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United For Clinical Nutrition EuroPN Survey[1]

Medical nutrition therapy and clinical outcomes in critically ill adults: A European multinational, prospective observational cohort study

UNITED for clinical nutrition
by Fresenius Kabi

1. Matejovic, M, Huet, O, Dams, K, Elke G, Vaquerizo Alonso C, Csomos A, Krzych LJ, Tetamo R, Puthucheary Z, Rooyackers O, Tjäder I, Küchenhoff H, Hartl WH, Hiesmayr M. Medical nutrition therapy and clinical outcomes in critically ill adults: a European multinational, prospective observational cohort study (EuroPN). Critical Care. 2022;26(143).

Background
Why research in clinical nutrition in the ICU matters

Adequate nutrition is essential to support the recovery of hospitalized patients, particularly those with critical illness.[2,3]

ESPEN ICU guidelines recommend a medical nutrition therapy that:

- provides <70 % of measured energy expenditure (EE) or of estimated needs during the early phase of acute illness[4]
- provides 80-100 % of EE after day 3[4]
- enables the progressive delivery of 1.3 g/kg protein equivalents[4]

If IC is not used, one of these options may be preferred:
- VO_2 or VCO_2 measurements
- simple weight-based equations (such as 20-25 kcal/kg/d)[4]

Adressing unmet needs

- Most critically ill patients do not receive adequate nutritional intake according to guideline targets.[5,6]
- Evidence from RCTs and observational studies on the amount and timing of medical nutrition therapy and clinical outcomes is inconsistent.[7-15]

EE: Energy expenditure, IC: Indirect calorimetry, RCT: Randomized controlled trial, VCO_2: Carbon dioxide production; VO_2: Oxygen consumption

Study design*

Exploring how medical nutrition is put into practice across Europe

EuroPN Survey: One of the largest longitudinal European real-world-studies

- **Multinational:**
  - Austria
  - Belgium
  - Czech Republic
  - France
  - Germany
  - Hungary
  - Italy
  - Poland
  - Spain
  - Sweden
  - UK
- **Prospective, observational**
- Data relating to nutrition intake was collected in the ICU for up to **15 days** and compared to the **ESPEN guidelines targets**
- **77 ICUs, 1172 patients**
- **Follow-up until day 90**

Study population

Patient Characteristics (n=1172[a])	Number of (%) or Median [95% CI]
Age	66.0 [56.0;74.0]
Male	745 (63.6)
Female	427 (36.4)
BMI (kg/m^2), n=1168	26.8 [24.0;31.1]
Type of ICU admission Surgical (emergency/elective) Non-surgical Others	 580 (49.5) 573 (48.9) 19 (1.6)
APACHE II, n=1132	18.5 [13.0;26.0]
SOFA (Median), n=1042	7 [4;10]
ICU LOS (days), n=1158	10 [7;16]

[a] unless otherwise indicated

Aims

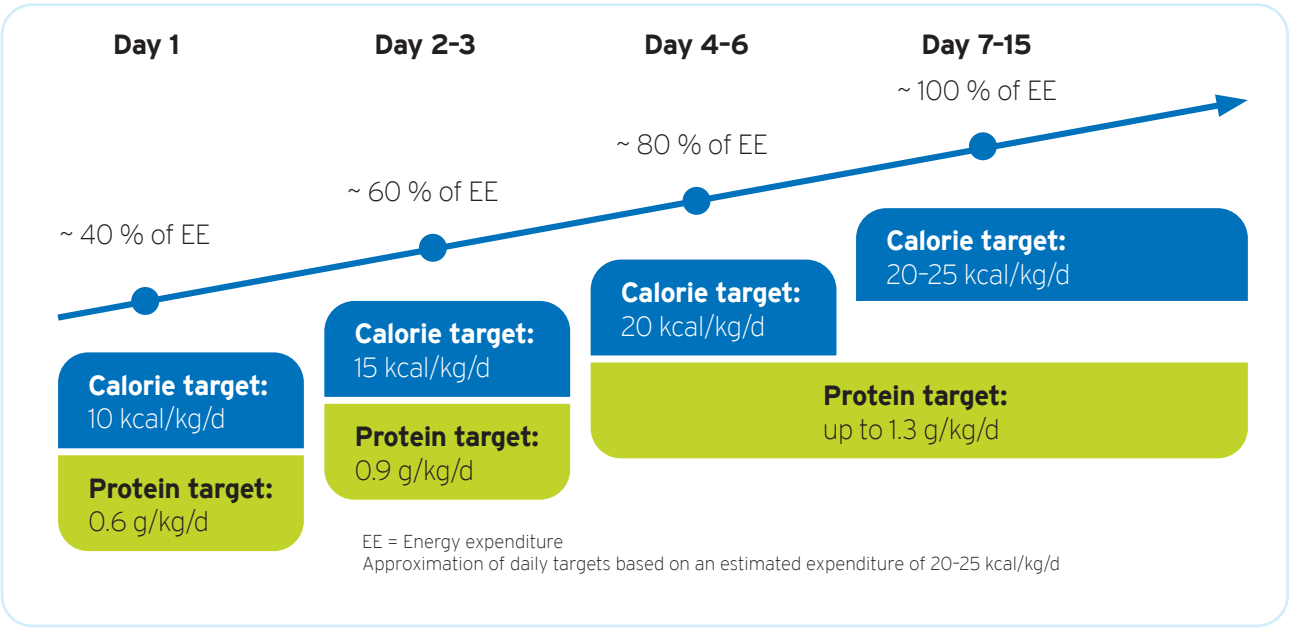
- Describe medical nutrition therapy for up to 15 days after ICU admission in European critically ill patients with a minimum length of stay of 5 days
- Assess the association between the daily calorie and protein intake and time to weaning from invasive mechanical ventilation and 90-day survival time

