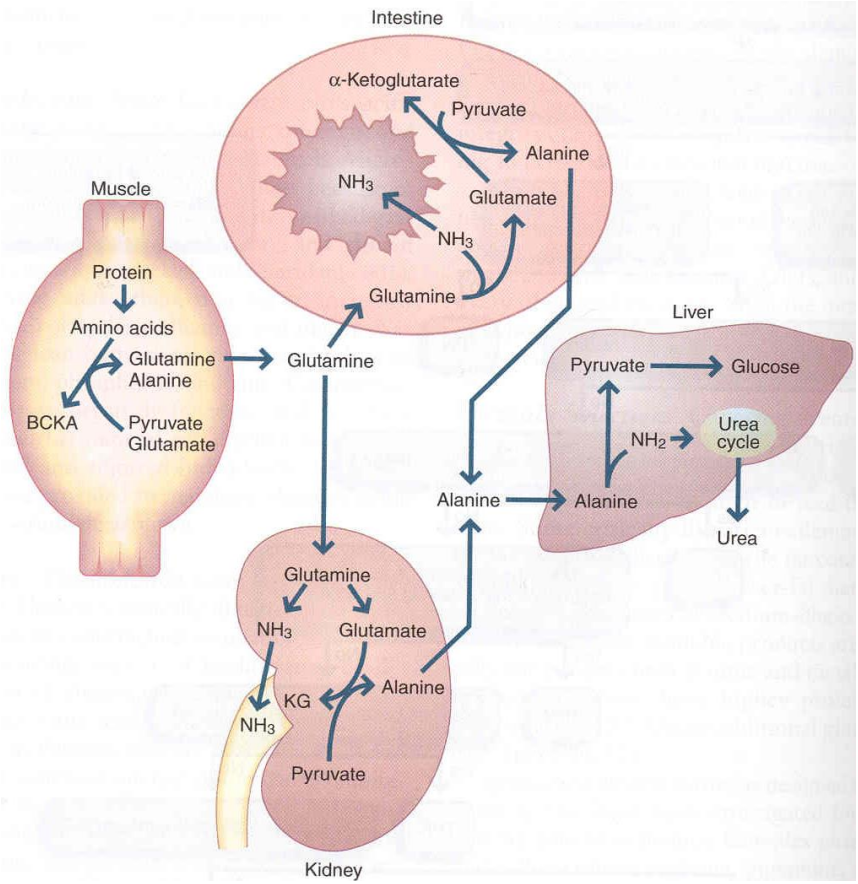
1. **Entérale 'adulte' si ≥15-20kg**
2. **Jr (1-10 ans) chez < 15 kg**
3. **Préparations prématurés chez nourrissons**
4. **lactosérum ou peptides: ↑ motilité gast.**
5. **ω-3**

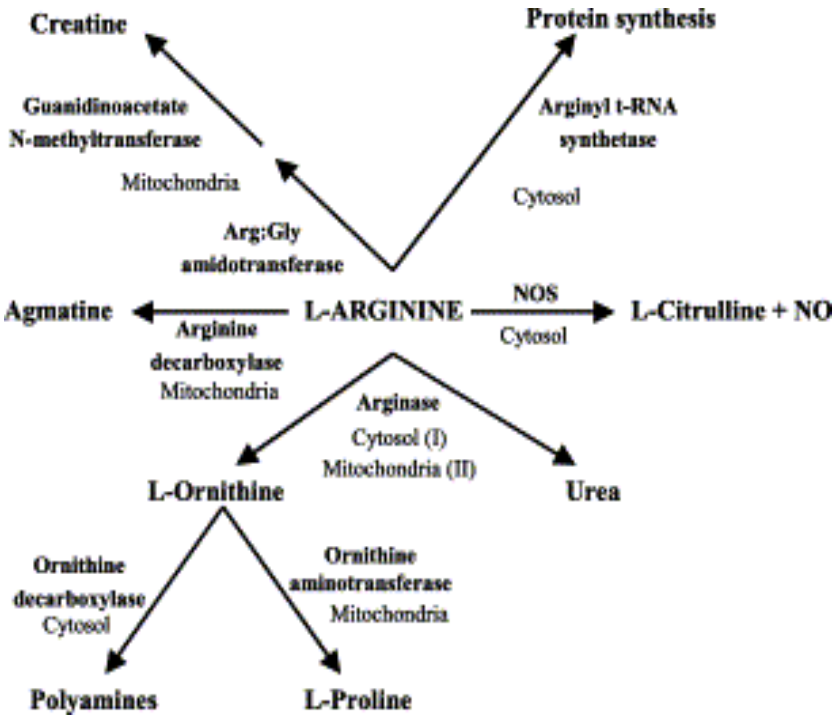
JPEN J Parenter Enteral Nutr 2008; 32; 520



