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Highlights of A.S.P.E.N. Clinical Nutrition Week

29 January – 1 February 2011

Conference calendar
Nutritional needs and interventions to support geriatric hip fracture recovery

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Introduction

Undernutrition is often observed in the elderly, and it appears to be more severe in patients with hip fracture than in the general aging population. A state of undernutrition on admission is consistently documented in elderly patients with hip fracture. This, in addition to an inadequate food intake during hospital stay, can adversely influence the clinical outcome. Among the various nutrients, a low protein intake may be particularly detrimental for both the acquisition of bone mass and the conservation of bone integrity with aging. Protein undernutrition can favor the occurrence of hip fracture by increasing the propensity to fall as a result of muscle weakness and of impaired movement co-ordination, by affecting protective mechanisms, such as reaction time or muscle strength, and/or by decreasing bone mass (Figure 1). Furthermore, a reduction in the protective layer of soft tissue padding decreases the force required to fracture an osteoporotic hip.

Close to 40% of hip fractures occur in nursing homes, in which undernutrition is known to be particularly prevalent. The age-adjusted incidence of hip fracture is higher in urban areas than rural areas. To investigate whether the higher number of nursing homes located in urban versus rural areas could explain this observation, we used a 5-year record of hip fractures and found an even larger difference in incidence between urban and rural areas when patients living at home were considered separately; thus, the difference was unlikely to be due to a predominantly urban location of institutions for elderly. It is well established that osteoporotic fractures are associated with significantly increased mortality particularly in men, who also need a more intensive medical care environment after hip fracture. The proportion of potential years of life lost is greater in men than age-matched women. Finally, when the hospital outcome of elderly is assessed in relation to nutritional status – as evaluated at admission by the Mini Nutritional Assessment (MNA®) – poor nutritional status is associated with higher in-hospital mortality rate, higher rate of discharge to nursing homes and longer length of stay (LOS).

This article will review the evidence for nutrition to impact the pathogenesis and management of osteoporotic fractures, a mechanism that is possibly partly mediated through insulin-like growth factor-I (IGF-I).

BMD and dietary protein

Numerous studies have determined a positive association between bone mass at various skeletal sites and spontaneous protein intake. In a survey carried out in hospitalized elderly patients, low protein intake was associated with reduced femoral neck areal bone mineral density (BMD) and poor physical performance. The
Fracture risk and dietary protein

An indirect argument in favor of a deleterious effect of high protein intake on bone is that hip fracture appears to occur more frequently in countries with high protein intake of animal origin. But, as expected, the countries with the highest incidence are those with longest life expectancy, which could explain higher fracture incidence. Data from the Nurses’ Health Study, which included middle-aged women, demonstrated a trend for a hip fracture incidence inversely related to protein intake. In a prospective study carried out on more than 40,000 postmenopausal women in Iowa, USA, higher protein intake was associated with a reduced risk of hip fracture. The protective effect was observed with dietary protein of animal origin. In a case-control study, the highest quartile of protein intake was associated with a lower hip fracture risk (odds ratio 0.35, 95% confidence interval 0.21–0.59) in those aged 50 to 69 years. In another survey in middle-aged adults, no association between hip fracture and non-dairy animal protein intake could be detected. However, fracture risk was increased when a high protein diet was accompanied by a low calcium intake. In two longitudinal Framingham studies, with mean ages of 55 and 72 years, respectively, higher protein intake was associated with lower hip fracture risk. The 85% reduction observed in the former was only detected if calcium intake was greater than 800 mg/d. In a longitudinal study, hip fracture incidence was positively related to a higher ratio of animal-to-vegetable protein intake, but BMD was greater in the group with higher protein intake.

High protein intake has been claimed to be a risk factor for osteoporosis. The proposed mechanism implies that increasing protein intake increases acid production and renal acid excretion. Since urinary calcium excretion directly varies with acid excretion, urinary calcium is positively correlated with protein intake. These associations would thus suggest that high protein intake will in turn induce a negative calcium balance and, consequently, would favor bone loss. Nutrition-generated acid load would then lead to an increased bone dissolution in healthy individuals, this by analogy to the classical physico-chemical in vitro observation that lowering pH favors the dissolution of calcium phosphate crystals, including those of hydroxyapatite. However, further studies indicate that a reduction in dietary protein leads in fact to a reduction in calcium absorption and to secondary hyperparathyroidism. A low (0.7 g/kg BW), but not a high (2.1 g/kg BW), protein intake was associated with an increase in biochemical markers of bone turnover compared with a diet containing 1.0 g/kg of protein. In healthy postmenopausal women, a diet high in meat (1.6 g/kg BW of protein) compared with 0.9 g/kg for 8 weeks did not affect calcium retention nor indices of bone metabolism.

It has been claimed that the source of protein, animal versus vegetable, would affect calcium metabolism differently. This is based on the hypothesis that animal protein would generate more sulfurous acid from sulfur-containing amino acids than a vegetarian diet. That animal protein, in contrast to vegetable protein, would be consistently detrimental for bone health is not supported by chemical and experimental evidence. Indeed, a vegetarian diet with protein derived from grains and legumes delivers as many millimoles of sulfur per gram protein as would a purely meat-based diet. On the other hand, it appears that meats contain other than sulfur acid-producing substances. High protein intake is not associated with significant changes in blood pH. In favor of this endogenous acid production in bone metabolism, it appears that neutralization of this endogenous acid production with potassium bicarbonate is associated with positive calcium balance. In a cross-sectional survey, BMD was higher in subjects with diets rich in fruits and vegetables, presumably rich in alkali. However, this issue is further complicated by the fact that the vegetable intake-induced decrease in bone resorption has been shown to be independent from acid-base changes and that potassium but not sodium bicarbonate (ie, the same anion), or citrate administration, reduces urinary calcium excretion.

Intervention trials

Intervention studies using a simple nutritionally-complete oral nutritional supplement (ONS) that normalizes protein intake can improve the clinical outcome after hip fracture. In a randomized study of elderly patients with femoral neck fracture, protein intake in those receiving a 20 g milk protein supplement increased from low to a level still below the recommended daily allowance (0.8 g/kg BW), thus avoiding the risk of an excess of dietary protein. Follow-up showed a significant difference between groups in the clinical course...
in rehabilitation hospitals, with the supplemented patients doing better than the control group. A significantly lower rate of complications and deaths was still observed at 6 months in the supplemented group. The LOS in the orthopedic ward and rehabilitation hospital was significantly shorter in supplemented patients than in controls. Normalization of protein intake, independently of that of energy, calcium and vitamin D, was in fact responsible for this more favorable outcome.

Nutritional requirements are not met while patients are in hospital although adequate quantities of food are offered. Whereas ONS is associated with a favorable outcome, the key nutrient responsible for this beneficial effect seems to be protein; in a randomized controlled trial protein intake was the primary variable accounting for the better outcome. In undernourished elderly with a recent hip fracture, an increase in protein intake, from low to normal, can also be beneficial for bone integrity. Indeed, protein repletion with 20 g milk protein supplement daily for 6 months compared to an isocaloric placebo produced greater gains in serum prealbumin, IGF-I and immunoglobulin M (IgM), and an attenuated proximal femur BMD decrease. In this trial, all 82 patients (mean age 80.7 ± 1.2 years) were given 200,000 IU vitamin D once at baseline, and 550 mg/d of calcium, starting within 1 week of an osteoporotic hip fracture. In a multiple regression analysis, baseline IGF-I concentration and biceps muscle strength, together with 20 g protein supplements, accounted for more than 30% of the variance of the LOS in rehabilitation hospitals (r² = 0.312; P < 0.0005), which was reduced by 25% in the 20 g protein supplemented group (Figure 2).

LOS in rehabilitation hospitals was reduced by 25% in the 20 g protein supplemented group

Figure 2. Protein malnutrition in the pathogenesis of osteoporotic fractures

The lower incidence of medical complications observed after providing a 20 g protein supplement is compatible with the hypothesis of IGF-I improving the immune status

Short-term studies on the kinetics of the IGF-I response to protein supplements were conducted in two situations associated with low baseline IGF-I levels. In elderly with a recent hip fracture, a protein supplement of 20 g/d increased serum IGF-I and IGF-binding protein-3 within 1 week. Various protein sources, namely casein, whey, and whey plus essential amino acids (EAA), similarly elevated IGF-I. The increase in bone turnover, as assessed by biochemical markers, was slightly delayed. A randomized double-blind controlled trial in hospitalized frail elderly patients tested whether zinc could influence the IGF-I response and kinetics to 20 g protein supplements (composed of 15 g whey and 5 g EAA). The rationale of this comparative study was the presence of a zinc-responsive element in the promoter of the IGF-I gene. Whereas IGF-I rapidly increased in groups receiving the protein supplement, zinc accelerated this increase, and decreased the serum level of a biochemical marker of bone resorption. With zinc supplements, activities of daily living (ADL) improved in those patients with the highest degree of malnutrition. The lower incidence of medical complications observed after providing a 20 g protein supplement is compatible with the hypothesis of IGF-I improving the immune status, as this growth factor can stimulate the proliferation of immunocompetent cells and modulate immunoglobulin secretion.

