PENSA 2011 Highlights

The 14th Congress of Parenteral and Enteral Nutrition Society of Asia (PENSA) held on October 14–16, 2011, in Taipei, Taiwan brought together physicians, nurses, dietitians, pharmacists and nutritional specialists from Asia and beyond to discuss the latest advances in the field of nutrition. At the Nestlé Nutrition Institute (NNI) luncheon symposium, Professor Daren Heyland presented a new approach to optimizing enteral nutrition (EN) in the intensive care unit (ICU), stressing the role of early, proactive feeding to support patients during their ICU stay. At the symposium on malnutrition and geriatric nutrition, Ms Patricia Anthony discussed the effects of ageing on the immune system and the impact nutrition supplementation can have on health outcomes in the elderly.

Impact of adequate nutrition on outcomes

The amount of calories received has a direct relationship with 60-day mortality. In ICU patients who were receiving an average of 1,034 calories per day, an increase of 1,000 calories per day decreased the risk of dying by 24% (p=0.014).1 Receiving 1,000 more calories per day also increased the number of ventilator-free days (3.5 additional days; p=0.003). In a separate study, an additional 1,000 calories per day was also associated with a reduced risk of infection in ICU patients, particularly after 96 hours of ICU admission.4

How much is enough?

It is difficult to successfully deliver all of a patient’s prescribed calories in the ICU setting. A study of the association between 12-day caloric adequacy and 60-day hospital mortality has found that as the amount of calories delivered increases, mortality decreases.2 This effect peaks when a patient receives 80–85% of prescribed calories, implying that 80–85% could be a valid practical target range. This goal is achievable, as data from the INS show that the best-performing ICUs are currently reaching this level of nutrition delivery.

Overcoming barriers to EN

Aggressive gastric feeding can become a problem if it causes regurgitation, aspiration and pneumonia. Strategies to maximize the benefits and minimize the risks of EN can reduce these complications (Table 1).

Nurse-directed feeding protocols are very important. Successful protocols make the process of ordering and adjusting EN easy for staff – for example, doctors can tick a checkbox that then authorizes nursing staff to make the order. ICUs using an enteral feeding protocol achieve significantly better nutritional adequacy than ICUs without such a protocol.6 However, even with traditional protocols, patients are only receiving 60% of goal calories. If this situation is to be improved, a new approach to enteral feeding protocols is needed.

Table 1. Strategies to maximize the benefits and minimize the risks of EN

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Benefits</th>
<th>Contraindications</th>
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<tbody>
<tr>
<td>Head of bed elevation to 45° angle (or at least 30° if patient cannot tolerate 45°)</td>
<td>Reduces regurgitation, aspiration and subsequent pneumonia</td>
<td>Unstable c-spine, haemodynamically unstable, pelvic fractures with instability, prone position, intra-aortic balloon pump, some procedures, obesity</td>
</tr>
<tr>
<td>Proactive use of motility agents from initiation of EN</td>
<td>Increase in gastric emptying, reduction in feeding intolerance, greater caloric intake in critically ill patients (no effect on mortality or infectious complications)</td>
<td>Patients with contraindications to EN (perforated or obstructed gut, high-output fistula, etc.) Discontinue when no longer needed</td>
</tr>
<tr>
<td>Small bowel feeding tube if intragastric feeds are not tolerated and motility agents fail</td>
<td>Reduces reflux, aspiration and ventilator-associated pneumonia</td>
<td>None</td>
</tr>
<tr>
<td>Feeding protocol</td>
<td>Provide standardized structure to care, improve nutrition delivery</td>
<td>None</td>
</tr>
<tr>
<td>Include percent nutrition delivered in daily nursing report to medical team</td>
<td>Brings issue to attention of medical team, allows adjustments to be made in a timely manner</td>
<td>None</td>
</tr>
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</table>

EN, enteral nutrition
The PEP uP feeding protocol

In ICUs using traditional protocols, common reasons for inadequate EN delivery include being slow to start patients on EN, increasing the rate slowly, interruptions for procedures, and impaired gut motility. The Enhanced Protein-Energy Provision via the Enteral Route in Critically Ill Patients (PEP uP) protocol is an attempt to improve EN delivery by addressing these barriers. The fundamental philosophy behind the PEP uP protocol is to enhance the delivery of EN with a proactive approach that optimizes EN delivery (Table 2).