GLUTAMINE ET ARGININE





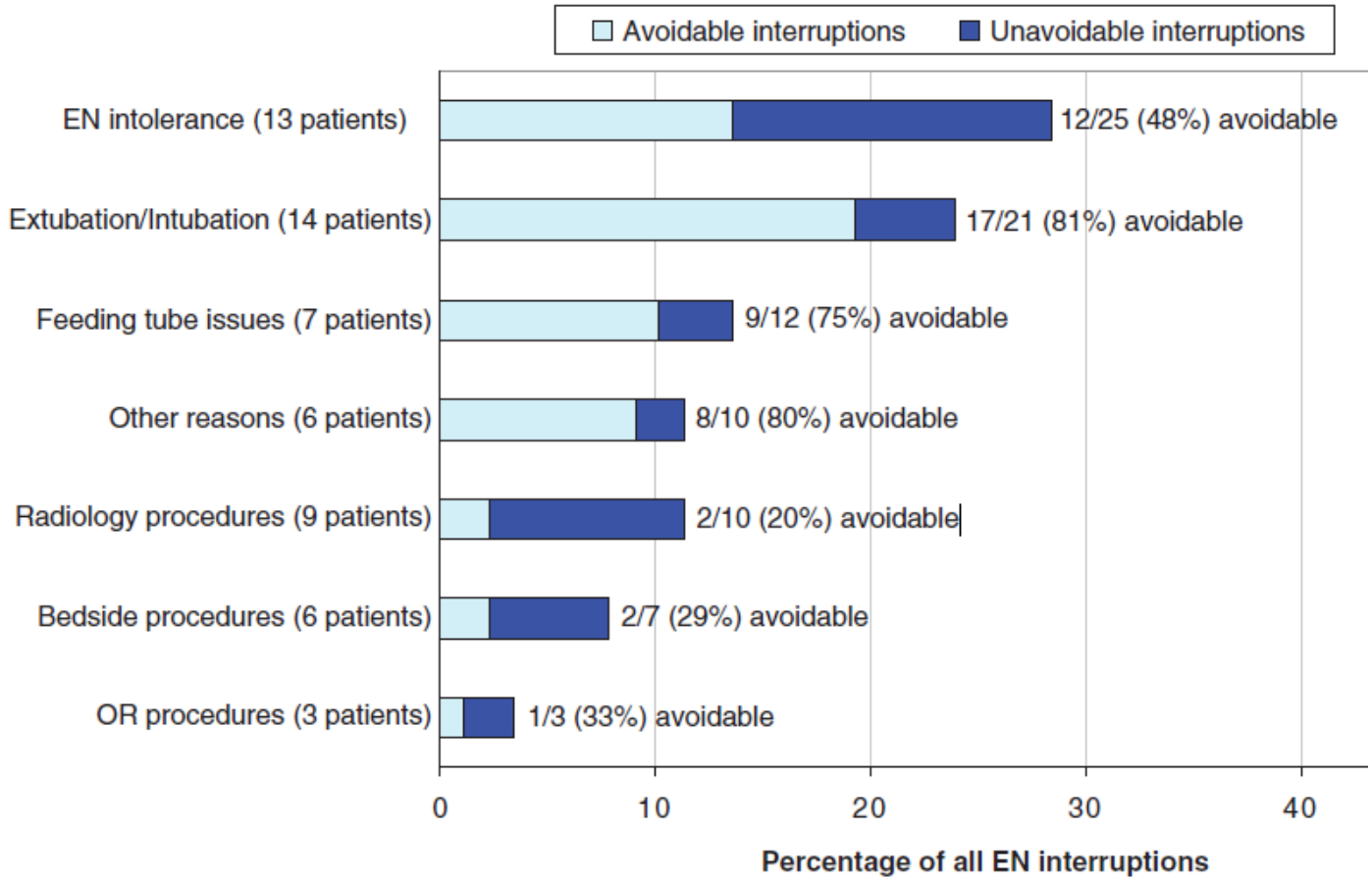


Facteurs limitants la *NE*

- Pratiques actuelles
- Interruptions de nutrition
- Facteurs humains
- Manque de données probantes