Based on the magnitude of bone loss occurring on the contralateral side after hip fracture, and also on the well established increased risk of subsequent fracture after an osteoporotic fracture, a clinical pathway for the management of patients with low trauma fracture has been implemented. A multidisciplinary team oversees the osteoporosis clinical pathway (Figure 3). Patient information is collected (including consideration of risk factors and dietary intakes), additional diagnostic tests are conducted as deemed necessary, and the global evaluation leads to an individualized patient care plan. Education on nutrition, physical exercise and lifestyle habits is offered to the patients and their relatives. Benefits observed at 6 months include a high rate of patient compliance to the recommended intervention, suggesting positive awareness and efforts made in the management of their disease.
Altogether, these results indicate that sufficient protein intake is mandatory for bone health and other clinical outcomes (Table 1). While a gradual decline in caloric intake with age can be considered as an adequate adjustment to the progressive reduction in energy expenditure, the parallel reduction in protein intake may be detrimental for maintaining the integrity and function of several organs or systems, including skeletal muscle and bone. A restoration of the altered growth hormone (GH)–IGF-I system in the elderly by protein replenishment is likely to favorably influence not only BMD but also muscle mass and strength, two variables that are important determinants of the risk of falling.

**Mechanisms involved**

Based on experimental and clinical observations, IGF-I appears to play a prominent role in the pathophysiology of osteoporosis, of osteoporotic fracture and of its complications.

Protein restriction has been shown to reduce IGF-I plasma levels by inducing resistance to the action of GH at the hepatic level, and by increasing IGF-I metabolic clearance rate. Decreased levels of IGF-I have been found in states of undernutrition, such as marasmus, anorexia nervosa, celiac disease or in HIV-infected patients. Furthermore, elevated protein intake prevents the decrease in IGF-I usually observed in hypocaloric states.

IGF-I can exert anabolic effects on bone mass not only during times of body growth, but also during adulthood. Furthermore, by its renal action on tubular reabsorption of phosphate and on the synthesis of calcitriol, through a direct action on renal cells, IGF-I can be considered as an important controller of the intestinal absorption and of the extracellular concentration of both calcium and phosphate, the main elements of bone minerals, achieved in part through IGF-I–stimulated activation of vitamin D (Figure 4). In humans, increased intake of aromatic, but not of branched-chain, amino acids is associated with increases in serum IGF-I, intestinal calcium absorption and 24-h urinary calcium excretion, without any change in biochemical markers of bone turnover. Dairy products are a rich source of these aromatic amino acids, supporting the benefits of milk protein consumption.
Table 1. Summary of evidence from intervention trials

<table>
<thead>
<tr>
<th>Study population</th>
<th>Age</th>
<th>Nutritional intervention</th>
<th>Control</th>
<th>Duration and follow-up</th>
<th>Outcomes</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elderly hip fracture patients</td>
<td>80.4 ± 8.5 y</td>
<td>20 g milk protein +525 mg calcium +25 IU vitamin D +other vitamins/minerals</td>
<td>no ONS</td>
<td>32 d (mean) intervention; 6 mo follow up</td>
<td>Increase serum albumin levels at 14 d, 28 d, and 6 mo</td>
<td>P = 0.05</td>
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<td></td>
<td>Improve clinical course in orthopedic ward; recovery hospital, and at 6 mo follow up</td>
<td>P &lt; 0.05</td>
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<td>P &lt; 0.02</td>
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<tr>
<td>Elderly hip fracture patients</td>
<td>83.2 ± 1.3 y</td>
<td>20 g milk protein +525 mg calcium +25 IU vitamin D +other vitamins/minerals</td>
<td>protein-free ONS</td>
<td>38 d mean intervention; 7 mo follow up</td>
<td>Decrease rate of complications and deaths at 7 mo follow up</td>
<td>P &lt; 0.02</td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td>Improve clinical course during recovery hospital stay</td>
<td>P &lt; 0.05</td>
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<td>P &lt; 0.03</td>
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<tr>
<td>Elderly hip fracture patients who received an initial dose of vitamin D (200,000 IU)</td>
<td>80.7 ± 7.4 y</td>
<td>20 g milk protein +525 mg calcium +25 IU vitamin D +other vitamins/minerals</td>
<td>isocaloric, protein-free ONS</td>
<td>One ONS, 5 d/wk for 6 mo; 1 y follow up</td>
<td>Increase serum prealbumin levels at 1 y</td>
<td>P = 0.003</td>
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<td>P &lt; 0.05</td>
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<td>P = 0.016</td>
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<td>Increase immunoglobulin M levels at 6 mo</td>
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<td>Increase serum IGF-I concentration at 6 mo</td>
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<td></td>
<td>Decrease rate of complications and deaths at 7 mo follow up</td>
</tr>
<tr>
<td>Elderly women with recent hip fracture</td>
<td>81.3 ± 7.4 y</td>
<td>20 g casein, whey, or whey plus EAA +550 mg calcium +500 IU vitamin D</td>
<td>no ONS</td>
<td>One ONS daily for 4 wk</td>
<td>Increase serum IGF-I concentration at 1 wk</td>
<td>P &lt; 0.003</td>
</tr>
<tr>
<td>Hospital patients with or at risk of malnutrition as measured by MNA®</td>
<td>83.6 ± 1.3 y</td>
<td>15 g whey plus 5 g EAA +550 mg calcium +30 mg zinc</td>
<td>no ONS</td>
<td>One ONS daily for 4 wk</td>
<td>Protein supplements increase serum IGF-I concentration at 1 wk</td>
<td>P = 0.0001</td>
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<td></td>
<td>Additional zinc supplements further increase serum IGF-I concentration at 1 wk</td>
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<td></td>
<td>Additional zinc supplements decrease a serum bone resorption biomarker at 1 wk</td>
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<td>Protein supplements improve functional performance in ADL</td>
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</table>

P value: P < 0.05. P < 0.02. P < 0.01. P < 0.001.

Figure 4. Effect of dietary protein in the growth hormone–IGF-I axis

Osteogenic cells not only express specific IGF-I receptors, but they can also produce IGF-I. The amino acids arginine or lysine increased IGF-I production and collagen synthesis by a mice osteoblastic cell line, in a time- and concentration-dependent manner. These results highlight the potential role of locally produced IGF-I, under the influence of extracellular amino acid concentration, in the regulation of osteoblast function.

IGF-I delivered by subcutaneous osmotic minipumps in adult rats made osteoporotic by ovariectomy increased BMD. The increase in BMD induced by IGF-I was associated with an increase in the resistance to mechanical strain in relation also with an increase of bone shaft outer dimensions.

Isocaloric protein undernutrition

We have developed an experimental model in adult female rats of selective protein deprivation with isocaloric low protein diets supplemented with identical amounts of minerals to study the specific influence of protein deficiency in the pathogenesis of osteoporosis. A decrease in BMD is observed at the level of skeletal sites formed by trabecular or cortical bone in animals fed 2.5% casein, but receiving the same amount of energy. This is associated with a marked and early decrease in plasma IGF-I by 40%. In this model, the decrease in bone mass and bone strength is primarily related to an early inhibition of bone formation. Transgenic mice with targeted osteoblast overexpression of IGF-I do
not exhibit the decrease in bone mass or strength induced by isocaloric protein malnutrition.52

Under a low protein diet, the normal cycling in female rats ceased. A role of increased bone resorption could be partially explained by the depressed sex hormone status. However, other mechanisms, including the effects of circulating or locally released cytokines, are likely. Production and action of tumor necrosis factor-α (TNF-α) play a central role in the accelerated bone loss caused by sex hormone deficiency, as indicated by experiments carried out in transgenic mice overexpressing TNF-α receptor 1 protein, which blocks the effects of this factor. The influence of ovariectomy is prevented in transgenic animals overexpressing the receptor.53 To address the issue of the accelerated bone loss occurring under a low protein diet, we used the model of transgenic mice, which overexpress the soluble TNF-α receptor. Blocking TNF-α activity prevented the component of increased bone resorption induced by the isocaloric low protein diet, without modifying the alterations in bone formation.54 Similarly, we also assessed whether interleukin-1 (IL-1) could be involved in this process. In transgenic mice overexpressing an IL-1 receptor antagonist, a situation in which IL-1 is prevented from exerting its biological action, bone loss was identical whatever the IL-1 activity.

An isocaloric low protein (2.5% casein) diet also decreased BMD and altered mechanical properties in male rats; protein deficiency induced cortical and trabecular thinning, leading to a decreased bone mineral mass and bone strength.55 At an early time point (1 month), histomorphometry analysis showed that the bone loss process is mainly related to decreased bone formation. In this gender too, some state of hypogonadism was associated with a long-term isocaloric low protein diet. Adult male and female rats differed by the kinetics of the response to the isocaloric low protein diet, with changes occurring more slowly in males than in females.

