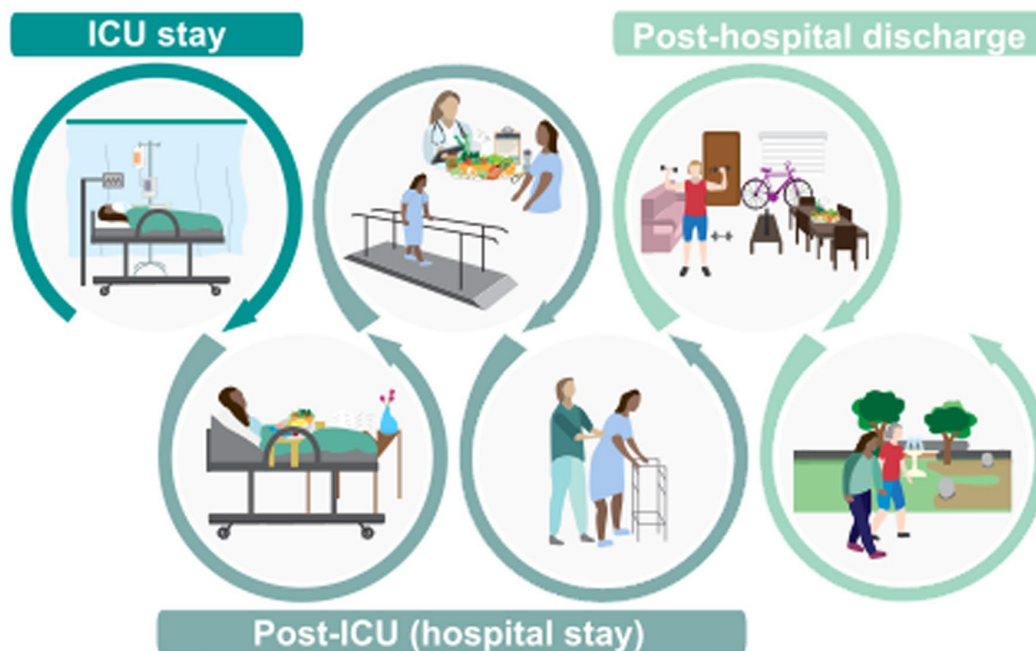


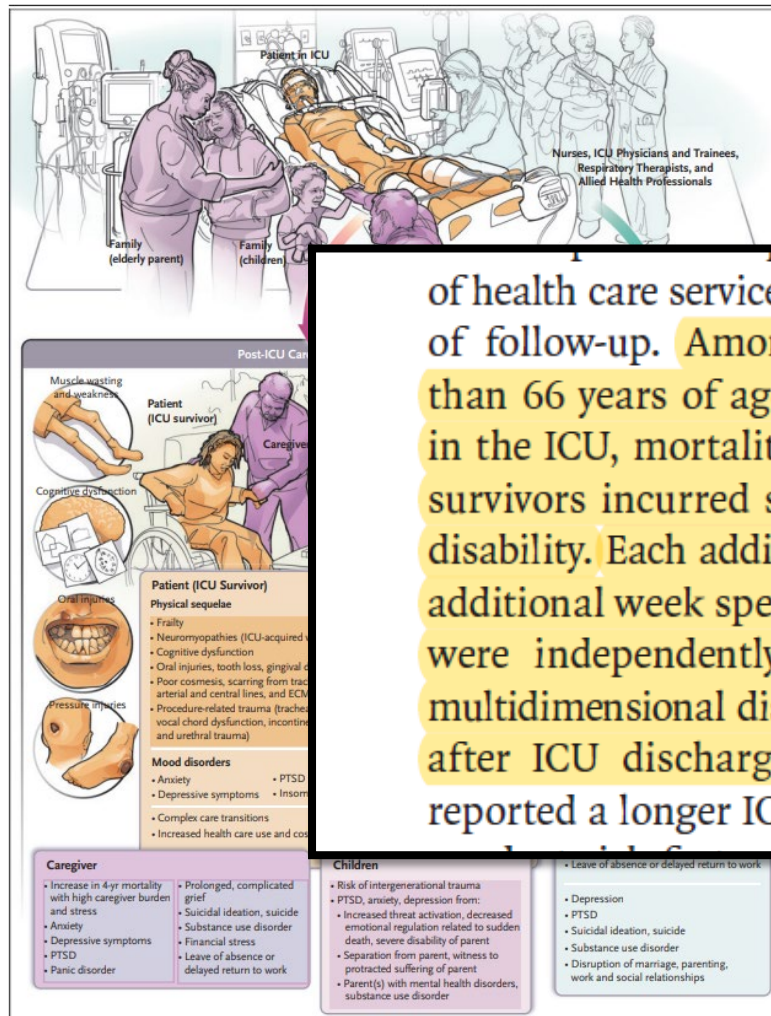
# Cesty zpět pohledem (nejen) výživy



C. Corey Hardin, M.D., Ph.D., *Editor*

# Outcomes after Critical Illness

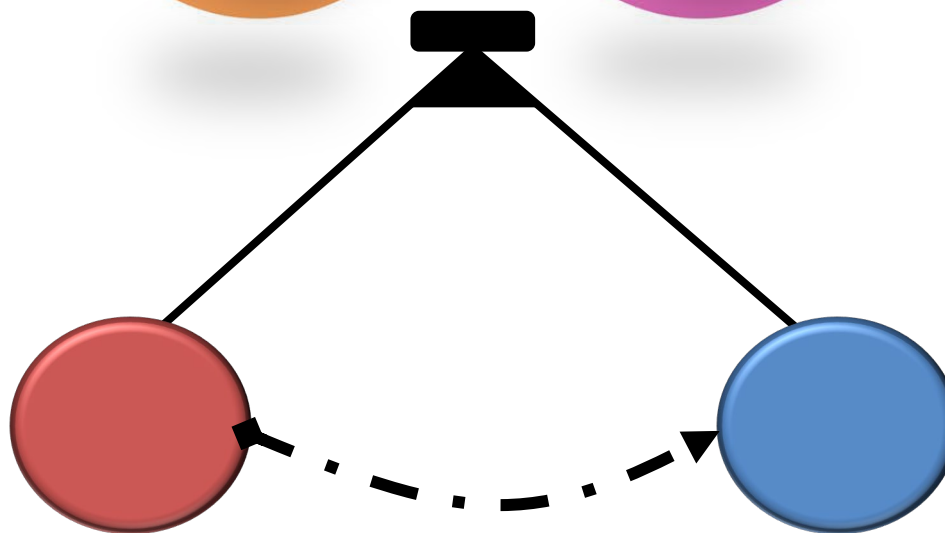
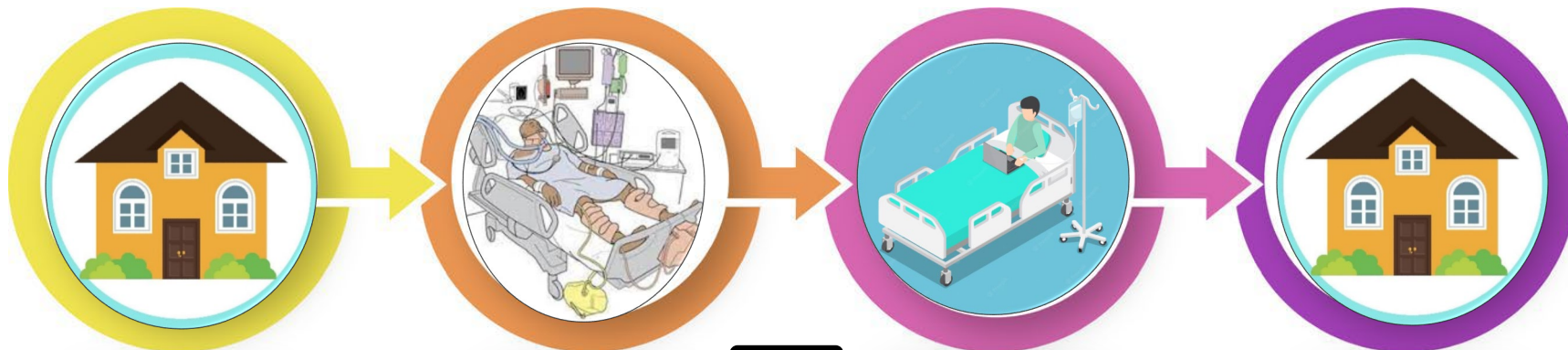
Margaret S. Herridge, M.D., M.P.H., and Élie Azoulay, M.D., Ph.D.