Facteurs limitants

Soins int. pédiatriques
Boston
N= 117

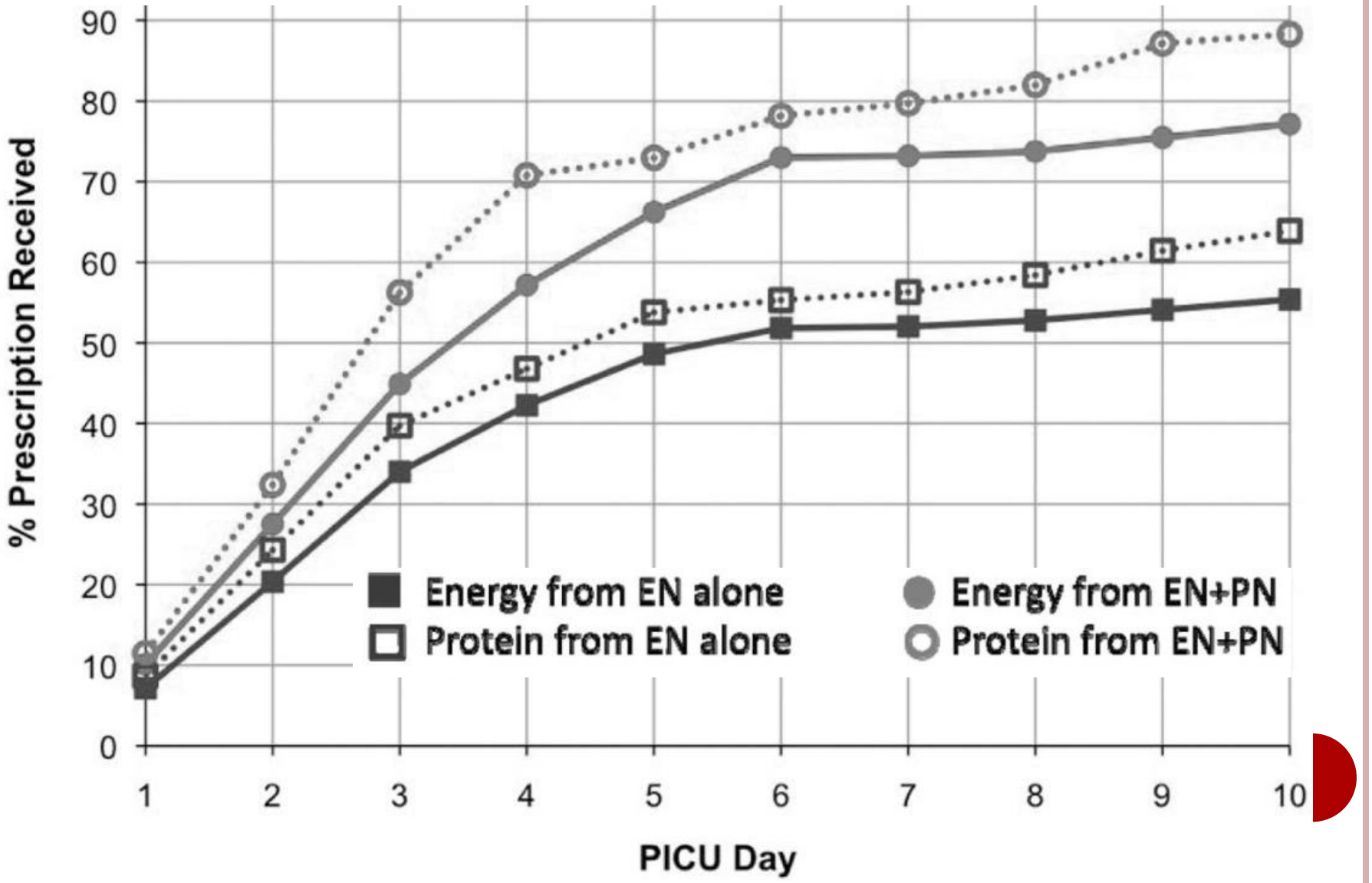


. Reasons for EN interruption. EN, enteral nutrition; OR, operating room.