We then evaluated GH secretion by measuring GH pulsatility over a 24-hour period. The amplitude of the pulses of GH was maintained, whereas the number of pulses, and thereby the area under the curve, appeared to be lowered under an isocaloric low protein diet (Ammann, unpublished results). The administration of pharmacological doses of IGF-I, producing a 5-fold increase in IGF-I circulating levels in an attempt to correct the negative influence of protein deficiency, was without effect on bone if the protein intake was insufficient.56 We tested also the effects of GH. Under an isocaloric low protein diet, the IGF-I response to GH appeared to be blunted, but the most striking finding was that GH was catabolic on bone, instead of anabolic, since there was a dose-dependent decrease in bone strength after 4 weeks of GH treatment in animals fed the isocaloric low protein diet.57 We tested the effects of protein replenishment by administering EAA supplements in the same relative proportion as in casein. These supplements caused an increase in IGF-I up to a level higher than in rats fed the control diet, increased biochemical bone formation and decreased markers of bone resorption, and improved bone strength more than bone mineral mass, probably in relation with an increase in cortical thickness, as demonstrated by micro-quantitative computerized tomography.58

Conclusion

Nutrition has an impact on muscle and bone homeostasis. In elderly patients, dietary protein has an important role in maintaining muscle and bone mass, as demonstrated in randomized controlled trials, the first of which were published nearly two decades ago. An ONS can be used to supplement 20 g milk protein associated with clinically significant reductions in complications and deaths, and LOS among geriatric hip fracture patients. This specific nutritional intervention is likely impacting an IGF-I-mediated effect that is detected as early as 1 week after initiation, and that remains after 6 months. Simultaneous supplementation of protein, calcium, vitamin D and zinc can help optimize muscle and bone health, and nutrition should be an integral part of the clinical pathway for the medical management of osteoporosis and hip fracture patients.

References

Health economic perspective
Nutritional needs and interventions to support geriatric hip fracture recovery

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Global Health Economics Specialist
Nestlé HealthCare Nutrition

Hip fracture is the most dramatic clinical sequela of osteoporosis. It is associated with a high mortality rate, the need for long-term medical care and prolonged disability. Protein malnutrition is often seen in elderly persons and is more severe in patients with hip fracture. In fact, protein deficiency may contribute to the occurrence of hip fracture. Furthermore, malnutrition in general and protein deficiency, in particular, at admission and during recovery may adversely influence clinical outcome after hip fracture.

Hip fractures are associated with substantial healthcare utilization; it was reported that hip fractures account for approximately 20% of orthopedic bed occupancies in the United Kingdom. It should also be noted that about one third of elderly individuals fall annually and 1% will suffer a hip fracture. In Europe, hip fractures were estimated to account for 34% of the costs of all osteoporotic fractures and quality of life in the years subsequent to hip fracture was assumed to be 80% of that of a healthy individual.

Based on the United Nations’ population database and an annual hip fracture incidence of 8.1/10,000 population, there were an estimated almost 5.5 million hip fractures worldwide in 2009, of which almost 1.8 million occurred in East Asia and the Pacific, almost 300,000 occurred in North America and more than 400,000 in the European Union (EU). Hospital costs were estimated at USD 11,943/hip fracture (2009 data), thus leading to a cost of more than USD 65.5 billion worldwide, including more than USD 21 billion in East Asia and the Pacific, more than USD 3 billion in North America and almost USD 5 billion in the EU. In addition, the estimated cost of ambulance services was almost USD 760 million in East Asia and the Pacific, almost USD 60 million for North America and more than USD 86.6 million in the EU. Thus, the financial burden of hip fracture totals almost USD 21.9 billion in East Asia and the Pacific, more than USD 3.6 billion in North America and almost USD 5.7 billion in the EU. These estimates do not take into account other costs, such as excess primary care and outpatient visits or work days lost by caregivers, relatives while caring for persons with hip fracture.

There is a clinical benefit and a potential economic benefit of specific nutritional intervention among elderly persons recovering from hip fracture. Use of a nutritionally-complete, high protein oral nutritional supplement (ONS) offering near 20 g milk protein, 525 mg calcium, 25 IU vitamin D, and other vitamins and minerals may bring considerable benefits by significantly reducing healthcare utilization, eg, by reducing length of stay (LOS) by 3.2–21 days in rehabilitation wards compared to 32 days for combined stays (ICU and rehabilitation wards) offered with protein-free or isocaloric placebo interventions. Other studies using a nutritionally-complete high protein ONS also show significantly fewer unfavorable outcomes (such as death, major complication [relative risk (RR) 0.78, 95% CI 0.65 to 0.95] or at least one complication by end of study [RR 0.85, 99% CI 0.66 to 1.08]) versus protein-free or isocaloric placebo interventions. However, no consensus was found for the effect on mortality rates. Even though limited evidence is available on the clinical benefits of high protein ONS use among hip fracture patients, it seems to reduce healthcare consumption.

Based on an estimated cost per day of USD 597 for a hip fracture (based on UK data), and assuming the same daily cost for combined stays (ICU plus rehabilitation), we could estimate that a decrease in LOS of 32 days would lead to a potential cost-saving of USD 19,108 per hip fracture.

While specialized nutritional management of hip fracture patients seems to be helpful for decreasing healthcare consumption, as just described, none of the clinical outcomes have directly measured hospital or rehabilitation facilities costs. Thus, more research needs to be undertaken to prospectively demonstrate the cost-effectiveness of high protein ONS use among hip fracture patients.

References
Associations between nutritional status, weight loss, radiotherapy treatment toxicity and treatment outcomes in gastrointestinal cancer patients

Hill A, Kiss N, Hodgson B, Crowe TC, Walsh AD.
School of Exercise and Nutrition Sciences, Deakin University, Burwood, Melbourne, Victoria, Australia.

BACKGROUND AND AIMS: Patients with gastrointestinal cancers are susceptible to nutritional deterioration which may be compounded by radiotherapy treatment toxicities. This study aimed to determine whether nutritional status at radiotherapy commencement or changes in nutritional status throughout radiotherapy were associated with treatment toxicity and outcomes in gastrointestinal cancer patients.

METHODS: Seventy-three gastrointestinal cancer patients receiving curative radiotherapy underwent medical record audits assessing body weight, radiotherapy toxicity, unplanned treatment breaks or hospital admissions and completion of prescribed treatment/s. Nutritional status was assessed in a subset of patients (n = 11) using the Patient-Generated Subjective Global Assessment tool.

RESULTS: Seventy-five percent of patients lost weight throughout radiotherapy. Weight loss was significantly greater in patients experiencing unplanned radiotherapy breaks (-3.1% vs -1.6%, P < 0.05) and in patients not completing prescribed chemotherapy (-3.3% vs -1.6%, P < 0.05). Toxicity severity was strongly correlated with Patient-Generated Subjective Global Assessment score (r = 0.839, P < 0.001) and was increased in patients experiencing unplanned admission compared to those without admission (42.1% vs 9.3% with grade 3 toxicity respectively, P < 0.001).

CONCLUSIONS: Deterioration in nutritional status during radiotherapy (as measured by weight loss) may be associated with poorer short-term treatment outcomes in gastrointestinal cancer patients. Patient numbers were too small to definitively determine the effect of nutritional status at radiotherapy commencement or changes in nutritional status throughout radiotherapy (defined by PG-SGA) on treatment outcomes. Further research is required to investigate this in larger, longer-term studies.

CRITICAL CARE

Enteral nutrition with eicosapentaenoic acid, gamma-linolenic acid and antioxidants in the early treatment of sepsis: Results from a multicenter, prospective, randomized, double blinded and controlled study – INTERSEPT study

Pontes-Arruda A, Martins LF, de Lima SM, Isola AM, Toledo D, Rezende E, Maia M, Magnan GB. Gla And Antioxidants Role In Sepsis Treatment Study Group II.
Department of Nutrition and Intensive Care, Fernandes Tavora Hospital, Fortaleza, Ceará, Brazil.

INTRODUCTION: Enteral nutrition (EN) with eicosapentaenoic acid (EPA)/gamma-linolenic acid (GLA) is recommended for mechanically ventilated patients with severe lung injury. EPA/GLA has anti-inflammatory benefits as is evident by its association with reduction in pulmonary inflammation, improvements in oxygenation, and clinical outcomes in severe forms of acute lung injury. This study was a prospective, multicenter, randomized, double-blinded and controlled trial designed to investigate if EPA/GLA could play a role in patients with early sepsis (SIRS with confirmed or presumed infection and without any organ dysfunction), by reducing the progression of the disease to severe sepsis (sepsis associated with at least one organ failure) or septic shock (sepsis associated with hypotension despite adequate fluid resuscitation).