of health care services, and survival status at 1 year of follow-up. Among patients who were older than 66 years of age and spent 2 or more weeks in the ICU, mortality was 40% at 1 year, and the survivors incurred substantial multidimensional disability. Each additional decade of age and each additional week spent in the ICU beyond 2 weeks were independently associated with increased multidimensional disability and mortality at 1 year after ICU discharge. French investigators also reported a longer ICU stay as an important inde-

**Table 1. Sequelae of Critical Illness.\***

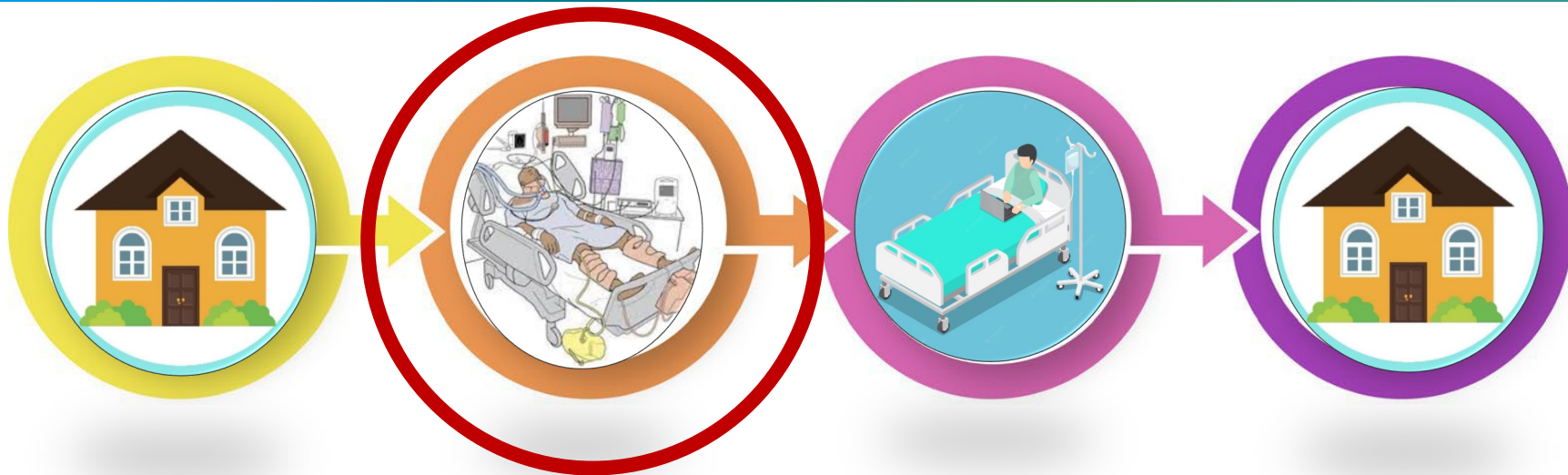
Disorder	Consequences
ICU-acquired weakness	Multidimensional functional disability (prolonged mechanical ventilation, compromised ambulation, impaired ADL, pharyngeal muscle weakness, swallowing difficulties and increased risk of aspiration, employment difficulties, <u>reduced health-related quality of life for <math>\geq 5</math> yr</u> )
Nutritional compromise	Compromised physical and neurocognitive recovery
Entrapment neuropathy	Foot or wrist drop, compromising rehabilitation and functioning
Frailty	Functional disability, new nursing home admission, increased post-ICU mortality
Cognitive dysfunction	Decrease in attention, concentration, processing speed, memory, executive dysfunction for $\geq 5$ yr; employment and health status affected
Mood disorders	Depressive symptoms, anxiety, PTSD, suicidality, substance misuse for $\geq 8$ yr
Pressure injuries	May persist beyond 1 yr and impede return to work; increased post-ICU mortality
Oral complications	Gingivitis, dental caries, tooth injury or loss, need for longer-term dental follow-up
Endocrinopathies	Derangement of thyroid, adrenal function, and hypothalamic–pituitary axis, disrupting endocrine homeostasis, sexual function
Musculoskeletal disorders	Frozen joints, contractures, and heterotopic ossification
Changes in appearance	Alopecia, scarring, and disfigurement, complicating social reintegration
Taste changes	Difficulty with feeding and nutrition
Hearing or vision changes	Delayed recovery, return to home and work
Procedure-related trauma	Rectal and urethral injury, vocal cord dysfunction with altered phonation, tracheal stenosis, impeding ADL, rehabilitation, and return to home and work
Renal dysfunction	Chronic impairment of the glomerular filtration rate, need for renal-replacement therapy, compromised health-related quality of life, and increased health care use and 1-year mortality



Časná, „agresivní“  
Kalorie  
ICU výživa je klíč

Restriktivně-progresivní  
„Nutrient-rich“ a „protein-dense“  
Za „dveře“ ICU  
Jen výživa nestačí





## **⌚ Anabolic Resistance: An Uncomfortable Truth for Clinical Trials in Preventing Intensive Care–acquired Weakness and Physical Functional Impairment**