JPEN J Parenter Enteral Nutr. 2010;34:38-45

Mehta Crit Care Med. 2013.

31 S.Int Pédiatriques - *N = 500*



Voie orale

Pat	Âge	GCS	ISS	S.Int #Jr	Hosp #Jr	Poids Kg /perc	Complications
1	12,8	11	24	4	9	65,4 / **94**	
16	10,9	8	21	4	9	27 / 5	
20	1,1	9	18	4	12	12,9 / **90**	**3 Plaies de pression**
28	15,8	9	34	4	9	75 / **85**	**Plaie au creux poplité**
38	2,5	8	22	5	6	16,6 / **97**	**Plaie occipitale**

4 patients sur 5 présentaient un poids > 85ep

Pistes de solution

ÉVALUATION NUTRITIONNELLE

Taille mesurée au lit

Amplitude des bras

Circonférence brachiale

Masse musculaire

Masse adipeuse

Courbes

Poids + juste

Impacts

Besoins
Énergie
Protéine
Liquide

INDICATEURS MALNUTRITION

NUTRI CLIN PRACT.2017;32:40-51

Table 4. Primary Indicators of Malnutrition When Single Data Point Available.

Indicator	Mild Malnutrition	Moderate Malnutrition	Severe Malnutrition
Weight-for-length *z* score	−1 to −1.9 *z* score	−2 to −2.9 *z* score	Below −3 *z* score
BMI-for-age *z* score	−1 to −1.9 *z* score	−2 to −2.9 *z* score	Below −3 *z* score
Length/height-for-age *z* score	No data	No data	Below −3 *z* score
Mid-upper arm circumference	−1 to −1.9 *z* score	−2 to −2.9 *z* score	Below −3 *z* score

BMI, body mass index. Adapted with permission from Becker P, Carney LN, Corkins MR, et al. Consensus statement of the Academy of Nutrition and Dietetics/American Society for Parenteral and Enteral Nutrition: indicators recommended for the identification and documentation of pediatric malnutrition (undernutrition). *Nutr Clin Pract*. 2015;30(1):147-161.

Table 5. Primary Indicators of Malnutrition When 2 or More Data Points Available.

Indicator	Mild Malnutrition	Moderate Malnutrition	Severe Malnutrition
Weight gain velocity (<2 years of age)	Less than 75%[a] of the norm[b] for expected weight gain	Less than 50%[a] of the norm[b] for expected weight gain	Less than 25%[a] of the norm[b] for expected weight gain
Weight loss (2–20 years of age)	5% usual body weight	7.5% usual body weight	10% usual body weight
Deceleration in weight-for-length/height (BMI) *z* score	Decline of 1 *z* score	Decline of 2 *z* score	Decline of 3 *z* score
Inadequate nutrient intake	51%–75% estimated energy/protein need	26%–50% estimated energy/protein need	<25% estimated energy/protein need

Sévère

Perte de poids > 2% 1 sem

> 5% 1 ms

> 7.5% 3 ms

Calorimétrie indirecte

- **Mesure le V O2 et VCO2 ml/min sur 45min**
- **on obtient la dépense d'énergie au repos.**