Secondary outcomes included development of individual organ failures, ICU and hospital stay, use of mechanical ventilation, and 28-day all-cause mortality. METHODS: Randomization was concealed and patients were allocated to receive for 7 days either an EPA/GLA diet or an isocaloric, isonitrogenous control diet, not enhanced with lipids. Diets were continuously tube fed at a minimum of 75% of basal energy expenditure (BEE) × 1.3. To evaluate the progression to severe sepsis/septic shock a daily screening of individual organ failures was performed. All clinical outcomes were recorded during a 28-day follow-up period. RESULTS: 115 patients in the early stages of sepsis requiring EN were included, out of which 106 were considered evaluable. Intent to treat (ITT) analysis demonstrated that patients fed EPA/GLA developed less severe sepsis/septic shock (26.3% vs 50%, P = 0.0259), with similar results observed for the evaluable patients (26.4% vs 50.9%, P = 0.0217). The ITT analysis demonstrated that patients in the study group developed less cardiovascular (36.2% vs 21%, P = 0.0381) and respiratory failures (39.6% vs 24.6%, P = 0.0362), similarly fewer evaluable patients developed cardiovascular (20.7% vs 37.7%, P = 0.03), and respiratory failures (26.4% vs 39.6%, P = 0.04). The percentage of EPA/GLA patients requiring invasive mechanical ventilation was reduced as compared with controls (ITT: 18.9% vs 33.9%, P = 0.394; Evaluable: 17.5% vs 34.5%, P = 0.295). Patients nourished with EPA/GLA remain fewer days at the ICU compared to the control population (ITT: 21.1 vs 14.7 ICU-free days, P < 0.0001; Evaluable: 20.8 vs 14.3 ICU-free days, P < 0.0001), and fewer days at the hospital (ITT: 19.5 vs 10.3 hospital-free days, P < 0.0001; Evaluable: 19.1 vs 10.2 hospital-free days, P < 0.001). No difference was observed in the 28-day all-cause mortality (ITT: 26.2% EPA/GLA vs 27.6% control, P = 0.839).
P = 0.72; Evaluable: 26.4 EPA/GLA vs 30.18 control, P = 0.79).

CONCLUSIONS: These data suggest that EPA/GLA may play a beneficial role for enteral nutrition in the early stages of sepsis without associated organ dysfunction, by contributing to slow the progression of sepsis-related organ dysfunction, specially cardiovascular and respiratory dysfunctions. Trial registration: Clinical trials.gov NCT00329680.

Practicalities of nutrition support in the intensive care unit: The usefulness of gastric residual volume and prokinetic agents with enteral nutrition

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The provision of early nutrition therapy to critically ill patients is established as the standard of care in most intensive care units around the world. Despite the known benefits, tolerance of enteral nutrition in the critically ill varies and delivery is often interrupted. Observational research has demonstrated that clinicians deliver little more than half of the enteral nutrition they plan to provide. The main clinical tool for assessing gastric tolerance is gastric residual volume; however, its usefulness in this setting is debated. There are several strategies employed to improve the tolerance and hence adequacy of enteral nutrition delivery in the critically ill. One of the most widely used strategies is that of prokinetic drug administration, most commonly metoclopramide and erythromycin. Although widely used, the evidence is reviewed, and future directions are discussed.

The optimal lipid formulation in enteral feeding in critical illness: Clinical update and review of the literature

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Suitable and timely early enteral nutrition is paramount to providing optimal patient care for the critically ill. Lipids serve many essential roles throughout the human body, and are important components of most enteral formulations. This paper reviews lipid structure, function, and optimal utility for this macronutrient in enteral feeds. The use of omega-3 fatty acids has become common in critical care formulations, and their clinical efficacy is outlined separately. Available evidence is reviewed, and future directions are discussed.

A retrospective study about the influence of early nutritional support on mortality and nosocomial infection in the critical care setting

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BACKGROUND AND AIMS: To determine whether early nutritional support reduces mortality and the incidence of nosocomial infection, critically ill patients in the current practice.

METHODS: A retrospective observational study was conducted in all critically ill patients who had been prescribed nutritional support, throughout one year, in an Intensive Care Unit. The time to start and the route of delivery of nutritional support were determined by the attending clinician’s assessment of gastrointestinal function and hemodynamic stability. Age, gender, severity of illness, start time and route of nutritional support, prescribed and delivered daily caloric intake for the first 7 days, whether they were a medical or surgical patient, length of stay in ICU, incidence rate of nosocomial infections and ICU mortality were recorded. Patients were classified according to whether or not they received nutritional support within 48 h of their admission to ICU and Binary Logistic Regression was performed to assess the effect of early nutritional support on ICU mortality and ICU nosocomial infections after controlling for confounders.

RESULTS: Ninety-two consecutive patients were included in the study. Start time of nutritional support showed a mean of 3.1 ± 1.9 days. Patients in the early nutritional support group had a lower ICU mortality in an unadjusted analysis (20% vs 40.4%, P = 0.031). Early nutritional support was found to be an independent predictor of mortality in the regression analysis model (OR 0.28; 95% confidence interval, 0.09 to 0.84; P = 0.023). Our study did not demonstrate any association between early nutritional support and the incidence of nosocomial infection (OR 0.77; 95% confidence interval, 0.26 to 2.24; P = 0.63), which was related to the route of nutritional support and the caloric intake. The delayed nutritional support group showed a longer length of stay and nosocomial infections than the early group, although these differences were not statistically significant.

CONCLUSIONS: Our study shows that early nutrition support reduces ICU mortality in critically ill patients, although it does not demonstrate any influence over nosocomial infection in the current practice in intensive care.

The success of enteral nutrition and ICU-acquired infections: A multicenter observational study

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BACKGROUND AND AIMS: The objective of this study was to evaluate the relationship between increasing success with enteral nutrition (EN) and acquired infection in the Intensive Care Unit (ICU).

METHODS: We conducted a prospective, multicenter, observational study in three Medical/Surgical ICUs. We included patients mechanically ventilated in ICU more than 72 h and who received enteral nutrition only. Charts were reviewed to determine success with EN delivery and clinical outcomes. Suspected infections were adjudicated by two or more clinicians to determine the presence or absence of infection (rated as either probable or possible infection).

RESULTS: Of the 207 patients included in this analysis, the average age was 62.0 years; APACHE II score was 23.3; BMI: 28.5, and 73% were medical.
Overall, patients received 48.9% (range 0–120%) of their energy and 45.1% (range 0–120%) of their protein requirements from EN. Overall, 25.1% developed an infection after 72 h from admission, 21.7% developed an infection after 96 h from admission, and the 28-day mortality was 29.0%. In a regression model, greater amounts of energy and protein were consistently associated with a reduction in infection. However, estimates only achieved levels near statistical significance for risk of at least 1 probable infection after >96 h (Odds Ratio [OR]: 0.32, 95% Confidence Interval [CI]: 0.10–1.02, P = 0.054 and OR: 0.40, 95% CI: 0.18–0.89, P = 0.024 per 1,000 kcal/d energy and 30 g/d protein, respectively). In all cases, the OR was lower when considering infections that developed after 96 h compared to infections that developed after 72 h and when considering ‘Probable’ infections compared to all infections which included ‘Possible’ infections. CONCLUSIONS: Successful EN may be associated with a reduction in infectious complications, particularly after 96 h of ICU admission.

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 In general, clinical guidelines identify, summarize, and evaluate the most current data concerning prevention, diagnosis, prognosis, therapy and cost for a specific patient population. This paper will briefly describe the authors’ point of view regarding controversial aspects of adult critical care nutrition therapy guidelines published by preeminent professional societies in the United States (US), Canada, and Europe. The US guidelines were developed by subject matter experts to offer recommendations for specialized nutrition therapy that are supported by review and analysis of the pertinent current literature, other national and international guidelines, and by a blend of expert opinion and clinical practicality. A similar strategy was used to compile all three guideline publications resulting in many areas of common agreement, but disparate substantive recommendations do exist regarding: indirect calorimetry versus predictive equations, prokinetics in the intensive care unit (ICU), arginine use in the ICU, probiotic use in the ICU, and acceptable gastric residual volumes in the ICU patient. All of the guidelines are based on high quality studies in patients with critical illness, but like any other therapeutic modality for an ICU patient, nutritional interventions require a multidisciplinary approach that incorporates institutional best practices, individual patient considerations, and above all, clinical judgment.