Elements of the PEP uP protocol

The PEP uP protocol introduces EN at target rate in appropriate patients. In intubated, mechanically ventilated patients in two medical-surgical ICUs, starting EN at the target rate did not increase mortality or complications compared with a gradual increase in flow rate, and enabled patients to receive more of their prescribed nutrients.8

The initial choice of formula is a concentrated, semi-elemental formula (Peptamen 1.5®, Nestlé Nutrition) because it can be easily digested and absorbed, and would be tolerated by the greatest number of patients (both full-volume and trophic-fed patients).2 Gastric emptying is faster with whey-based than casein-based formulae, and a higher density whey-based formula can be safely substituted for an equal volume of a lower energy density formula without affecting tolerance.9,10

Up-front protein supplementation (twice-daily bolus of 14 g Benepeptide®, Nestlé Nutrition) is given to prevent the accumulation of a protein debt. Inadequate protein intake can result in loss of lean muscle mass and immune dysfunction, leading to weakness and prolonged mechanical ventilation. When the patient is meeting their protein requirements, this supplement can be discontinued.

An up-front motility agent is also suggested (metoclopramide 10 mg IV every 6 hours, with a dosage adjustment in renal failure) in the absence of contraindications. This is re-evaluated in the following days and discontinued when appropriate.

Shifting NPO to trophic feeds

An alternative to NPO in patients who are not suitable for high-volume EN are trophic feeds, which involve giving a minimal volume of EN based formula can be safely substituted for an equal volume of a lower energy density formula without affecting tolerance.11

Higher tolerance for gastric residuals

The threshold for acceptable gastric residual volume (GRV) varies between units. A trial comparing 200 ml versus 500 ml recently reported no statistically significant differences in frequency of pneumonia, duration of mechanical ventilation, length of stay or mortality between the two groups (intubated, mechanically ventilated ICU patients).11 While 500 ml could be too high for critically ill patients, it may be acceptable for medical, haemodynamically stable patients. Ideally, units could apply one threshold value that is acceptable for the majority of ICU patients, including surgical and haemodynamically challenged patients. This suggests the GRV threshold could be >200 but <500 ml. The PEP uP protocol uses 250–300 ml.

Safety and acceptability of the PEP uP protocol

A single-centre feasibility trial of the PEP uP protocol at the Kingston General Hospital, Canada investigated whether nurses would accept the new approach, and if it was safe for patients.7 Nurses were most wary of starting feeds at target hourly rate, but readily accepted a 24-hour volume-based target, and immediate starts for motility agents and protein supplements. No adverse events were reported.

After the protocol was implemented patients were more likely to receive trophic feeds instead of NPO orders, and the number of patients receiving protein supplements and motility agents on day 1 increased from 0% to between 20% and 30%. The number of complications such as vomiting, regurgitation, witnessed aspiration and ventilator-associated pneumonia was not increased on the PEP uP protocol. The percent of prescribed calories actually received increased to between 80% and 100% – a remarkable level.

Conclusion

Significant iatrogenic malnutrition occurs in healthcare settings and this is associated with worse clinical outcomes for critically ill patients. There is a need to further improve EN delivery in ICUs worldwide. This can be achieved through the optimization of feeding protocols, which should be a part of standard of care in ICUs as part of the attempt to maximize safe administration of EN. The PEP uP protocol is a proactive approach to feeding the critically ill patient, and represents a step towards this goal. The PEP uP protocol is acceptable and safe, and a multicentre trial evaluating it further is currently underway in Canada and the USA.

References


7. Heyland DK, Carli NE, Dhaliwal R, et al. Enhanced protein-energy provision via the enteral route in...
Malnutrition also exacerbates the immune system impairment seen with normal ageing. Malnourished older adults have a similar pattern of immune changes as immunosenescence, but to a greater degree. Malnourished patients have a three-fold higher risk of infectious complications compared with well-nourished controls.8

Weight loss in older adults increases mortality and risk of disability, and is associated with a decline in functional status. Older adults are at high risk of protein and micronutrient deficiencies including vitamins B6, B12, C, D, E, folate, calcium, iron, selenium and zinc.

### Protein needs

Compromised health status increases protein needs, and when people become ill they tend to consume even less protein than usual. The current US Recommended Daily Intake (RDI) for protein is 0.8 g/kg body weight per day, which has been determined based on the needs of healthy young adults. There is scientific consensus that older adults require a minimum of 1.06 g/kg protein per day to be in neutral nitrogen balance,2 and higher levels (1.2–1.5 g/kg/d) may be needed in times of illness and during recovery.

A study in elderly hip fracture patients showed that increased protein intake improved muscle strength and reduced loss of bone mass. These clinical benefits also culminated in a significantly reduced rehabilitation length of stay in the protein-supplemented patients (33 vs 54 days; p=0.018).8

### Nutrition intervention can make a difference

A nutritional supplement containing vitamins E, B6, B12, folate, pre- and probiotics (in addition to protein and calories), has demonstrated a positive effect on immune response in healthy elderly people living in the community.8 Subjects taking the supplement showed increased natural killer (NK) cell activity, while this activity decreased in non-supplemented controls. Decreasing levels of NK cells can mean longer-lasting infections and a lower defence against tumour cells. Increased levels in the supplemented group therefore indicate a strengthening of the immune system. In addition, interleukin-2 production by peripheral blood mononuclear cells decreased in control subjects but held steady in supplemented subjects.