RESEARCH

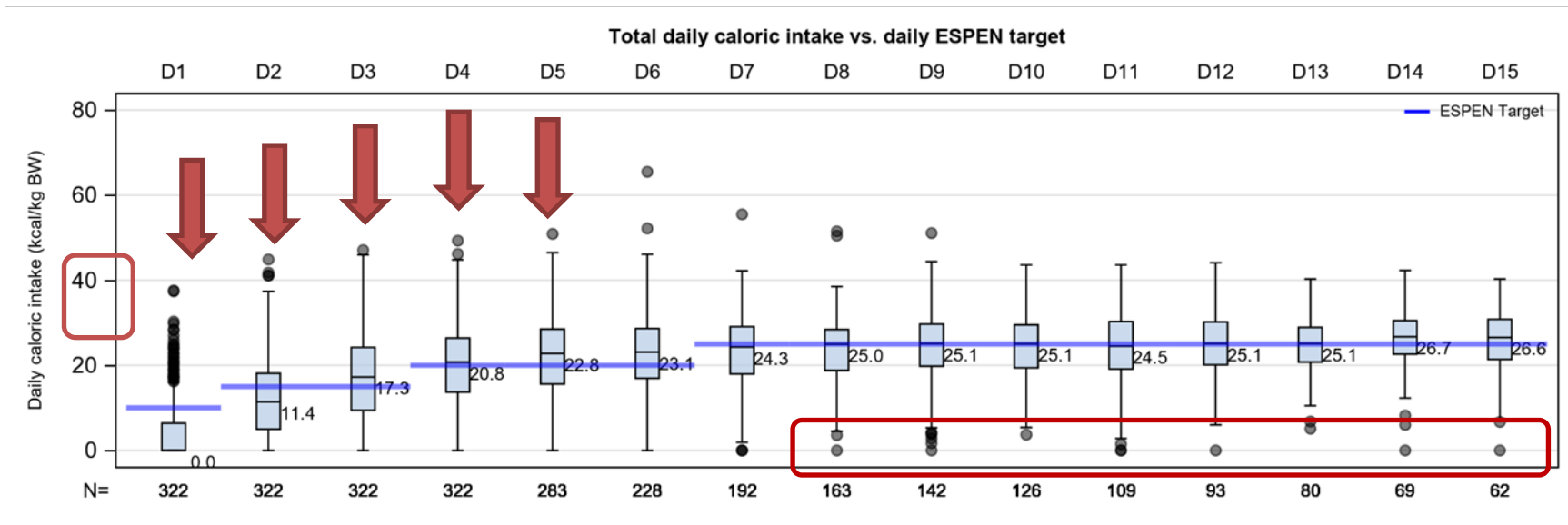
Open Access



# Medical nutrition therapy and clinical outcomes in critically ill adults: a European multinational, prospective observational cohort study (EuroPN)

Martin Matejovic<sup>1</sup>, Olivier Huet<sup>2</sup>, Karolien Dams<sup>3</sup>, Gunnar Elke<sup>4</sup>, Clara Vaquerizo Alonso<sup>5</sup>, Akos Csomoş<sup>6</sup>, Łukasz J. Krzych<sup>7</sup>, Romano Tetamo<sup>8</sup>, Zudin Puthucheary<sup>9</sup>, Olav Rooyackers<sup>10</sup>, Inga Tjäder<sup>11</sup>, Helmut Kuechenhoff<sup>12</sup>, Wolfgang H. Hartl<sup>13\*†</sup> and Michael Hiesmayr<sup>14\*†</sup>

# Denní kalorický příjem (kcal/kg BW/d) vs. ESPEN cíle



ESPEN targets: 10 kcal/kg on D1, 15 kcal/kg on D2-3, 20 kcal/kg on D4-6, 25 kcal/kg D7-15

Graph shows median, IQR, min and max with outliers

# Plná výživa v prvních dnech nezlepšuje výsledek, naopak...

- 16 000 pts v rámci RCT – riziko poškození pacienta plnou výživou!
  - *Platí pro všechny podskupiny*

Casaer et al. *NEJM* 2011  
Rice et al. *JAMA* 2012  
Heidegger et al. *Lancet* 2013  
Doig et al. *JAMA* 2013 & *ICM* 2015 & *Lancet Respir Med* 2015  
Arabi et al. *Am J Clin Nutr* 2011 & *NEJM* 2015  
Fivez et al. *NEJM* 2016  
Allingstrup et al. *Intensive Care Med* 2017  
TARGET trial investigators. *NEJM* 2018  
Heyland et al. *Lancet* 2023



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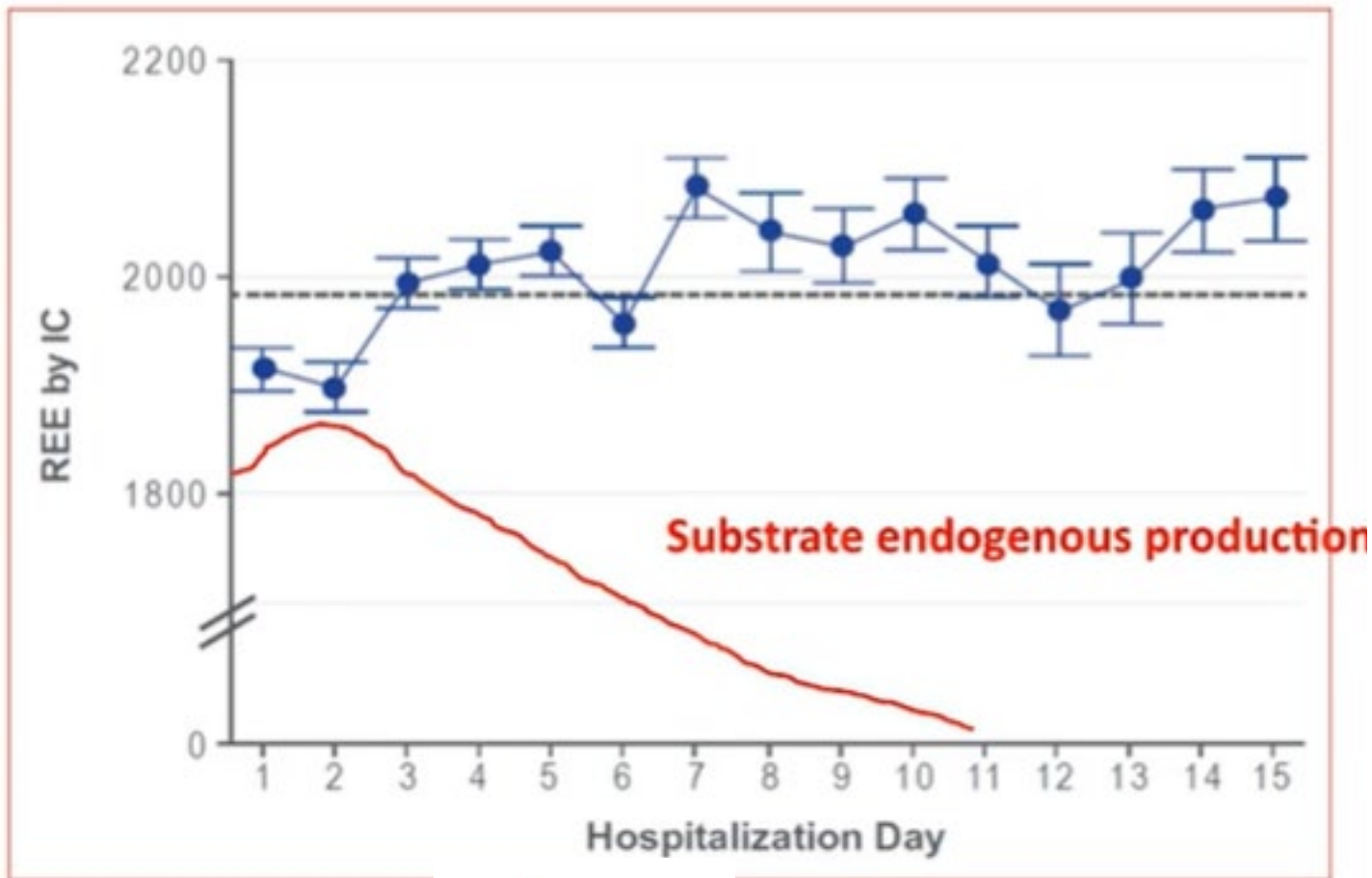
# Low versus standard calorie and protein feeding in ventilated adults with shock: a randomised, controlled, multicentre, open-label, parallel-group trial (NUTRIREA-3)