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 BACKGROUND: Early enteral nutrition (EN) is the preferred strategy for feeding the critically ill; however, it is not always possible to initiate EN within the recommended 24 to 48 hours. When these situations arise, controversy exists whether to start feeding early via the parenteral route or to delay feeding until EN can be provided. METHODS: A multicenter, international, observational study examined nutrition practices in intensive care units (ICUs). Eligible patients were critically ill patients with a medical diagnosis who remained in the ICU for >72 hours and received EN >48 hours after admission. Data were collected on site, including patient characteristics, daily nutrition practices, and outcomes at 60 days. Nutrition and clinical outcomes were compared between three groups of patients: (1) early parenteral nutrition (PN) (<48 hours after admission) and late EN (>48 hours after admission), (2) late PN and late EN, and (3) late EN and no PN. RESULTS: Of the 703 patients who met our inclusion criteria, 541 (77.0%) medical patients received late EN and no PN. In patients receiving late EN and PN, 83 (11.8%) received early EN and 79 (11.2%) received late PN. Adequacy of calories and protein from total nutrition was highest in the early PN group (74.1% ± 21.2% and 71.5% ± 24.9%, respectively) and lowest in the late EN group (42.9% ± 21.2% and 38.7% ± 21.6%) (P = 0.001). The proportion of patients dead or remaining in hospital was significantly higher for early PN compared with late EN and PN (unadjusted hazard ratio for early PN = 0.55; 95% confidence interval, 0.37–0.83, P = 0.015). However, this difference did not remain significant (P = 0.65) after adjustment for baseline characteristics. CONCLUSIONS: The results suggest that initiating PN early, when it is not possible to feed enterally early, may improve provision of calories and protein but is not associated with better clinical outcomes compared with late EN or PN.

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 BACKGROUND AND AIMS: The evidence in support of Early Enteral Nutrition (EEN) after upper gastrointestinal surgery is inconclusive. The aim of this study was to determine if EEN improved clinical outcomes and shortened length of hospital stay. METHODS: Open, prospective multicentre randomised controlled trial within a regional UK Cancer Network. One hundred and twenty-one patients with suspected operable upper gastrointestinal cancer (54 esophageal, 38 gastric, 29 pancreatic) were studied. Patients were randomized to receive EEN (n = 64) or Control management postoperatively (nil by mouth and IV fluid, n = 57). Analysis was based on intention-to-treat and the primary outcome measure was length of hospital stay. RESULTS: Operative morbidity was less common after EEN (32.8%) than Control management (50.9%, P = 0.044), due to fewer wound infections (P = 0.017), chest infections (P = 0.036) and anastomotic leaks (P = 0.055). Median length of hospital stay was 16 days (IQ = 9) after EEN compared with 19 (IQ = 11) days after Control management (P = 0.023). CONCLUSIONS: EEN was associated with significantly shortened length of hospital stay and improved clinical outcomes. These findings reinforce the potential benefit

 ...
of early oral nutrition in principle and as championed within enhanced recovery after surgery programmes, and such strategies deserve further research in the arena of upper GI surgery.

**Randomized trial of initial trophic versus full-energy enteral nutrition in mechanically ventilated patients with acute respiratory failure**


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OBJECTIVE: Enteral nutrition is provided to mechanically ventilated patients who cannot eat normally, yet the amount of support needed is unknown. We conducted this randomized, open-label study to test the hypothesis that initial low-volume (ie, trophic) enteral nutrition would decrease episodes of gastrointestinal intolerance/complications and improve outcomes as compared to initial full-energy enteral nutrition in patients with acute respiratory failure. DESIGN: Randomized, open-label study. PATIENTS: A total of 200 patients with acute respiratory failure expected to require mechanical ventilation for at least 72 hrs. INTERVENTIONS: Patients were randomized to receive either initial trophic (10 mL/hr) or full-energy enteral nutrition for the initial 6 days of ventilation. MEASUREMENTS AND MAIN RESULTS: The primary outcome measure was ventilator-free days to day 28. Baseline characteristics were similar between the 98 patients randomized to trophic and the 102 patients randomized to full-energy nutrition. At enrollment, patients had a mean Acute Physiology and Chronic Health Evaluation II score of 26.9 and a Pao2/Fio2 ratio of 182 and 22.4% for the trophic group vs 19.6% for the full-energy group. Both groups had a median of 23.0 ventilator-free days (P = 0.64). Mortality to hospital discharge was 22.4% for the trophic group vs 19.6% for the full-energy group (P = 0.62). In the first 6 days, the trophic group had trends for less diarrhea (19% vs 24% of feeding days; P = 0.08) and significantly fewer episodes of elevated gastric residual volumes (2% vs 8% of feeding days; P < 0.001). CONCLUSION: Initial trophic enteral nutrition resulted in clinical outcomes in mechanically ventilated patients with acute respiratory failure similar to those of early full-energy enteral nutrition but with fewer episodes of gastrointestinal intolerance.

**DYSPHAGIA**

**Dietary and fluid intakes of older adults in care homes requiring a texture modified diet: The role of snacks**


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OBJECTIVE: To evaluate and compare energy, protein, non-starch polysaccharide, and fluid intakes of a care home population consuming a texture modified diet (TMD) with those on a standard diet and also to evaluate the role of snacks in individuals’ diets. DESIGN: Cross-sectional study. SETTING: Care homes. PARTICIPANTS: Thirty residents (n = 15 requiring standard diet: n = 15 requiring TMD). MEASUREMENTS: Dietary intakes were assessed using a 3-day weighed plate-wastage method. All snacks and drinks consumed were observed and recorded.

Weights of standard portions and volumes were used to determine actual amounts consumed of these items. Estimated intakes were converted to energy and nutrient intakes using WinDiets Dietary analysis software. RESULTS: Residents on a TMD had significantly lower intakes of energy (1,312 [326] kcal vs 1,569 [260] kcal, P < 0.024), non-starch polysaccharide (6.3 [1.7] g vs 8.3 [2.7] g, P < 0.02) and fluid (1,196 [288] mL vs 1,611 [362] mL, P < 0.002) when compared with residents on a standard texture diet. Snacks provided significantly less energy (13% or 173 kcal vs 22% or 343 kcal, P = 0.001) and non-starch polysaccharide (P < 0.001) in those requiring the TMD.

CONCLUSIONS: These results suggest that dietary and fluid intakes of older adults in care homes requiring a TMD are significantly less than individuals on a standard texture diet. These are unlikely to be meeting individuals’ dietary and nutritional needs. Strategies that maximize provision of appetizing energy and nutrient-dense foods (including snacks) and fluids of suitable textures require further investigation.
Noninvasive treatment strategy for swallowing problems related to prolonged nonoral feeding in spinal muscular atrophy type II

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A 25-year-old patient with spinal muscular atrophy (SMA) type II was referred due to swallowing problems related to prolonged nonoral feeding. Restriction of jaw movement, neck stiffness, absence of oral food intake, and weakness of the oropharyngeal and laryngeal muscles were considered to be the main factors contributing to the deterioration of his swallowing function. Treatment comprised exercises to improve flexibility of the neck and temporomandibular joint, tactile oral stimulation, passive and active oropharyngo-laryngeal exercises, and supraglottic swallowing maneuvers. Treatment was performed for 30 min per day, three times a week, for 7 months. On initial videofluoroscopic examination, the patient was unable to safely tolerate any per-oral nutrition. After 7 months of treatment, the patient's swallowing function had improved to the extent that he was able to resume oral intake of food under supervision, and aspiration was no longer evident. These findings suggest that noninvasive treatment is a possible strategy for enhancing the swallowing function of a patient with SMA type II presenting with swallowing difficulties related to prolonged nonoral feeding.

Longitudinal changes of the swallowing process in subacute stroke patients with aspiration

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The purpose of this study was to evaluate longitudinal changes of the swallowing process in stroke patients with aspiration using kinematic analysis. Twenty-eight subacute stroke patients with aspiration on fluid at initial videofluoroscopic swallowing studies (VFSS) were included. Follow-up VFSS was performed at 2–4 weeks after initial studies that were conducted at an average of 26 days after stroke. Temporal and spatial variables were calculated by two-dimensional motion analysis of hyoid bone and movement. Swallowing process delays associated with hyoid bone and epiglottic movements were improved at follow-up studies, whereas spatial variables were not. Fourteen patients had recovered from aspiration at follow-up. Time to the start of the hyoid movement was longer in the nonrecovered patient group at initial studies (1.76 ± 1.07 s) than in the recovered group (0.90 ± 0.82 s, P = 0.024). Although time-associated differences between the nonrecovered and recovered groups disappeared at follow-up studies, aspiration persisted in the nonrecovered group. This study shows that recovery from delays in the swallowing process is a conspicuous change during the subacute stage in stroke patients with aspiration. Our findings suggest that delayed swallowing triggering at initial VFSS is a useful predictor of poor recovery from aspiration in stroke patients.