APACHE II Score: Acute Physiology And Chronic Health Evaluation, BMI: Body mass index, CI: Confidence interval, EN: Enteral nutrition, ESPEN: European Society for Clinical Nutrition and Metabolism, ICU: Intensive care unit, LOS: Length of stay, SOFA: Sequential Organ Failure Assessment

* Full study protocol published: Hiesmayr M, et al. 2021.[16]

Methods
Connecting nutritional intake with nutritional targets and clinical outcomes

Calculation of calorie and protein balances* based on progressive daily targets



EE = Energy expenditure
Approximation of daily targets based on an estimated expenditure of 20-25 kcal/kg/d

Association of daily nutrition intake and outcomes

Daily nutrient intake	LOW	MODERATE	HIGH
Calories (kcal/kg/d)	< 10	10-20	> 20
Protein (g/kg/d)	< 0.8	0.8-1.2	> 1.2

Clinical Outcome

- 90-day survival time
- Time to successful weaning from invasive mechanical ventilation (IMV)

*Calculated as the percentage deviation of nutritional intakes from all sources compared to ESPEN targets

EE: Energy expenditure, ESPEN: European Society for Clinical Nutrition and Metabolism, ICU: Intensive care unit, IMV: Invasive mechanical ventilation

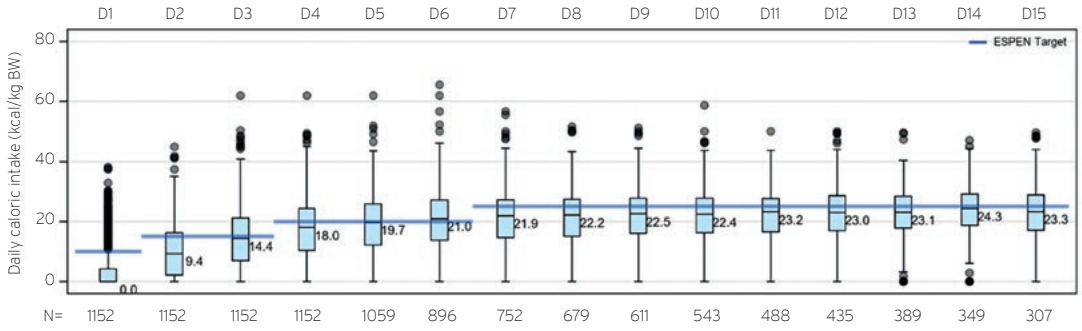
Results

How well are targets being met? Valuable insights into the current situation.

Medical nutrition therapy

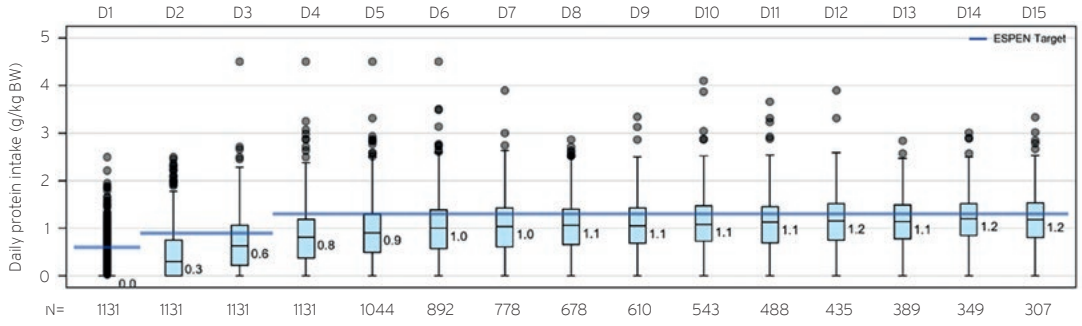
- EN and PN were initiated on median ICU day 2.0 [95% CI: 2.0;4.0]. The provision of nutrition was increased progressively over the first 5 days.
- Over half of the patients received medical nutrition therapy, either EN and/or PN, on day 3 after ICU admission.