*Jean Reianier. Gaetan Plantefeve. Jean-Paul Mira. Laurent Araud. Pierre Asfar. Nadia Aissaoui. Julio Badie. Nicolae-Vlad Botoc. Laurent Brisard.*

(6 kcal/kg/day and 0.2–0.4 g/kg/day versus 25 kcal/kg/day and 1.0–1.3 g/kg/day)

## Implications of the available evidence

NUTRIREA-3 provides a high level of evidence that patients benefit from restricted calorie and protein intakes during the acute phase of critical illness. The NUTRIREA-3 results are consistent with those of EPaNIC, which focussed only on calorie



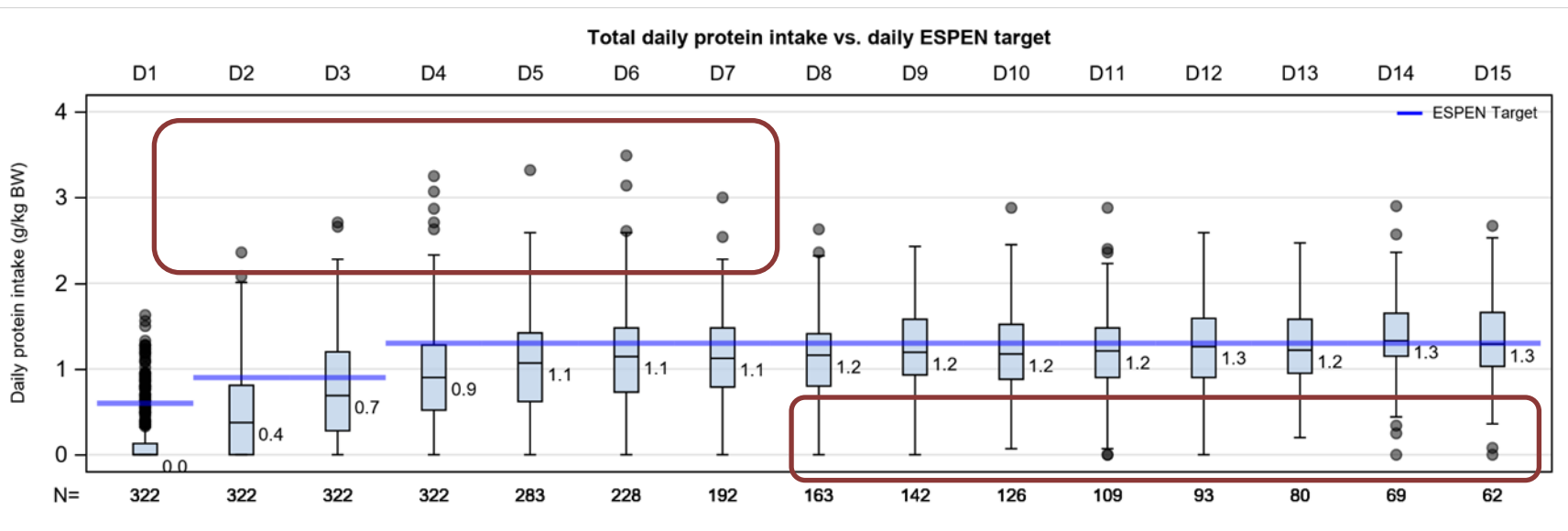
## EPG

- 200-300 g GLU
- > 1 l 20% GLU!



- + 400-500 propofol
- + 200-300 citrát
- + 400 glukóza

# Denní příjem bílkovin (g/kg BW/d) vs. ESPEN cíle



# Vadí to?.. více je přece více u proteinů

---

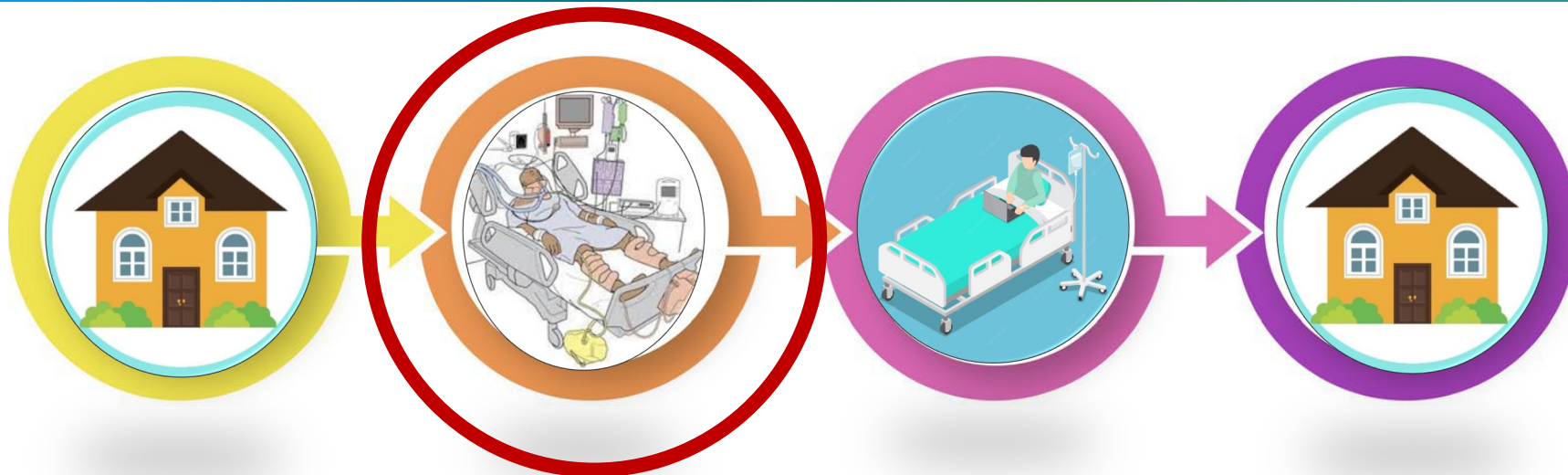
The effect of higher protein dosing in critically ill patients with high nutritional risk (EFFORT Protein): an international, multicentre, pragmatic, registry-based randomised trial

Cíl: 1.2 g/kg/D versus 2.2 g/kg /D

Realita: 1.6 vs 0.9 g/kg/D

## Implications of all the available evidence

The results of this large-scale randomised controlled trial provide high-quality evidence against the efficacy of high dose protein and suggest that there might be a harmful effect in patients with acute kidney injury and high organ failure scores at admission. Future trials should focus on the identification of subcohorts of critically ill patients that could benefit from high-dose protein administration.



