Nutrition in Critical Care

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CLINICAL GUIDELINES

• ASPEN/CCSM Guideline for the Provision and Assessment of Nutrition Support in the Adult Critically Ill Patient. JPEN (2016) 40:159-211


Update on previous ESPEN guidelines on EN and PN (2006 & 2009 resp)
• ESPEN 2018 methodology upgraded → rigorous evidence-based and consensus-based recommendations.

• ESPEN – includes studies published in the year 2000 or later were included in the meta-analysis. Large prospective RCT’s mainly since 2000.

• Large heterogeneity of the ICU population means the recommendations can only be a basis to support decisions made for each patient on an individual basis.
WHY FEED

Overall goal – To achieve optimal nutritional support for patients and minimise further malnutrition

• Reduce the effect of ICU Acquired Weakness (IAW)
  Multi-factorial –
  - effect of catabolic hormones
  - imbalance between energy and protein intake and requirements
  - physical immobilisation

• Reduce infectious complications

• Improve patient outcome
WHO TO FEED

• Patients at risk

• Consider in all patients staying in the ICU mainly for >48hrs.

• Every patient staying for >48hrs in the ICU should be considered at risk for malnutrition

ESPEN pragmatic approach because currently no gold standard for assessing nutritional risk/ malnutrition on ICU. (Different to ASPEN – NUTRIC SCORE or NRS 2002 – to categorise patients and define the nutritional regimen)
WHEN & WHICH ROUTE

• Start early Enteral Nutrition (EN) within 48 hrs of ICU admission unless contraindicated (See ESICM guidelines)

• Start slowly and build up

• Oral diet preferred in pts able to eat (Aim ≥70% Est Req’s)

• If oral intake not possible, early EN rather than delaying EN or giving PN

• If contraindications to EN, implement PN within 3-7 days. Earlier PN instead of no nutrition in severely malnourished patients
WHEN & WHICH ROUTE

• To avoid overfeeding, early full EN and early full PN shall not be used in critically ill patients but shall be prescribed within 3-7 days
WHEN TO FEED

Days 1-2
- Acute Phase
- Early Period

3-7
- Acute Phase
- Late Period

After day 7
- Anabolism
- Late Phase
- Rehabilitation
- Or Chronic Phase

Catabolism

"together we do the amazing"
WHEN TO FEED

• ESICM: 17 Recommendations favouring initiation of Early EN and 7 recommendations favouring delaying EN.
• Early EN for the majority of critically ill
• Suggested delaying EN in patients with: uncontrolled shock, uncontrolled hypoxaemia and acidosis, uncontrolled upper GI bleeding, GRV >500ml/6h, bowel ischaemia, bowel obstruction abdominal compartment syndrome, high-output fistulae without distal feeding access
WHAT TO FEED

• A general clinical assessment should be performed

• Include: weight, height, BMI, assess for recent unintentional weight loss or decrease in physical performance, MUAC, number of days of hospitalisation before ICU admission and/or in the ICU

• Assess risk of re-feeding syndrome
WHAT TO FEED - ENERGY

• In Mechanically Ventilated patients, Resting Energy Expenditure should be determined by Indirect Calorimetry

• If IC not available use predictive equations:
  - 25-28kcals/Kg BW (30-35kcals/Kg BW if rehab phase)
  - 11-14kcals/kg BW if BMI > 30 or
    (Use IBW if BMI ≥ 30 : 22-25kcal/kg IBW)

- Penn State University Equation (PSU) — using Max Temp °C (last 24hr) and median MV (L/min).
  If BMI ≥ 30 aim for 70-80% PSU beyond first week of ICU
WHAT TO FEED

• Avoid excessive amounts of nutrition by any route in early phase (days 1-2 of ICU stay) because of endogenous energy production

• Too low and too high calorie intake associated with \( \uparrow \) mortality

• However in all studies calorie delivery was lower than prescribed (50-70%)
WHAT TO FEED - PROTEIN

• During critical illness $\geq 1.3\text{g/Kg BW protein/d}$ can be delivered progressively. BMI $> 30$ Aim for 2-2.5g/Kg IBW/ d. Achieve target by day 4 of admission.