- **SS (Steady-stade) mesure sur 5min aux 20 à 60min sur plusieurs heures**

- **Moore 1989**

  Énergie mesurée > 173% Énergie prédite

  QR 0,68 lipide

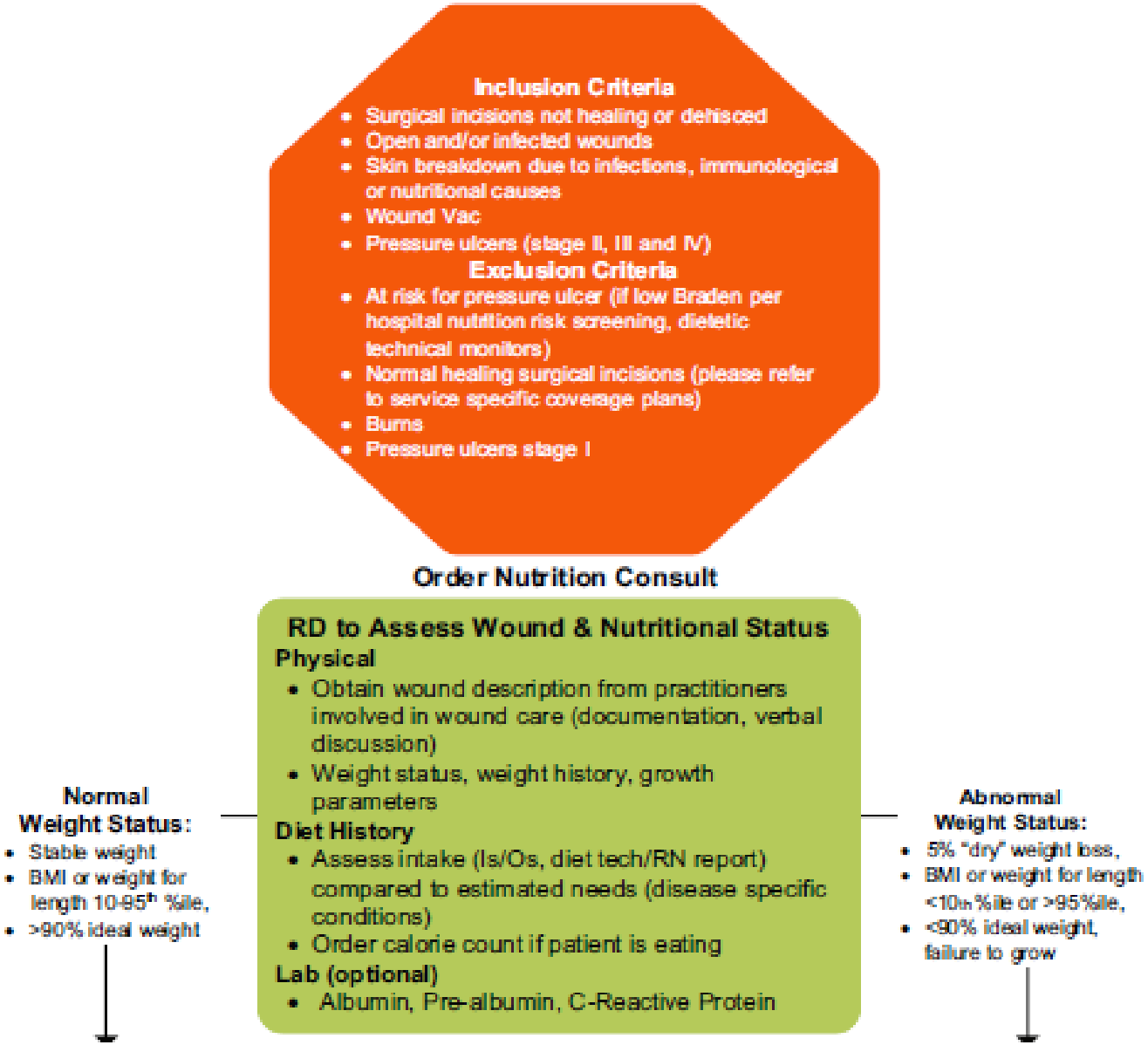
- **QR - JPEN, 2008;32;520**

  > 0.85 exclut l'insuffisance E
  > 1 prédit une surcharge E en glucides

- **Facteur (TX) 1,3**

  Maintien > 95% poids si QR 0,80 à 0,95

Nutrition Interventions to Optimize Pediatric Wound Healing: An Evidence-Based Clinical Pathway *Nutr Clin Pract.* 2014;29:473-482