**⊗ Anabolic Resistance: An Uncomfortable Truth for Clinical Trials in Preventing Intensive Care–acquired Weakness and Physical Functional Impairment**

**Akutní katabolismus: nepříjemná pravda pro intenzivisty**



### Heterogeneous critically ill cohort



### Metabolic prognostic enrichment

- ✓ Nutrition risk score
- ✓ "Clinical phenotype"
- ✓ Clinical metabolic markers

### Higher-risk patients



### Lower-risk patients



Standard of care nutrition

### Predictive enrichment

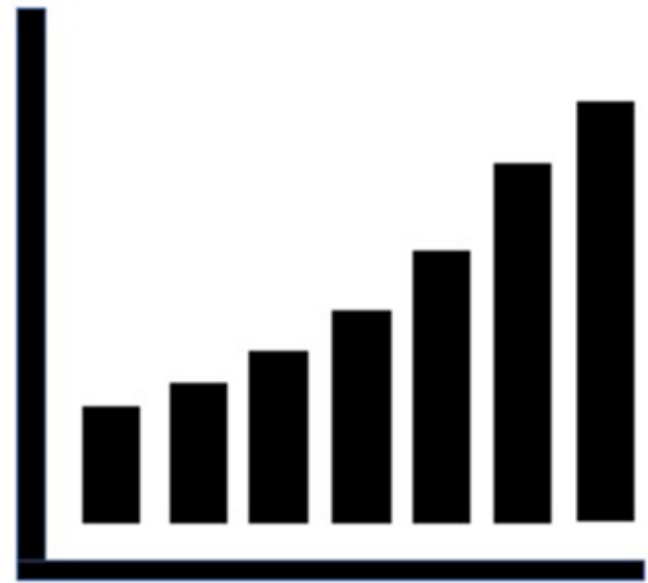
- ✓ Inflammatory phenotype
- ✓ Level of autophagy
- ✓ Metabolomic & microbiota pattern

Individualized nutrition  
for Metabotype "X"

Individualized nutrition  
for Metabotype "Y"



Early full energy delivery



Start low with daily progressive

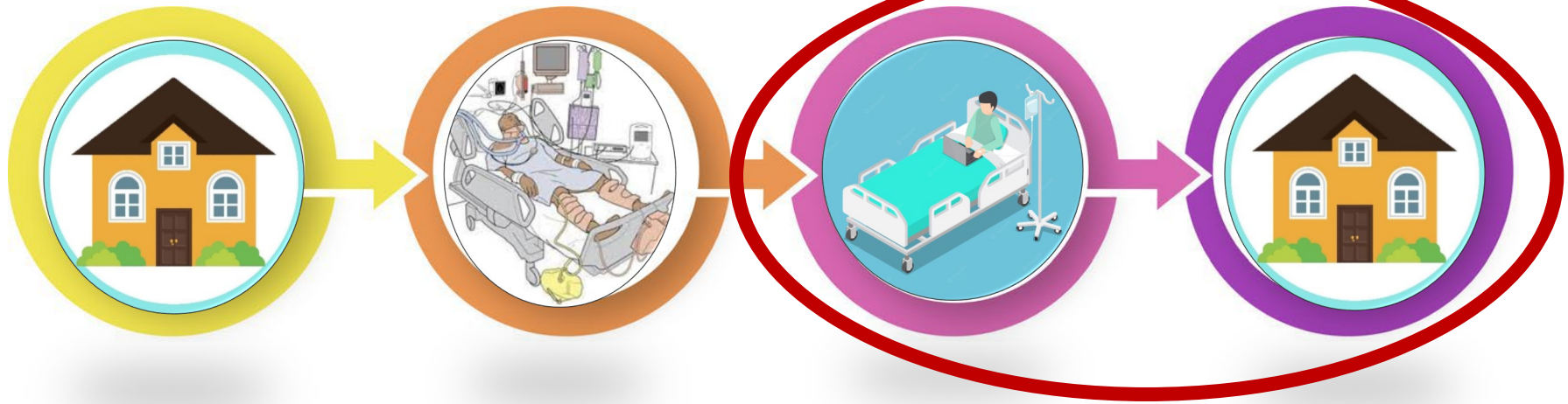
### Nejistoty:

- Kdy přesně začít (ready to feed?)
- Jak rychle navyšovat (just counting ICU days?)
- Jak individualizovat
- Je 2. , 3. hit stejný jako první?

# 2023

## Desatero ICU nutričních příkázání

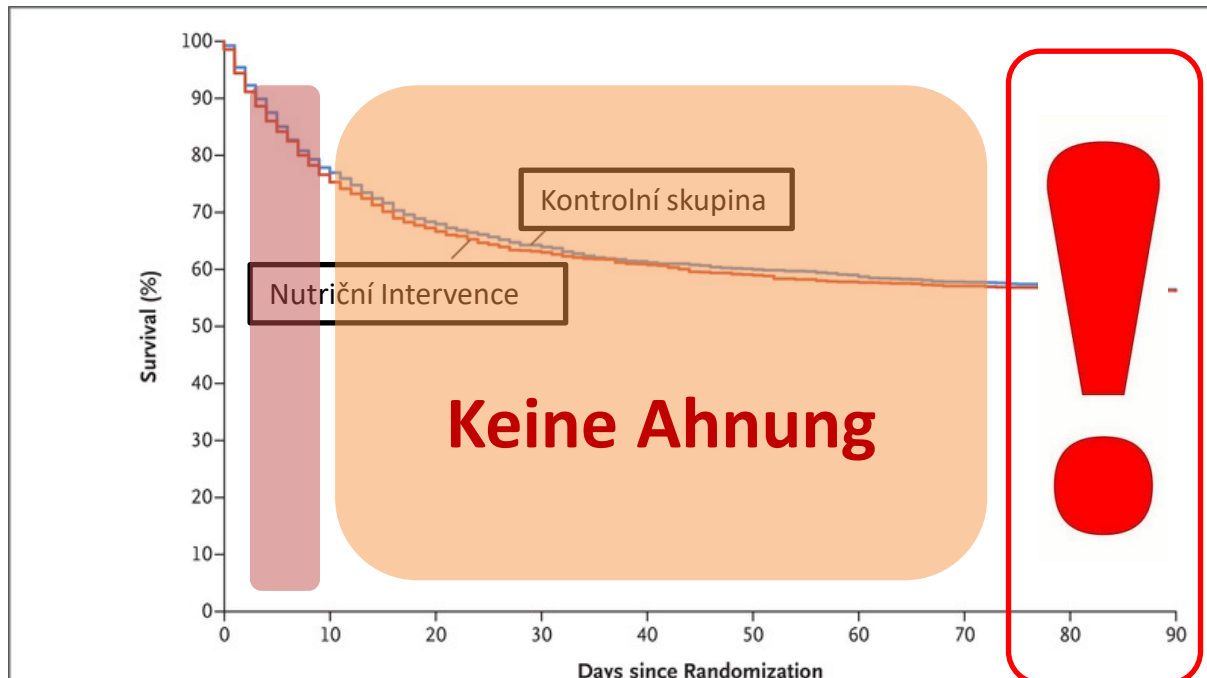
1. **Ne**živ plně v prvních dnech
2. **Ne**přeceňuj přínos kalorií během ICU
3. **Ne**přeceňuj přínos bílkovin během ICU
4. Preferuj enterální výživu
5. **Ne**snaž se o EN za každou cenu
6. **Ne**boj se parenterální výživy až přijde čas
7. **Ne**podceňuj mikronutrienty časně
8. **Ne**podceňuj refeeding syndrom
9. **Ne**boj se uvažovat o anabolické podpoře ve správný čas
10. **Neváhej** doporučit co nutričně dál po propuštění z ICU



