The recent ESPEN guidelines (Singer et al., 2019) highlight the importance of recognising different phases of critical illness when considering route, timing and dose of nutrition support. Phases include: early acute phase, late acute phase and rehabilitation or chronic phase (i.e. post-acute phase) – see Figure 1. See Table 1 for nutritional targets during the different phases.

**Figure 1: Phases of critical illness**

<table>
<thead>
<tr>
<th>Phase</th>
<th>Days* in ICU</th>
<th>Kcal Goal</th>
<th>Protein Goal</th>
<th>Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Acute</td>
<td>0-2</td>
<td>≤15-20 kcal/kg</td>
<td>≤1g/kg kcal/kg</td>
<td><strong>Energy:</strong> Include non-nutritional energy sources. Consider endogenous energy production and patient’s capacity to mount this response. Unclear whether a very malnourished patient/starved patient will produce as much endogenous glucose as a well-nourished acutely unwell patient. Consider refeeding syndrome risk. Consider contraindications to feeding/feeding other than trickle feeding. <strong>Protein:</strong> Unknown whether patients with high losses, e.g. on CRRT, or with large wounds need more in first 2 days.</td>
</tr>
<tr>
<td>Late Acute</td>
<td>2-7</td>
<td>15-20-25 kcal/kg</td>
<td>1.2-1.5g/kg kcal/kg</td>
<td><strong>Energy:</strong> Include non-nutritional kcal sources. Consider refeeding syndrome risk. Consider patients clinical status, more caution in patients who are sicker/not improving/deteriorating compared to less caution in patients who are improving. <strong>Protein:</strong> Progressive increase to target. Aim for more protein in patients with losses (e.g. CRRT, wounds, steroids, high drain outputs). Consider renal function if not on CRRT.</td>
</tr>
</tbody>
</table>
Post-acute chronic phase

**Energy:**
- Progressive increase to target.
- Monitor for signs of overfeeding.

**Protein:**
- Protein targets in ICU patients remain unclear.
- Aim for more protein in patients with losses (e.g. CRRT, wounds, steroids, high drain outputs).
- Consider renal function if not on CRRT.

Post-acute rehabilitation phase

**Energy:**
- Monitor for overfeeding.
- Consider activity level, amount and type of physiotherapy.
- Monitor dry weight; functional status e.g. hand dynamometry and physical status (NFPE/SGA) if trained.

**Protein:**
- Consider renal function if not on CRRT.
- Consider activity level, amount and type of physiotherapy.
- Monitor functional status e.g. hand dynamometry and physical status (e.g. NFPE/SGA) if trained.

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**Key:** CRRT – continuous renal replacement therapy; NFPE – nutrition focused physical examination; SGA – subjective global assessment.

*Number of days is only a guide, each patient’s critical illness journey will differ. Critical illness may have commenced prior to ICU admission, or a few days into ICU admission. Acute phases may recur, e.g. new sepsis in a previously stable patient.*

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### Table 2 Medication infusions used in ICU and possible nutritional implications

<table>
<thead>
<tr>
<th>Medication</th>
<th>Possible nutritional implications</th>
</tr>
</thead>
</table>
| Inotropes/vasopressors, e.g. noradrenaline, adrenaline, vasopressin | - Increasing levels indicate severity of illness/unstable patient.  
- Inotropes can lead to hyperglycaemia.  
- Inotropes can increase energy requirements.  
- Avoid overfeeding patients with raised or increasing inotropic requirements.  
- Ischaemic bowel is a rare complication associated with EN. For patients on vasopressor therapy, monitor all signs of enteral feeding intolerance closely, including (but not limited to) abdominal distension, increased GAV/GRVs, decreased passage of stool, hypoactive bowel, increased metabolic acidosis and/or base deficit. If suspect gut ischaemia, EN may need to be withheld until symptoms and interventions are stabilised (McClave et al. 2016). |
| Sedatives e.g. midazolam infusion, propofol infusion, dexametadomidine, fentanyl, remifentanyl, vecuronium (muscle relaxant), sodium thiopentone | - Sedatives reduce energy requirements.  
- Sedatives reduce gut motility by relaxing visceral smooth muscle.  
- Propofol contains lipid which must be considered when devising nutrition support prescription, e.g. Lipuro contains MCT/LCT fat (0.01g fat/ml) and 1.058kcal/ml; Diprivan and Propofol 1% contain LCT fat (0.01g fat/ml) and 1.1kcal/ml. Propofol 2% contains 0.1g fat/ml and 1.1 kcal/ml (but lower volume needed compared with Propofol 1%). |
| Opioid analgesics, e.g. morphine infusion | Reduce gastric emptying and lead to disordered motility in the duodenum. Ensure adequate laxatives. |
| Dopamine infusion | Decreases proximal gastric tone and decreases contractions in gastric antrum. |
| Gastric acid reducing agents | Can stimulate gastrin which inhibits gastric emptying. |
| Intravenous 5% Dextrose | Gives 50g carbohydrate per litre, equivalent to 200kcal per litre. |
| Dialysate | Consider energy derived from glucose containing dialysates. |
| Citrate | Net energy absorption from citrate during CVVH is not known but can be estimated if 50% absorption is assumed, as follows: \[ \text{concentration of citrate containing solution in mmol/l x volume in ml/hr} \times 0.59\text{kcal} \times 0.50 = \text{estimated energy provision (kcal)}. \] |
| Amiodarone (anti-arythmic drug) | Metoclopramide (prokinetic) is contraindicated when on amiodarone infusion. |
| Inotropes/vaspressors, e.g. noradrenaline, adrenaline, vasopressin | Increasing levels indicate severity of illness/unstable patient.  
- Inotropes can lead to hyperglycaemia.  
- Inotropes can increase energy requirements.  
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When significant amounts of nutrients are provided or lost through means other than the nutrition support formula (e.g. intravenous infusions, drugs, dialysis mode), the nutrition care plan should be adjusted.