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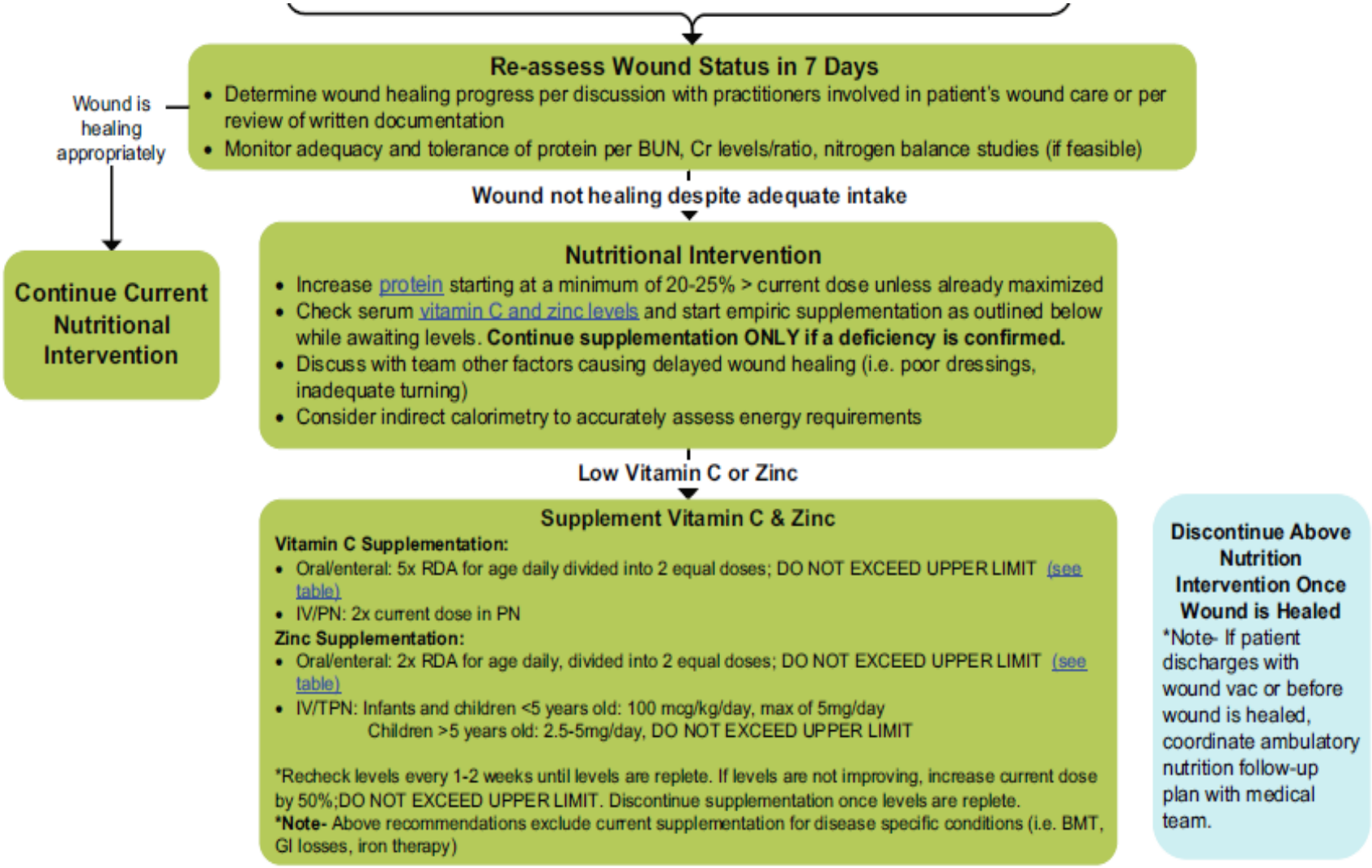