## **Nepříjemná pravda pro nutricionisty?**

**...přesvědčení personálu i pacientů, že lékařské ošetření/léčba je hlavní prioritou a že jídlo je až druhořadé...**

# Neglected side of ICU survivors: post ICU



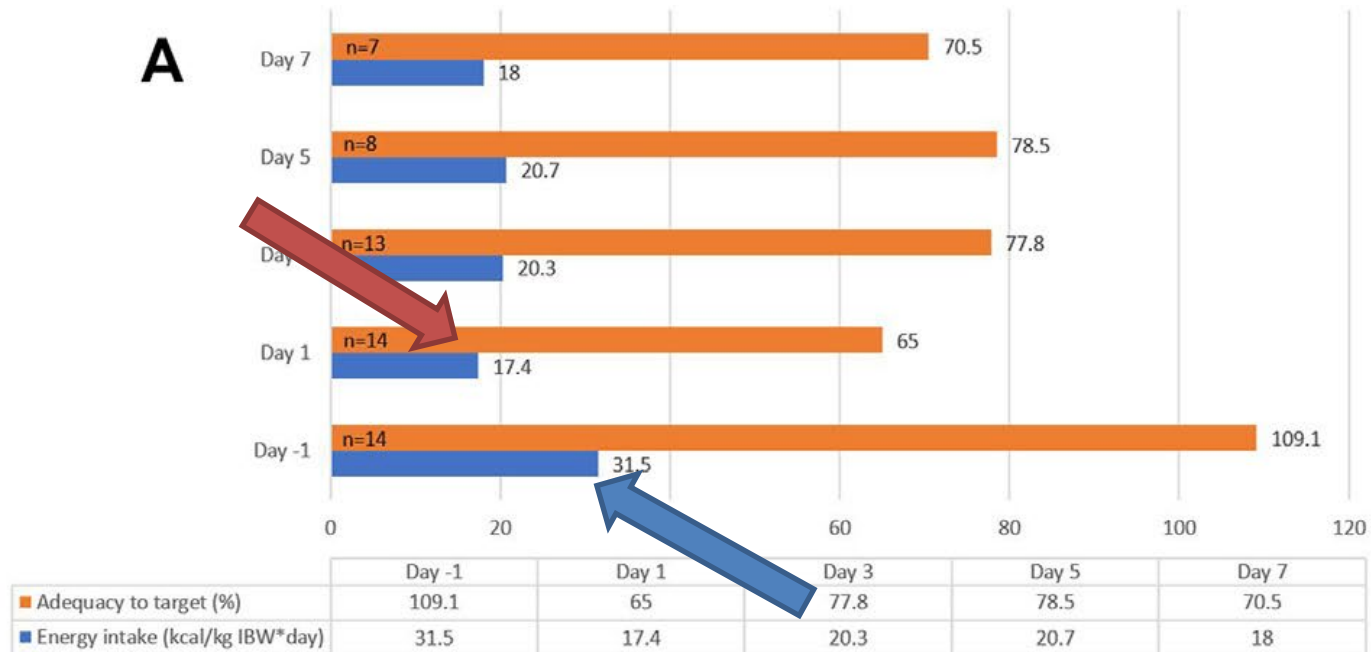


# Co víme o vývoji metabolického stavu po propuštění z ICU?



# Jak jsou ICU přeživší živeni?

## PROSPECT-I study



overfeeding není problém,  
underfeeding se zdá být normou

# Bariéry na cestě domů

„pacient je rozjedený“



All eaten



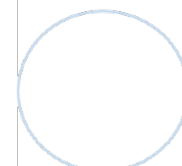
3/4 eaten



1/2 eaten



1/4 eaten



Nothing



### Healthcare system factors

- Lack of nutrition knowledge in wards
- Poor handover ICU to ward
- Lack of specialized dietetic knowledge
- Staffing shortage
- Financial restraints



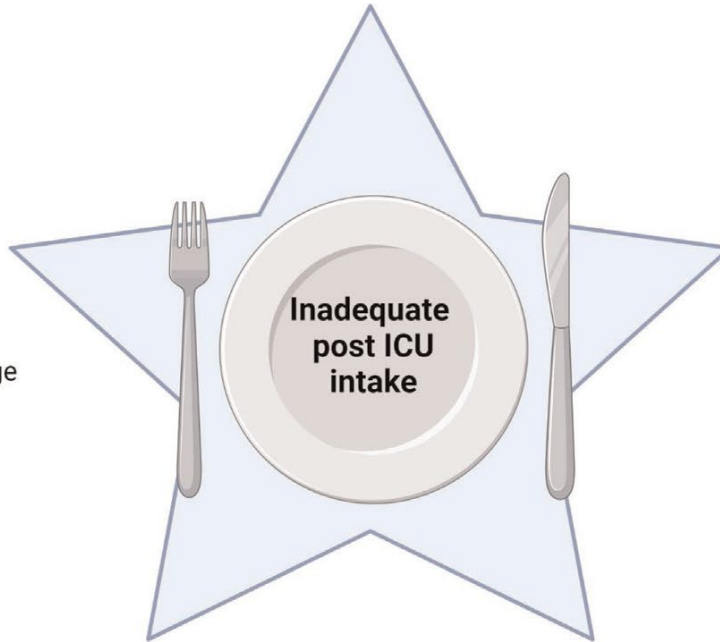
### Organizational process factors

- Inappropriate delivery times
- Inadequate prescriptions
- Missed meals
- Early removal of enteral feeding tubes



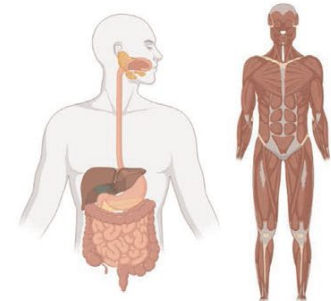
### Patient factors

- Poor appetite
- Early satiety
- Nausea-Vomiting
- Change of taste and smell
- Slow eating



### Functional problems

- Oropharyngeal dysphagia
- ICU acquired weakness
- Gastro/intestinal disturbances



### Psychological disabilities

- Depression-anxiety
- Post/traumatic stress disorder
- Sleep disturbances
- Pain
- Fatigue