Pneumonia and in-hospital mortality in the context of neurogenic oropharyngeal dysphagia (NOD) in stroke and a new NOD step-wise concept

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The aim of our work was to develop a step-wise concept for investigating neurogenic oropharyngeal dysphagia (NOD) that could be used by both trained nursing staff as well as swallowing therapists and physicians to identify patients with NOD at an early stage and so enable an appropriate therapy to be started. To achieve this objective, we assessed uniform terminology and standard operating procedures (SOP) in a new NOD step-wise concept. In-house stroke mortality rates and rates of pneumonia were measured over time (2003–2009) in order to show improvements in quality of care. In addition, outcome measures in a stroke-unit monitoring system were studied after neurorehabilitation (day 90) assessing quality of life (QL) and patient feedback. An investigation that was carried out in the context of internal and external quality assurance stroke projects revealed a significant correlation between the NOD step-wise concept and low rates of pneumonia and in-house mortality. The quality of life measures show a delta value that can contribute to “post-stroke” depression. The NOD step-wise concept (NSC) should, on the one hand, be capable of being routinely used in clinical care and, on the other, being able to fulfil the requirements of being scientifically based for investigating different stages of swallowing disorders. The value of our NSC relates to the effective management of clinical resources and the provision of adequate diagnostic and therapeutic options for different grades of dysphagia. We anticipate that our concept will provide substantial support to physicians, as well as swallowing therapists, in clinical settings and rehabilitation facilities, thereby promoting better guidance and understanding of neurogenic dysphagia as a concept in acute and rehabilitation care, especially stroke-unit settings.

Clinical practice guidelines from the French health high authority: Nutritional support strategy in protein-energy malnutrition in the elderly

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These guidelines were produced at the request of the General Directorate of Health within the scope of the French Nutrition and Health Program (PNNS). They concern the management of malnutrition in elderly persons living at home, in institutional care, or in hospital. They belong to a recent series of studies published by ANAES(1) or HAS. Preceding studies concerned the “Diagnostic assessment of protein-energy malnutrition in hospitalized adults” (ANAES, September 2003) and the work conducted by the Committee for the Assessment of Devices...
Supplementation with vitamin D and calcium in long-term care residents

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Vitamin D deficiency is a common finding in institutionalized older persons. Vitamin D-deficient elderly persons are at higher risk of falls and fractures. Long-term care residents should be considered at high risk of vitamin D deficiency and therefore vitamin D supplementation is highly recommended in this population. The minimal effective dose is 800 IU per day. It is recommended that vitamin D supplementation should be implemented in all patients in residential aged care facilities. In addition to vitamin D, calcium supplementation has shown to enhance the effect of vitamin D on bone. Calcium intake should be optimized (1,200–1,500 mg per day recommended) and supplementation offered to those with inadequate intake. The addition of calcium depends on tolerance, history of kidney stones, and emerging data regarding its cardiovascular safety.

Nutrition status among residents living in a veterans’ long-term care facility in Western Canada: A pilot study

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OBJECTIVE: To examine nutrition status and to explore risk factors for malnutrition in an urban veterans’ long-term care (LTC) facility in Western Canada to determine whether nutrition should be a higher priority for managers, physicians, and staff. DESIGN: A descriptive cross-sectional study design was used. SETTING: An LTC facility for Canadian veterans with a resident population of 120 adults who are 65 years or older. PARTICIPANTS: The sample consisted of 55 residents. Mean age was 86.5 years for the 50 men and 88.4 years for the 5 women. MEASUREMENTS: The Mini Nutritional Assessment (MNA) tool was used to examine the nutrition status. Selected items and scales from the Minimum Data Set-Resident Assessment Instrument (MDS-RAI 2.0) were used to substitute for 10 MNA items. RESULTS: Six (11%) residents were assessed as well nourished. Thirty-two (58%) residents were considered at risk for malnutrition and 17 (31%) were rated malnourished. A linear regression model revealed that malnutrition was associated with depression (P = 0.002), instability in health (P = 0.005), and severity of dementia (P = 0.011).

CONCLUSION: Most residents were found to be at risk or actually malnourished. Analyses of the results indicate that managers, physicians, and staff need to focus on residents with depression and dementia, and those whose health is unstable.

Nutritional status and health care costs for the elderly living in municipal residential homes—An intervention study

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OBJECTIVE: The aim was to study the effect of individualized meals on nutritional status among older people living in municipal residential homes and to compare the results with a control group. An additional aim was to estimate direct health care costs for both groups. SETTING: Six different municipal residential homes in the south-east of Sweden. PARTICIPANTS: Older people living in three residential homes constituted the intervention group (n = 42) and the rest constituted the control group (n = 67). INTERVENTION: A multifaceted intervention design was used. Based on an interview with staff a tailored education programme about nutritional care, including both theoretical and practical issues, was carried through to staff in the intervention group. Nutritional status among the elderly was measured by Mini Nutritional Assessment (MNA), individualized meals were offered to the residents based on the results of the MNA. Staff in the control group only received education on how to measure MNA and the residents followed the usual meal routines. MEASUREMENTS: Nutritional status was measured by MNA at baseline and after 3 months. Cost data on health care visits during 2007 were collected from the Cost Per Patient database. RESULTS: Nutritional status improved and body weight increased after 3 months in the intervention group. Thus, primary health care costs constituted about 80% of the total median cost in the intervention group and about 55% in the control group. CONCLUSION: With improved knowledge the staff could offer the elderly more individualized meals. One of their future challenges is to recognize and assess nutritional status among this group. If malnutrition could be prevented health care costs should be reduced.

Health economic impact of managing patients following a community-based diagnosis of malnutrition in the UK

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BACKGROUND AND AIMS: To examine the effect of malnutrition on clinical outcomes and healthcare resource use from initial diagnosis by a general practitioner (GP) in the UK.

HEALTH ECONOMICS
METHODOLOGY: 1,000 records of malnourished patients were randomly selected from The Health Improvement Network database and matched with a sample of 996 patients’ records with no previous history of malnutrition. Patients’ outcomes and resource use were quantified for 6 months following diagnosis. RESULTS: Malnourished patients utilized significantly more healthcare resources (eg, 18.90 vs 9.12 GP consultations; P < 0.001, and 13% vs 5% were hospitalized; P < 0.05). The six-month cost of managing the malnourished and non-malnourished group was £1,753 and £750 per patient respectively, generating an incremental cost of care following a diagnosis of malnutrition of £1,003 per patient. Thirteen percent and 2% of patients died in the malnourished and non-malnourished group respectively (P < 0.001). Independent predictors of mortality were: malnutrition (OR: 7.70); age (per 10 years) (OR: 10.46); and the Charlson Comorbidity Index Score (per unit score) (OR: 1.24). CONCLUSION: The healthcare cost of managing malnourished patients was more than twice that of managing non-malnourished patients, due to increased use of healthcare resources. After adjusting for age and comorbidity, malnutrition remained an independent predictor of mortality.

Efficacy, cost-effectiveness, and effects on quality of life of nutritional supplementation

[Article in Spanish]


This article summarizes the main results and conclusions presented in the Symposium “Nutritional supplementation: evidences and experiences” that took place in the XXIIIrd SENPE Congress (2008). Protein energy malnutrition, that can affect 30–50% of hospitalized patients, increases both time of hospitalization and costs of medical care of this kind of patients. There is a lot of scientific evidences demonstrating that the use of nutritional supplementation improves nutritional status or prevents malnutrition in those patients who do not meet their nutritional needs with a conventional diet or an adapted one with no replacing intake from normal food. This is strengthened by the results that demonstrate the role of nutritional supplements improving nutritional and functional parameters. Current bibliographic reviews focused on certain clinical frameworks (i.e. geriatrics, oncology), prove that nutritional supplements reduce complications related to pathology and to nutritional status, and also reduce length of hospitalization and mortality. More studies regarding to efficacy of oral nutritional supplements are needed. These studies should be carried out with a period of follow-up longer than the current published studies have. As well as effective, nutritional supplements become a save therapeutic intervention with no important adverse events that, according to bibliography, improve patient’s functionality and quality of life. It is worth mentioning that nutritional supplements can be effective on certain kind of patients, for instance, malnourished elderly or elderly in risk of malnourishment, and hospitalized surgical patients. Scientific literature refers that it is necessary to carry out more studies, with an accurate methodology, which assess the effect of nutritional supplements on quality of life and its cost-effectiveness on malnourished patients regarding specific clinical situations. That would allow physicians to make clinical decisions based on evidences and cost analysis.

Encouraging appropriate, evidence-based use of oral nutritional supplements

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With the considerable cost of disease-related malnutrition to individuals and to society (estimated to be > £13x109 for the UK, 2007 prices), there is a need for effective and evidence-based ways of preventing and treating this condition. The wide range of oral nutritional supplements that may be prescribed for the dietary management of malnutrition and other conditions account for only about 1% (about £99x106, 2007 data) of the prescribing budget in England. Systematic reviews and meta-analyses consistently suggest that ready-made, multi-nutrient liquids which may be prescribed can improve energy and nutritional intake, body weight and have a variety of clinical and functional benefits in a number of patient groups. Meta-analyses have repeatedly shown that oral nutritional supplements produce significant reductions in complications (eg, infections) and mortality, and a recent meta-analysis shows a reduction in hospital admissions (OR 0.56 [95% CI 0.41, 0.77], six randomized controlled trials). Such benefits suggest that the appropriate use of oral nutritional supplements should form an integral part of the management of malnutrition, particularly as there is currently a lack of evidence for alternative oral nutrition strategies (eg, food fortification and counselling). As with all therapies, compliance to oral nutritional supplements needs to be maximized and the use monitored. To make sure that those at risk of malnutrition are identified and treated appropriately, there is a need to embed national and local policies into routine clinical practice. In doing so, the economic burden of this costly condition can be curtailed. As recently suggested by the National Institute for Health and Clinical Excellence, substantial cost savings could be made if screening and treatment of malnourished patients was undertaken.