• Major Trauma $\geq 1.5\text{g/Kg BW}$, IHD 1.3-1.5g/Kg BW
  Head Injury 1.5g/Kg BW, CVVH 1.7g/Kg BW
  Spinal Cord Injury 2g/Kg BW

• Muscle comprises the largest protein pool in the body. Critical illness is associated with marked proteolysis and muscle loss (up to 1 kg per day)

• Physical activity may improve beneficial effects of nutritional therapy
PART 2

HOW TO FEED
Who to refer to dietitian:

- Long ICU stay > 10days
- BMI $\leq 18$ and $\geq 35$
- AKI/CKD requiring Renal Replacement Therapy (CVVH/IHD)
- Severe Pancreatitis
- Decompensated Liver Disease
- High output stoma/fistula
- Requiring post pyloric feeding (JEJ/NJ)
- New spinal cord injury
- Traumatic Brain Injury
- Considering Parenteral Nutrition (PN) – As soon as possible or BEFORE 11am if PN required the same day
Feeding Protocol

• Feeding protocols are standard practice in the ICU to facilitate early enteral feeding.

• Suitable for most patients on ICU and for others for the first few days of feeding—*nursing staff to calculate goal rate 25kcal/kg if BMI <30kg/m² or 20kcal/kg if BMI >30kg/m²*

• Accounts for propofol (1.1kcal/ml) 12ml/hr = 315kcals/24h

• Limitations of feeding protocols exist—doesn’t account for changes in clinical condition, other sources of energy intake (10% glucose/citrate dialysate), or feed interruptions. No protein calculation.

• Refer to dietitian if patient meets referral criteria or any intolerance issues or unsure for advice
Types of Enteral Feed

• First line feed on ITU is whole protein feed – Nutrison Protein Plus (1.25kcal/ml)

• Other feeds available depending on clinical need, e.g. nutrison concentrated, nutrison energy, nutrison multifibre

• If malabsorbing – may require peptide/MCT feed (Peptamen/Peptamen HN/Pepatmen AF/Vital 1.5)

• Prosorce TF (11g protein, 44kcal) required in some cases to meet higher protein needs

• Refer to dietitian if considering change of feed
Refeeding Syndrome

- Refeeding syndrome is defined as a condition characterised by severe fluid and electrolyte shifts and related metabolic complications.
- It occurs in malnourished patients undergoing re-feeding whether enterally (including orally) or parenterally and is associated with significant morbidity and mortality.
- It is characterised by hypophosphatemia, hypokalemia, hypomagnesaemia, altered glucose metabolism, vitamin deficiency and fluid abnormalities/altered fluid status.
- These can lead to cardiac, respiratory, neuromuscular, renal, and metabolic problems.
Pathogenesis and features of refeeding syndrome

- Hypokalaemia
- Hypomagnesaemia
- Hypophosphataemia
- Thiamine deficiency
- Salt and water retention - oedema

Starvation / Malnutrition

Glycogenolysis, gluconeogenesis and protein catabolism

Protein, fat, mineral, electrolyte and vitamin depletion – salt and water intolerance

Refeeding (switch to anabolism)

Fluid, salt, nutrients (CHO major energy source)

↑ Glucose uptake
↑ Utilization of thiamine
↑ Uptake of K⁺, Mg²⁺ & PO₄²⁻

↑ Protein and glycogen synthesis

Insulin secretion

Stanga et al 2008
Refeeding Syndrome
Identifying patients at risk

- **At Risk** – any patient who has had little or no food intake >5 days
- **High risk** – any patient in a starved state is at higher risk of RFS if they also have any of the following:
  - BMI < 16 kg/m^2
  - Unintentional weight loss >15% in 3-6 months
  - Very little/no nutrition >10 days
  - Low levels K, Mg, PO4 prior to feeding

- **High risk if 2 or more of the following:**
  - BMI < 18.5 kg/m^2
  - Unintentional weight loss >10% in past 3-6 months
  - Very little/no nutrition >5 days
  - A history of alcohol abuse or some drugs including insulin, chemotherapy, antacids or diuretics.