These improvements in immune parameters translated into a 41% reduction in infections in supplemented versus non-supplemented individuals (14.5% vs 24.4%, p=0.02). This reduction was predominantly in respiratory infections but also included gastrointestinal, skin and urinary infections.

A Cochrane review of oral nutritional supplements has found that supplements can improve nutritional status and reduce mortality and complications for undernourished elderly patients in the hospital setting.11 Supplementation allows the older adult to meet or exceed their recommended dietary allowances without decreasing their food intake.11

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**Table 1. Age-related changes in immune function**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decrease in new T lymphocyte generation and change in function</td>
<td>Reduced antibody response to vaccination</td>
</tr>
<tr>
<td>Decrease in total lymphocyte number</td>
<td>Decreased ability to recognize specific antigens and processes for immunologic memory</td>
</tr>
<tr>
<td>Decrease in natural killer (NK) cell effectiveness</td>
<td>Longer-lasting infections, lower defence against tumour cells</td>
</tr>
<tr>
<td>Reduced skin reaction to antigens (delayed type hypersensitivity)</td>
<td>Less ability to fight infection (pathogens)</td>
</tr>
<tr>
<td>Altered macrophage function</td>
<td>Suboptimal wound healing</td>
</tr>
<tr>
<td>Change in immunoglobulin (Ig) levels (increased IgA and IgD; decreased IgG)</td>
<td>High susceptibility to and incidence of pulmonary infection</td>
</tr>
<tr>
<td>Reduced antibody production in response to antigen or vaccination</td>
<td>Increase in autoantibodies versus antibodies, thus decreasing ability to fight infection but increasing inflammation</td>
</tr>
<tr>
<td>Reduced cytokine response in the setting of infection</td>
<td>Inability to manifest classic signs and symptoms of infection and mount an adequate response to infection</td>
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Taking an oral nutritional supplement between meals instead of with meals is a useful strategy to increase overall intake.\(^5\)

Recommendations for appropriate nutritional intervention based on the Mini Nutrition Assessment (MNA\(^6\)), a validated nutrition screening tool specially designed for the elderly population, are given in Figure 1.

**Conclusion**
Older age is associated with higher risk of infection, more severe infections and an increased mortality rate. This may be due to immunosenescence, or ‘ageing of the immune system’.

Malnutrition is common in older adults, and worsens immunosenescence and outcomes. In older adults with a medical crisis such as a fracture, infection or illness, nutrient needs increase but intake and appetite typically decrease. This leads to a downward spiral of declining nutritional status, weight loss, prolonged recovery, increased complications, muscle weakness and risk of falls, loss of independence in daily living and finally institutionalization (Figure 2).

Nutrition intervention can reverse poor nutritional status and potentially prevent this downward spiral of adverse outcomes. Nutritional supplementation has been shown to enhance the immune response, reduce complications and decrease the mortality rate in undernourished elderly patients.

### Figure 1. Recommendations for nutritional intervention\(^10,13,14\)

**MNA\(^6\), Mini Nutritional Assessment**

<table>
<thead>
<tr>
<th>MNA(^6) score</th>
<th>Normal nutritional status (12–14 points)</th>
<th>At risk of malnutrition (8–11 points)</th>
<th>Malnourished (6–7 points)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RESCREEN</strong></td>
<td>After acute event or illness</td>
<td>Once per year in community dwelling elderly</td>
<td>Every 3 months in institutionalized patients</td>
</tr>
<tr>
<td><strong>MONITOR</strong></td>
<td>Close weight monitoring</td>
<td>Rescreen every 3 months</td>
<td>Further in-depth nutrition assessment</td>
</tr>
<tr>
<td><strong>TREAT</strong></td>
<td>Nutrition intervention</td>
<td>Diet enhancement</td>
<td>Oral nutritional supplementation (400–600 kcal/d)</td>
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### Figure 2. In older adults, a medical crisis can lead to a downward spiral of worsening health status. Nutritional intervention can potentially prevent this decline

**ADLs, activities of daily living; IADLs, instrumental activities of daily living**

**Increased nutrient needs, decreased appetite and intake**

**Inactivity, muscle weakness, risk of falls and fractures**

**Loss of IADLs/ADLs, increased dependency**

**Institutionalization**

**Prolonged recovery, increased complications**

**Increased nutrient needs, decreased appetite and intake**

**References**