MEDICAL NUTRITION THERAPY

Compliance with and effects of preoperative immunonutrition in patients undergoing pancreaticoduodenectomy

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BACKGROUND/PURPOSE: This study was conducted to ascertain the feasibility and effectiveness of preoperative enteral immunonutrition using an immune-enhanced formula (Impact) in patients undergoing pancreaticoduodenectomy. METHODS: Twenty-five patients undergoing an elective pancreaticoduodenectomy were asked to ingest Impact for 5 days (750 mL/d) prior to surgery in addition to their normal...
Lower plasma arginine in enteral tube-fed patients with pressure ulcer and improved pressure ulcer healing after arginine supplementation by Arginaid Water

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OBJECTIVES: To determine the presence or extent of arginine deficiency in pressure ulcer (PU) patients on percutaneous endoscopic gastrostomy (PEG) feeding and to examine the effects of arginine supplementation on PU healing. DESIGN: All eligible PEG patients, with and without PU, were cross-sectionally assessed for plasma arginine. Three-month supplementation with arginine-enriched water (Arginaid Water) was performed on a subset of patients with PU. This intervention study was a prospective, non-controlled trial with 5 PU patients. SETTING: Geriatric ward of a rural clinical hospital in Japan. PARTICIPANTS: Thirty-nine inpatients with PEG feeding were assessed for plasma arginine. Five of the 13 patients with PU and five of 26 patients without PU underwent amino acid profiling. INTERVENTION: Five of the patients with PU received Arginaid Water supplementation. MEASUREMENTS: Plasma amino acid measurements and biochemical analyses were performed. For those with PU on Arginaid Water supplementation, plasma arginine concentration and PU status were monitored every month.

RESULTS: Patients with PU showed significantly lower plasma arginine concentration compared to those without PU (control vs PU: 80.2 ± 21.3 vs 62.8 ± 14.7 nmol/mL, P < 0.01). After the addition of Arginaid Water, plasma arginine concentration increased (before vs 3 months later: 57.9 ± 1.8 vs 83.1 ± 8.5, P < 0.01), and PU area, perimeter, DESIGN-R and PUSH scores significantly improved. CONCLUSION: Plasma arginine was lower in PU patients than in the control group. This preoperative oral ingestion of Arginaid Water was well tolerated and appeared to be effective for preventing incisional wound infection and reducing the response to surgical stress in patients undergoing a pancreaticoduodenectomy.

Appropriate protein and specific amino acid delivery can improve patient outcome: Fact or fantasy?

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Protein utilization and requirements in critical illness are much researched and debated topics. The enhanced turnover and catabolism of protein in the setting of critical illness is well described and multifactorial in nature. The need to preserve lean body mass and enhance nitrogen retention in this state to improve immunologic function and reduce morbidity is well described. Debates as to the optimum amount of protein to provide in such states still exist, and a significant amount of research has contributed to our understanding of not only how much protein to supply to these patients, but how best to do so. Small peptide formulations, intact protein formulations, branched chain amino acids, and specialty formulas all exist, and their benefits, drawbacks, and potential uses have been investigated. Specific amino acid therapy has become part of the concept of immunonutrition, or the modification and enhancement of the immune response with specific nutrients. In this article, we describe the changes in outcomes demonstrated through the provision of protein, both as a macronutrient and as specific amino acids.

Differential metabolic effects of casein and soy protein meals on skeletal muscle in healthy volunteers

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BACKGROUND AND AIMS: Dietary protein intake is known to affect whole body and interorgan protein turnover. We examined if moderate-nitrogen and carbohydrate casein and soy meals have a different effect on skeletal muscle protein and amino acid kinetics in healthy young subjects. METHODS: Muscle protein and amino acid kinetics were measured in the postabsorptive state and during 4-h enteral intake of isonitrogenous [0.21 g protein/(kg body weight · 4 h)] protein-based test meals, which contained either casein (CAPM; n = 12) or soy protein (SOPM; n = 10) in 2 separate groups. Stable isotope and muscle biopsy techniques were used to study metabolic effects. RESULTS: The net uptake of glutamate, serine, histidine, and lysine across the leg was larger during CAPM than during SOPM intake. Muscle concentrations of glutamate, serine, histidine, glutamine, isolecine and BCAA changed differently after CAPM and SOPM (P < 0.05). Muscle net protein breakdown decreased significantly (P < 0.05) to zero during feeding of both CAPM and SOPM, but differences in their (net) breakdown rates were not significant. Muscle protein synthesis was not different between CAPM and SOPM. CONCLUSION: Moderate-nitrogen casein and soy protein meals differently alter leg amino acid uptake without a significant difference in influencing acute muscle protein metabolism.
Nestlé Symposium – Consensus on the nutritional management of the critically ill obese patient

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Nearly a third of intensive care unit (ICU) patients are obese. Although the effect of obesity on mortality in ICU patients is unclear, mortality rates may rise when body mass index (BMI) exceeds 40 kg/m². Furthermore, the obese patient will probably have more comorbidities. Yet there is a lack of treatment guidelines for the critically ill obese patient.

A soon-to-be released consensus statement by a panel of experts concluded that the basic principles of critical care nutrition, including early enteral nutrition (EN), apply to the obese. These patients, like those who are non-obese, lack excess nutrient stores to support long periods of starvation.

Obese patients should undergo early assessment, including anthropometric measures, such as BMI and waist circumference, and for biomarkers of metabolic syndrome and inflammation. Caloric requirements should be assessed by indirect calorimetry (IC). Protein requirements should be estimated using the equation >2.0 g/kg ideal body weight (IBW)/d (for class I and II obesity) or >2.5 g/kg IBW/d (class III); use 24-hour urine urea nitrogen to assess nitrogen balance.

Hypocaloric, high protein feedings decrease the potential for overfeeding, aid in glucose control, and improve nutritional and clinical outcomes in the critically ill obese patient. A bariatric specific formula is preferable to modifying existing formulas with large doses of protein powder to meet the bariatric patient’s needs, as the latter may occlude tubes or contribute to contamination or intolerance. The ideal bariatric formula should have a non-protein calorie: nitrogen ratio of 35–40:1, no more than 0.75–1 kcal/mL, a relatively low carbohydrate content to meet obligatory needs of 100 g/d, and pharmconutrients that support critically ill patients (eg, magnesium, L-arginine, zinc, leucine, fish oils and L-carnitine).

Higher ratios of Firmicutes:Bifidobacteria seen in the obese may worsen systemic inflammatory response syndrome (SIRS); therefore, a bariatric formula should provide prebiotics (inulin or fructo-oligosaccharides [FOS]) or probiotics (Lactobacillus, Bifidobacteria).

References

The OMEGA and trophic vs full feeds studies: Results and implications

T Rice (Nashville, TN, USA)

The National Heart, Lung, and Blood Institute (NHLBI) Adult Respiratory Distress Syndrome Network OMEGA trial, a Phase III randomized controlled trial (RCT), tested the hypothesis that omega-3 fatty acid (FA) and antioxidant supplementation would improve clinical outcomes, compared with placebo, in patients with acute lung injury (ALI) by attenuating systemic inflammation.

Compared with the control diet, the study diet was higher in protein (20 vs 4 g/240 mL) and carbohydrate (52 vs 4 g/240 mL) and lower in fat (22 vs 45 g/240 mL). The control diet also contained little or no omega-3 FA and antioxidants.

The treatment group had fewer ventilator-free days (14.0 vs 17.2), fewer ICU-free days (14.0 vs 16.7) and greater mortality (26.6% vs 16.3%). The study was stopped for futility, and researchers concluded twice daily supplements of omega-3 FA and antioxidants to EN cannot be recommended in ALI patients.

Marked differences between previous studies and the OMEGA study may have contributed to the study results.
These factors include: the method of analysis (evaluable patients [other studies] vs intent-to-treat [OMEGA]); feeding method (full vs trophic/full); composition of control diet (high fat vs high carbohydrate); omega-3 FA delivery (continuous infusion vs twice-daily bolus); and tidal volume and fluid therapy (uncontrolled vs conservative lung protective therapy).

The EDEN trial was a prospective RCT that tested the hypothesis that initial low-volume (ie, trophic) EN would decrease episodes of gastrointestinal (GI) intolerance and complications and improve outcomes compared to initial full-energy EN in patients with acute respiratory failure. Study participants received either initial trophic (10 mL/h) or full-energy EN for the first 6 days of ventilation.