**Víte kolik času stráví Váš pacient v posteli  
na stand. odd. ?**

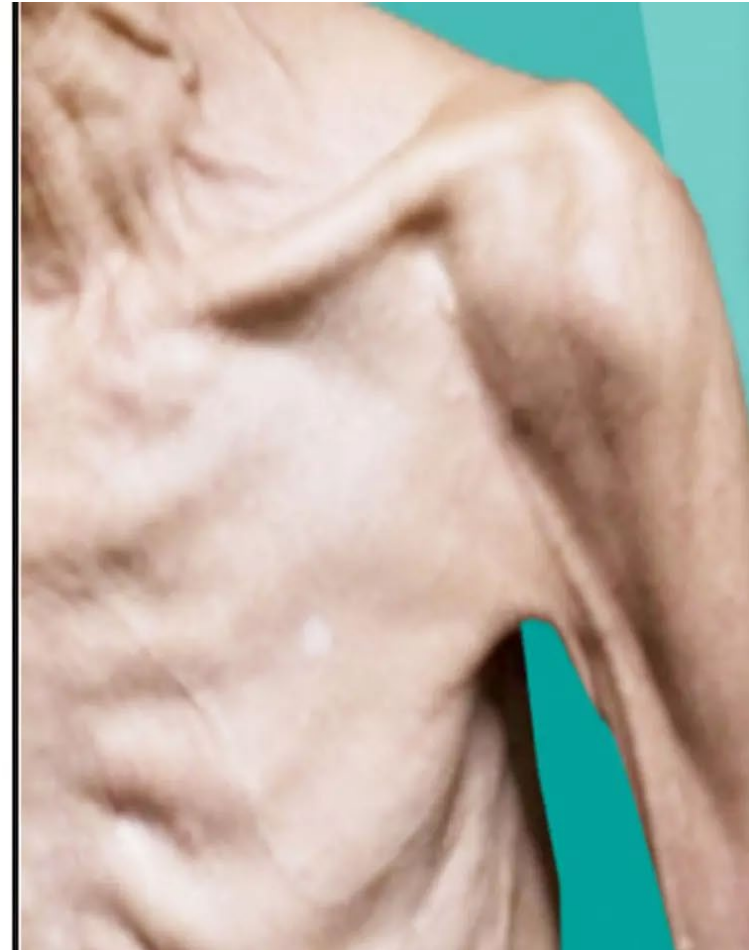


**≈ 95%!  
(45 min. denně mimo lůžko)**

**BED REST is TOXIC**



# Devastující muscle wasting – time for action



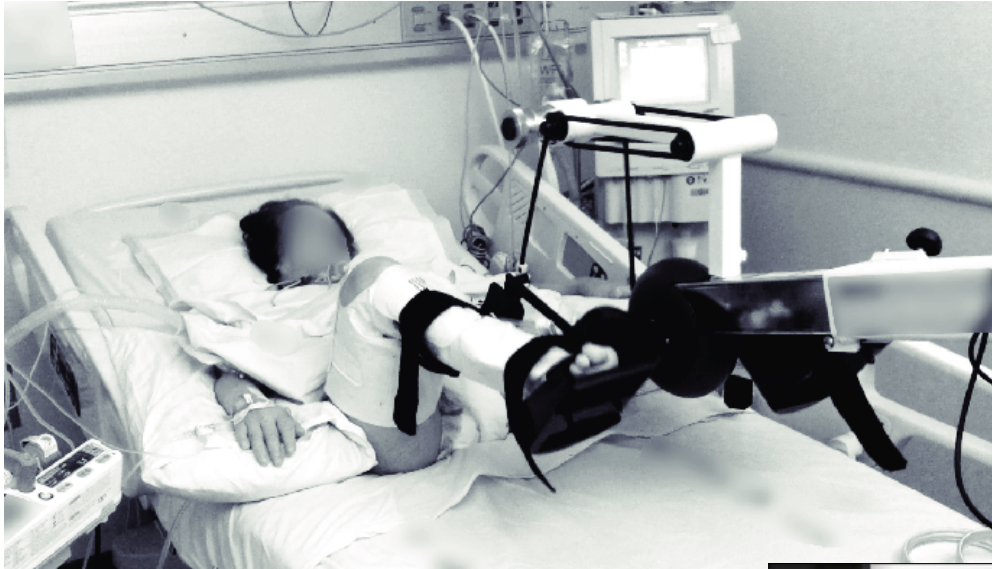
# Existuje optimální dávka a typ fyzické aktivity pro rychlost zotavení?

## WHAT THIS STUDY ADDS

---

- ⇒ Bed rest is less safe than staying active for acute hospital stays.
- ⇒ A small amount of slow walking (~25 min/day) is sufficient to improve function during acute hospital stays.
- ⇒ Optimal improvements in function are provided by either ~50 min/day of slow walking or ~40 min/day spent in multicomponent interventions (eg, ~20 min of resistance bands with ~20 min of aerobic activity).

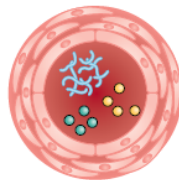
# Nemocniční „gym-bed“



# EXERKINY

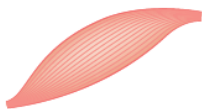


Exercise



Exerkines in the systemic circulation

Exerkiny jsou přenašeči dobrých zpráv uvnitř buňky, mezi buňkami, tkáněmi, orgány...



Skeletal muscle

- 12,13-diHOME
- Adiponectin
- Apelin
- Fetuin-A
- Follistatin
- HSP72
- IL-6
- IL-7
- IL-15
- Myostatin
- SDC4
- SPARC



Endocrine system

- BAIBA
- Fetuin-A
- Follistatin
- Fractalkine
- IL-6
- Irisin



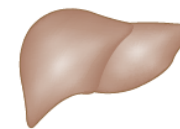
Adipose tissue

- 12,13-diHOME
- Adiponectin
- Angiopoietin-like protein 4
- BAIBA
- Catecholamines
- FGF21
- GDF15
- HSP72
- IL-6
- IL-15
- Irisin
- METRNL
- Myonectin
- TGFβ2