- **Extremely high risk:**
  - Patients in starved state BMI < 14
  - Negligible intake >15 days
Refeeding Protocol

• Refer to ITU Refeeding protocol
• Obtain weight and commence appropriate regimen
• **Prescribe vitamin supplements** -
  - IV Pabrinex I + II (if there is a concern re: gastric absorption/no enteral access route) once daily for a minimum of 3-5 days or Thiamine 100mg BD, Vitamin B Co Strong 1 tablet TDS and Forceval Soluble OD for 10 days
• **Monitor and correct** – K, PO4, Ca2, Mg2 daily until stable
Frequent feeding barriers in the critical care setting

• Feed off for diagnostic tests (CT/ MRI or similar)
• Fasting for procedures (e.g. surgical interventions, tracheostomy, extubation)
• Feeding tube placement (e.g. tube displacement, delays in tube insertion/confirmation of position).
• Gastrointestinal (GI) intolerance (e.g. vomiting, nausea, ileus)
• High gastric residual volumes (GRV) with cessation of feeding
GI INTOLERANCE - ↑ GRV

• In critically ill patients with gastric feeding intolerance, IV erythromycin should be used as a first line prokinetic therapy

• Alternatively, IV metoclopramide or a combination of both can be used.

• In patients with gastric feed intolerance not solved by prokinetics, postpyloric feeding should be used

• PN should not be started until all strategies to maximise EN tolerance have been attempted

(ESPEN 2018)
Parenteral Nutrition

- Historically some have associated PN as a last resort with its use being considered ‘high risk’ due to increased number of infections seen in dated studies.
  - Majority undertaken when; overfeeding common; line care suboptimal; access to ABX limited
  - CALORIES trial showed it is safe
  - PN may improve outcomes in those unable to feed enterally OR are not meeting energy targets
- Assess on a case by case basis
- Close monitoring required to prevent overfeeding and associated hyperglycemia
Parenteral Nutrition

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

• Parenteral lipid emulsions enriched with EPA + DHA (Fish oil dose 0.1-0.2 g/kg/d) can be provided in patients receiving PN.

• 2% Propofol (intralipid)= 1.1kcal/ml (therefore should be considered when devising feeding regimen)
  – 15ml/hr = 400kcal, 36g lipid/ 24 hr

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

• Weight 70kg = 21g/hour (500g/24hr)

(Espen 2018)
Post ITU

• Oral intake is poor post extubation <50% for 7 days post extubation
• Enteral feeding not thought to reduce oral intake – keep NG in until oral intake adequate for supplementary nutrition
• It can take up to 3-4 weeks for ghrelin (appetite hormone) to return to normal after critical illness
• 50% of patients experience post extubation dysphagia - refer to SLT (may require texture modified diet +/- fluids)
Nutrition Advice

• Establish small, frequent meal pattern 2-3 hourly
• High energy and protein menu, snacks and nourishing drinks (complan/meritene/milk)
• Low threshold for Oral Nutritional Supplements (ONS) Fortisip Compact Protein 300kcal and 18g protein

• If oral intake insufficient despite ONS- consider supplementary or full NG feeding
• PN reserved for non functioning gut (unable to take oral or EN) e.g. bowel obstruction, ileus, complex abdominal surgery
• Monitor and review oral/EN adequacy- adjust goals if required (weekly weight, monitor biochemistry, daily fluid balance, food chart, blood glucose)
Forward Planning

• Audit current energy and protein provision on ITU, compared to latest evidence/guidelines (BDA Outcomes)

• Await EFFORT Trial – high protein 2.2g/Kg BW versus low protein 1.2g/Kg BW (international registry based study)

• Trial of Nutricia Bengmark Nasojejunal feeding tubes (self advancing NJT)
Further Reading

• ASPEN/ICCM 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 (Feb 2016)
• ESPEN guideline of clinical nutrition in the intensive care unit (Nov 2018)
• EFFORT Trial - https://www.nutritioncare.org/EFFORTtrial/
• Journal of intensive care society - Optimising enteral nutrition in critically ill patients by reducing fasting times [accessed 02/05/19] https://journals.sagepub.com/doi/full/10.1177/1751143715599410
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Thank you, any questions?

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