Re-assess Wound Status in 7 Days
Determine wound healing progress per discussion with practitioners involved in patient's wound care or per review of written documentation
Monitor adequacy and tolerance of protein per BUN, Cr levels/ratio, nitrogen balance studies (if feasible)
Wound is healing appropriately
Continue Current Nutritional Intervention
Wound not healing despite adequate intake
Nutritional Intervention
Increase protein starting at a minimum of 20-25% > current dose unless already maximized
Check serum vitamin C and zinc levels and start empiric supplementation as outlined below while awaiting levels. Continue supplementation ONLY if a deficiency is confirmed.
Discuss with team other factors causing delayed wound healing (i.e. poor dressings, inadequate turning)
Consider indirect calorimetry to accurately assess energy requirements
Low Vitamin C or Zinc
Supplement Vitamin C & Zinc
Vitamin C Supplementation:
Oral/enteral: 5x RDA for age daily divided into 2 equal doses; DO NOT EXCEED UPPER LIMIT (see table)
IV/PN: 2x current dose in PN
Zinc Supplementation:
Oral/enteral: 2x RDA for age daily, divided into 2 equal doses; DO NOT EXCEED UPPER LIMIT (see table)
IV/TPN: Infants and children <5 years old: 100 mcg/kg/day, max of 5mg/day
Children >5 years old: 2.5-5mg/day, DO NOT EXCEED UPPER LIMIT
*Recheck levels every 1-2 weeks until levels are replete. If levels are not improving, increase current dose by 50%;DO NOT EXCEED UPPER LIMIT. Discontinue supplementation once levels are replete.
*Note- Above recommendations exclude current supplementation for disease specific conditions (i.e. BMT, GI losses, iron therapy)
Discontinue Above Nutrition Intervention Once Wound is Healed
*Note- If patient discharges with wound vac or before wound is healed, coordinate ambulatory nutrition follow-up plan with medical team.

Pistes de solutions

1) Évaluation nutritionnelle
2) Instaurer une *NE* 12-24H post-adm.
3) Post-pylorique
4) Solutions nutritives riches en protéine et énergie
5) Suivi des paramètres nutritionnels (CI – Bilan azoté)

Objectifs

- Assurer des apports protéino-énergétiquesà > 75% au 5e Jr et 100% au 7e Jr.
- Améliorer la tolérance de la *NE*
- Prévenir les complications (plaies, aspiration…)

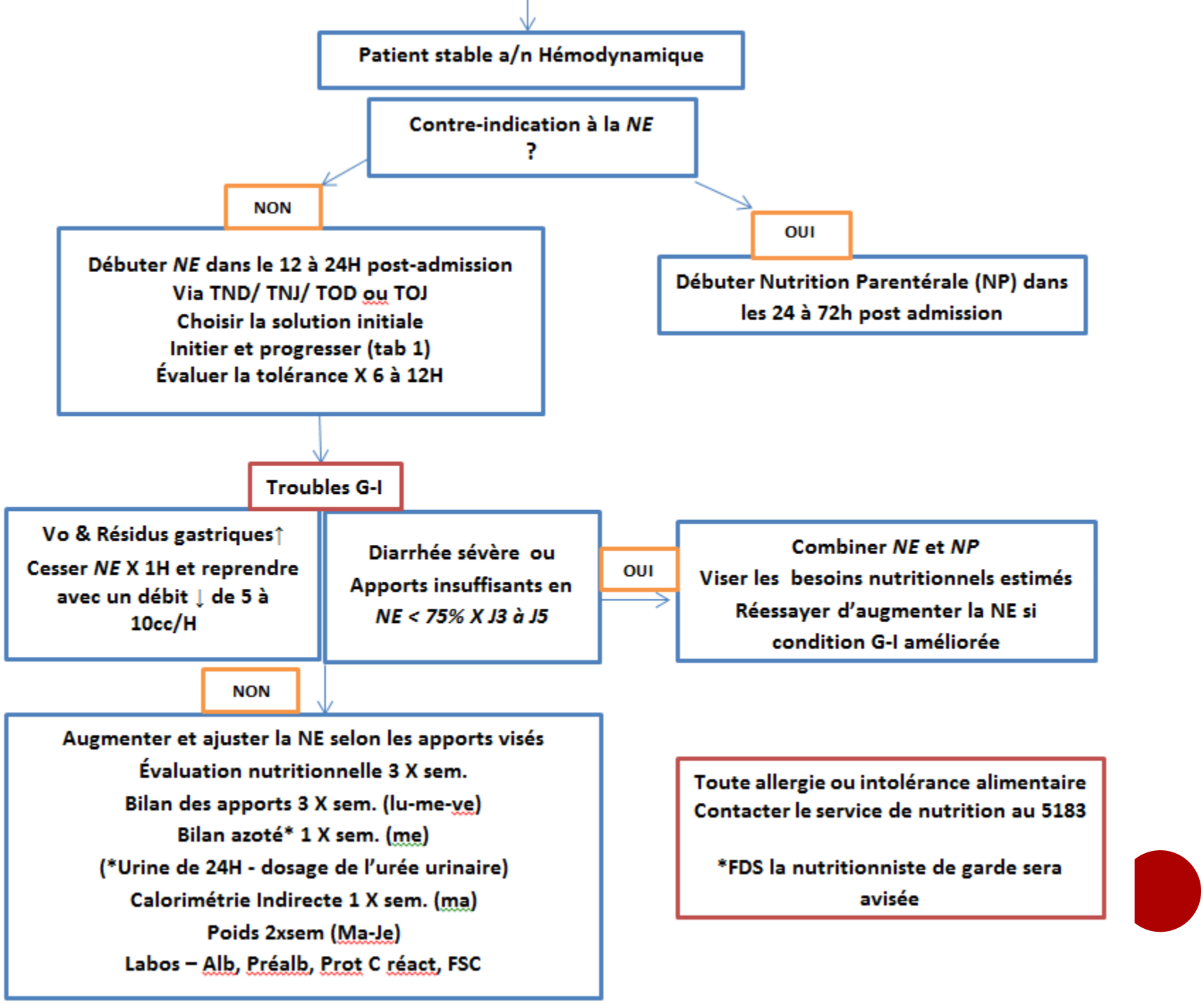
Protocole de soutien nutritionnel aux S.Intensifs pour les TCC modérés et sévères