Cardiovascular system

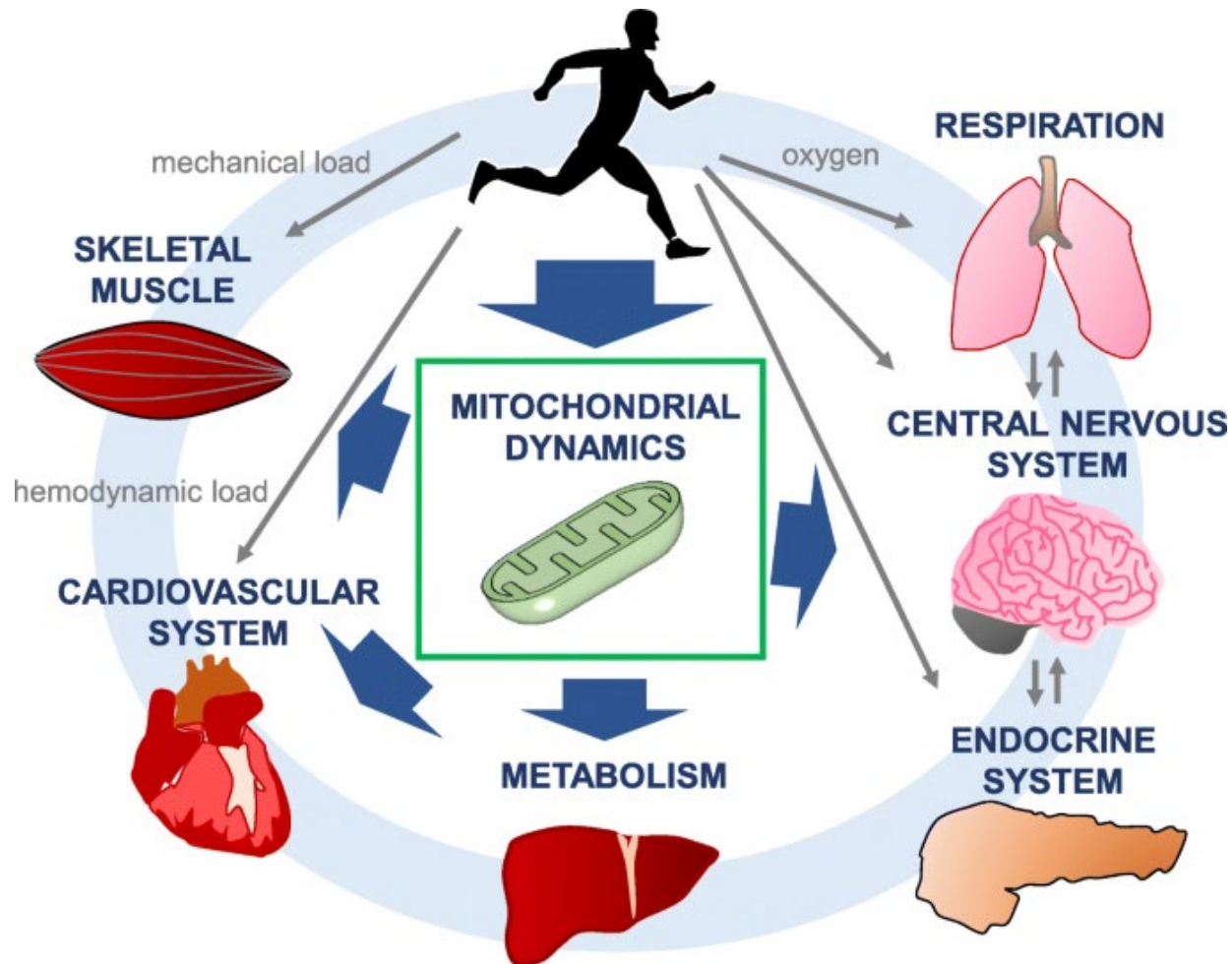
- 12,13-diHOME
- Adiponectin
- Angiopoietin 1
- Fractalkine
- FGF21
- IL-8
- Myonectin
- Musclin
- VEGF



Liver

- BAIBA
- Catecholamines
- IL-6
- Lactate
- Myonectin

# Fyzická aktivita = nejpotentnější lék na mitochondrie



# Lze nabídnout něco „navíc“?



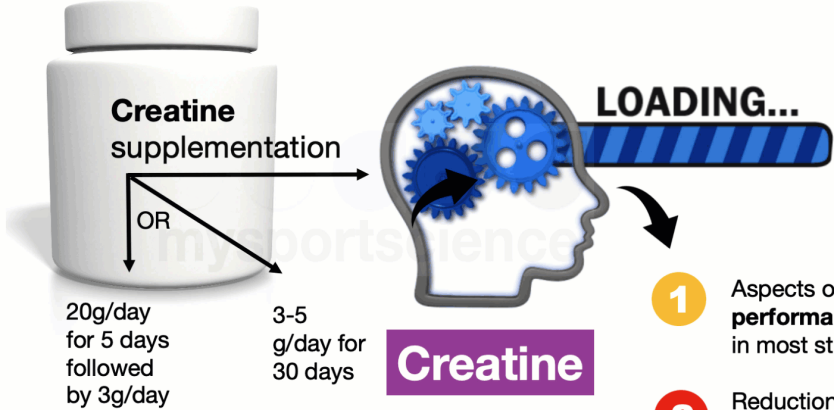
3-5 g / den

What we know\*

- ✓ Increases muscle creatine content.
- ✓ Augments the effect of training on muscle function.
- ✓ Augments the effect of training on lean mass.
- ✓ Has little (or no) effect when taken alone (without training).
- ✓ Is safe.

\*in healthy older individuals

## Creatine and the brain



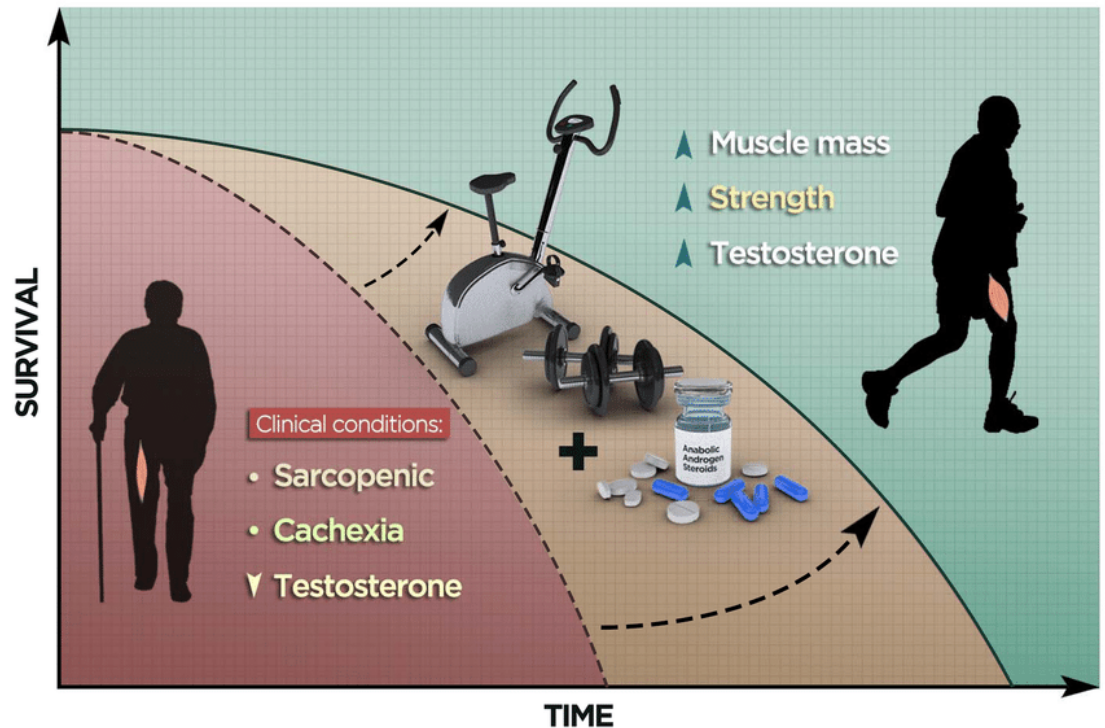
Safe to use and potentially positive effects on the brain

- 1 Aspects of **cognitive performance** improved in most studies
- 2 Reduction of impact of **concussion** or improved recovery from concussion



# Lze nabídnout něco „navíc“?

## Anabolic-Androgenic Steroids and Exercise Training: Breaking the Myths and Dealing With Better Outcome in Sarcopenia



25 mg-ženy, 50 mg muži 1x týdně/4-6 týdnů, nebo 3x á 3 týdny

# Maximum pro motivované All hands on deck.. (HCP, pacient, rodina...)



HQ Food  
Food synergy

Pohyb  
Cvičení – Ae/Res

HQ protein

Kreatin

V individuálních případech



Děkuji!