Total daily caloric intake vs. daily ESPEN target†



83% (Median, 95% CI 59.2;106.6) **of patients' ESPEN calorie targets were met**

Total daily protein intake vs. daily ESPEN target†



65% (Median, 95% CI 41.4;90.9) **of patients' ESPEN protein targets were met**

†Intake is presented as the median value, interquartile range, minimum and maximum values with outliers versus pre-defined targets (blue horizontal bars) based on the 2019 ESPEN Guideline on clinical nutrition in the ICU.[4]

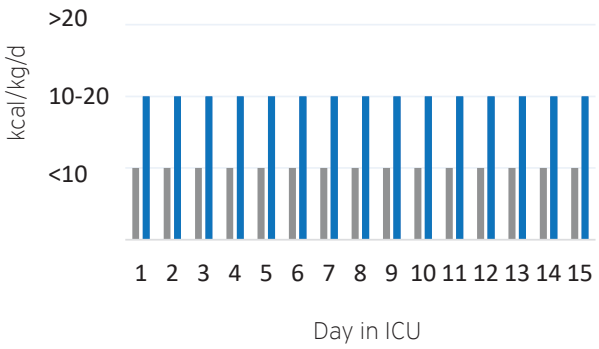
BW: Bodyweight, CI: Confidence interval, EN: Enteral nutrition, ESPEN: European Society for Clinical Nutrition and Metabolism, ICU: Intensive care unit, PN: Parenteral nutrition

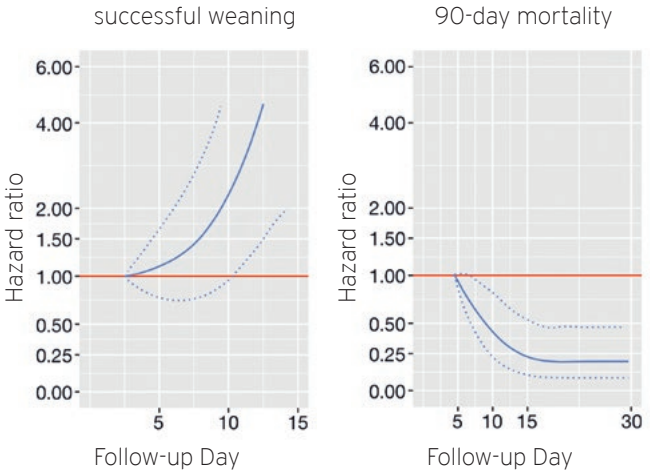
Clinical outcomes
How do patients benefit from moderate medical nutrition?

Calories†

10-20 kcal/kg/day (moderate) from day 1 to day 15 was significantly associated with a **longer 90-day survival time and shorter time on IMV** compared to less calories

Comparison of hypothetical calorie intakes (low vs. moderate)

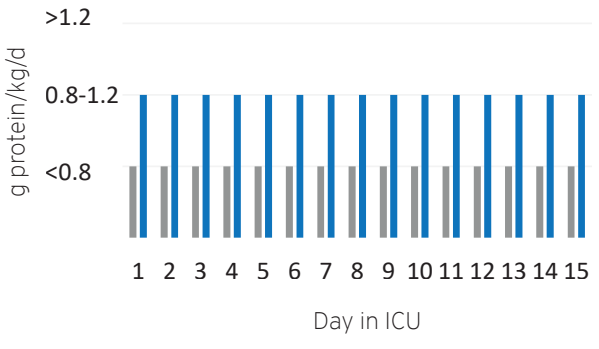




Proteins†

0.8-1.2 g/kg/day (moderate) from day 1 to day 15 was significantly associated with **earlier weaning from IMV**, but not with survival, compared to less protein

Comparison of hypothetical protein intakes (low vs. moderate)



† Hypothetical medical nutrition therapies with different levels of daily calorie and protein intake were used to facilitate the time-varying hazard ratios (HR) between nutrition and outcomes. Reference medical nutrition therapy is thereby always the one providing fewer calories. Blue solid lines indicate the Hazard ratio (HR), hatched lines the corresponding 95% CI; Significant association was indicated when HR and 95% CI do not cross the red line. A HR and 95% CI < 1 would indicate a longer survival time but also a longer time until extubation associated with the medical nutrition therapy providing more calories.

CI: Confidence interval, HR: Hazard ratio, ICU: Intensive care unit, IMV: Invasive mechanical ventilation

Conclusion
New evidence on the importance of medical nutrition therapy

Main take-aways of the study

- Calorie intake was mainly provided according to the targets recommended by the ESPEN guideline, but protein intake was lower.
- Early moderate daily calorie and protein intake were associated with improved clinical outcomes.

United For Clinical Nutrition EuroPN Survey:

The EuroPN study adds to the existing evidence on the benefits of an early medical nutrition therapy with moderate calorie and protein intake on clinical outcomes in critically ill patients.

ESPEN: European Society for Clinical Nutrition and Metabolism

Join us in raising the **relevance of clinical nutrition!**

Learn more about the initiative and explore the results of our multinational **United for Clinical Nutrition EuroPN study** on https://eu.unitedforclinicalnutrition.com

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