Une fois le choc hypovolémique traité, initier le soutien nutritionnel dans les **12 à 24H** suivant l'admission:

- Prévenir les états de malnutrition secondaire au stress métabolique
- Choisir la voie de nutrition qui diminue les périodes d'interruption
- Offrir la solution entérale qui optimise les apports protéino-énergétiques

Standardisation

Âge	Solution nutritive initiale	Dilution Kcal/ml	% Prot.	Débit initial X 6 à 12H	Si toléré Augmenter
0 – 6 mois	Nutramigen (Alimentum)	0.80	12%	5 à 10cc/H	5cc/H Q3H Ad max 25 cc/H
	Lait maternel + Fortifiant (50ml LM + 1 Fortifiant*)	0.74	9%		
6 à 8 mois	Peptamen prébio 1.0	0.86	16%	10cc/H	5cc/H Q3H Ad max 35cc/H
8 mois À 3 ans	Peptamen prébio 1.0	1	16%	10cc/H	5cc/H Q3H Ad max 35cc/H
≥ 3 -5 ans	Peptamen 1.5 (Vital 1.5)	1.5	18%	15cc/H	5cc/H Q3H Ad max 35cc/H
≥ 5-8 ans	Peptamen 1.5 (Vital 1.5)	1.5	18%	20cc/H	10 cc/H Q3H Ad max 40cc/H
8 -11ans	Peptamen 1.5 (Vital 1.5)	1.5	18%	20cc/H	10 cc/H Q3H Ad max 50cc/H
11 – 16 ans	Peptamen 1.2	1.2	25%	30CC/H	10cc/H Q3H Ad max 70 cc/H


Patient stable a/n Hémodynamique
Contre-indication à la *NE* ?
NON
OUI
Débuter *NE* dans le 12 à 24H post-admission
Via TND/ TNJ/ TOD ou TOJ
Choisir la solution initiale
Initier et progresser (tab 1)
Évaluer la tolérance X 6 à 12H
Débuter Nutrition Parentérale (NP) dans les 24 à 72h post admission
Troubles G-I
Vo & Résidus gastriques↑
Cesser *NE* X 1H et reprendre avec un débit ↓ de 5 à 10cc/H
Diarrhée sévère ou
Apports insuffisants en
NE < 75% X J3 à J5
OUI
Combiner *NE* et *NP*
Viser les besoins nutritionnels estimés
Réessayer d'augmenter la NE si condition G-I améliorée
NON
Augmenter et ajuster la NE selon les apports visés
Évaluation nutritionnelle 3 X sem.
Bilan des apports 3 X sem. (lu-me-ve)
Bilan azoté* 1 X sem. (me)
(*Urine de 24H - dosage de l'urée urinaire)
Calorimétrie Indirecte 1 X sem. (ma)
Poids 2xsem (Ma-Je)
Labos – Alb, Préalb, Prot C réact, FSC
Toute allergie ou intolérance alimentaire
Contacter le service de nutrition au 5183
*FDS la nutritionniste de garde sera avisée

Merci !

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