The groups had similar clinical outcomes (number of ventilator- and ICU-free days and mortality to hospital discharge). The trophic group had lower incidence of diarrhea and fewer episodes of high gastric residual volumes.

Glutamine protects against lethal injury by enhancing the release of heat shock proteins that stabilize proteins during stress. When given in doses of more than 0.3 g/kg/d, glutamine is associated with a significant benefit on mortality, length of stay (LOS), and infectious morbidity in critical illness. 2,3

High doses of antioxidants reduce mortality and both hospital and ICU LOS. 4 Selenium supplementation, alone and in combination with other antioxidants, is associated with a reduction in mortality, while non-selenium antioxidants have no effect on mortality. 5 Antioxidants catalyze the breakdown of reactive oxygen species, tempering and attenuating the invasion of bacteria and toxins that can cause capillary leakage and tissue injury following trauma and surgery. 6

Arginine-supplemented diets are associated with a 40% decrease in postoperative infection rates compared with standard enteral feedings independent of the site of surgery. 7 In elective surgery, immunomodulating diets with increased amounts of arginine and fish oils than the control diets significantly reduce risk of acquired infections, wound complications and LOS with no increase in mortality. 8 After injury, arginine levels fall with the induction of arginase by myeloid suppressor cells; arginine-supplemented diets help to restore arginine levels. 9

Omega-3 FA inhibit the metabolism of arachidonic acid into inflammatory eicosanoids and, as components of resolvins, act as agonists for the resolution of inflammation. 10 The effect of omega-3 FA on outcomes in patients with acute respiratory distress syndrome (ARDS) remains unclear. Early studies showed omega-3 FA supplementation using a high-fat formula decreased ventilation duration, ICU LOS and organ failure, and increased ventilator- and ICU-free days and survival in ARDS. 11-13 This is in contrast to results from the OMEGA study, which provided the omega-3 supplement in a high carbohydrate formula as a twice-daily bolus. 14 The OMEGA study demonstrated greater mortality in the treatment group and no improvement in outcomes, raising questions about the effect of the route of administration or the protective effect of conservative fluid management and low tidal volume in reducing inflammation.

**Pharmaconutrition: Does it work? Does it change outcomes?**

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P Cotton (Houston, TX, USA)  
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T Rice (Nashville, TN, USA)

A large body of evidence supports the use of perioperative immunonutrition in elective surgery patients. 1 A recent meta-analysis shows arginine-supplemented diets reduce infections in wounds and other sites by 41% and hospital LOS by 2.4 days compared with control diets. 2 The effect is most pronounced with pre- and postoperative administration of arginine given together with fish oils and nucleotides. 3

Following surgery, arginine levels quickly fall when myeloid cells induce arginase. 4 Decreased proliferation of arginine-dependent T cells leads to greater susceptibility to infection. Immunonutrition provides supraphysiologic quantities of arginine and omega-3 FA that help to increase arginine levels, and nucleotides that normalize T cell function. 1,4

**References**


Decreasing the risk of infectious complications not only improves care, but lowers health care costs while also recovering costs in a pay for performance system. A health economics model was used to estimate the potential hospital cost savings of using immunonutrition in GI cancer surgery patients.

The model used evidence-based outcomes on perioperative use of immunonutrition and United States (US) hospital data on costs from the US Healthcare Cost and Utilization Project (HCUP) to estimate cost savings by two methods. The potential cost saving due to a reduced hospital LOS was estimated to be $329,200 per 100 patients. The potential cost saving due to reduced postsurgical infections was $248,400 per 100 patients.

This health economic model may be utilized by individual institutional using the facility’s LOS and complication rate to project potential savings.

### References


### ICU-acquired weakness: How bad is it and can nutrition help?

**D Needham (Baltimore, MD, USA)**

**J Kress (Chicago, IL, USA)**

**P Wischmeyer (Denver, CO, USA)**

ICU-acquired weakness with neuromuscular complications occurs in nearly 50% of patients with prolonged critical illness, particularly those with sepsis, multiple organ failure, or on protracted mechanical ventilation. Whilst still in the hospital, it results in higher mortality, prolonged duration of mechanical ventilation and increased LOS. Long after hospital discharge, ICU-acquired weakness delays return to self-sufficiency. Five years after discharge, 84–95% of survivors with ICU-acquired weakness continue to have some neuromuscular abnormalities.

Factors that increase the risk for ICU-acquired weakness include multiple organ failure, muscle inactivity, hyperglycemia, and use of corticosteroids and neuromuscular blockers. Strategies to reduce its prevalence and morbidity focus on early identification and treatment of conditions leading to multiple organ failure, especially severe sepsis and septic shock; minimizing deep sedation and the use of neuromuscular blocking agents; tight glycemic control; early mobilization; and judicious use of corticosteroids.

Early and continued physical and occupational therapy in the ICU improves functional outcomes and increases ventilator-free days. These programs are feasible, well tolerated and do not increase costs.

Patients with ICU-acquired weakness sustain significant weight loss and muscle wasting, which may be tempered by providing adequate nutrition. Increased energy...
and protein intake is associated with improved clinical outcomes in critically ill patients, particularly those with BMI <25 or ≥35 kg/m².7

Although some anabolic supplements may be beneficial in the post-acute period of critical illness,10 current guidelines recommend potent anabolic steroids not be given during the early phase of critical illness when patients are catabolic.11 Before anabolic steroids can be used safely in clinical practice, further study is required to determine when patients transition from a catabolic to an anabolic state.

References
2. Deem S. Anesth Care 2006;51:1042-1052.

Rhoads Research Lecture – Insulin resistance and enhanced recovery to surgery
O Ljungqvist (Stockholm, Sweden)

Many traditional perioperative treatments increase the stress of surgery. These include preoperative fasting after midnight,1 receiving long-acting preanesthetic medication and excessive intraoperative intravenous (IV) fluids, and prolonging bed rest and hypocaloric feeding after surgery.2 Increased stress may exacerbate postoperative insulin resistance and delay recovery. Eliminating such practices and replacing them with evidence-based practices enhances recovery from surgery, especially for complex surgery in which the risk of insulin resistance is high.3

The risk of infections, renal failure, and polyneuropathy rises with insulin resistance when blood vessels, kidneys, and nerve tissue, which are sensitive to circulating glucose concentrations, cannot reduce the transport of glucose inside the cell in the face of hyperglycemia.4 The negative effects of hyperglycemia following surgery occur regardless of whether or not the patient is diabetic. Following cardiac surgery, insulin resistance is correlated with a 5- to 6-fold increased risk of complications and a 10-fold increased risk of infection.5

Insulin resistance impairs muscle function and contributes to decreased mobility via its effect on carbohydrate, protein and fat metabolism. It reduces glucose uptake and glycogen storage and increases protein catabolism in muscle. In adipose tissues, it increases lipolysis, fat oxidation, and inflammatory reactions by creating disturbances in the signaling system.6

Simple clinical approaches may reduce stress, support function, and speed patient recovery. The Enhanced Recovery After Surgery (ERAS) care bundle is a standardized protocol that promotes normal eating and sleep patterns, use of short-acting anesthetics, and early mobilization.7 Patients receive a 12.5% carbohydrate drink 4 hours before surgery, which boosts insulin sensitivity by 50%, compared with overnight fasting or taking the drink the evening before. By activating muscle insulin signaling pathways,8 the carbohydrate drink activates muscle uptake of glucose.9

The ERAS bundle eliminates preoperative bowel preps, restricts perioperative intravenous (IV) fluids, and promotes use of short-acting anesthetics.10 Postoperatively, patients receive oral analgesics and are fed early thereby reducing insulin resistance.11 Early mobilization, removing catheters and drains, and avoiding nasogastric tubes also help speed return to function.7

A recent single-center prospective cohort study of 953 patients before and after reinforcement of an ERAS protocol demonstrated that, compared with traditional treatment, the ERAS bundle decreases LOS, symptoms, readmissions, and 30-day morbidity. Restriction of fluid and use of a preoperative carbohydrate drink were major independent predictors. Carbohydrate treatment reduced risk of symptoms delaying discharge (pain, GI symptoms, dizziness) by 44% compared with traditional treatment, and reduced risk of wound dehiscence by 16%.12

References

Safe practices in enteral nutrition: Medications, misconnections and hangtimes
J Boullata (Philadelphia, PA, USA)
D Simmons (Houston, TX, USA)

Failure to follow recommended guidelines for drug administration through an enteral feeding tube is common and contributes to adverse outcomes including physical and chemical incompatibilities, altered drug or nutrient stability, altered GI tract function, and occluded feeding tubes.1

The A.S.P.E.N. Enteral Nutrition Practice Recommendations formed the basis for the 2010 Be A.W.A.R.E.
safe enteral medication delivery campaign designed to promote safer medication delivery through an enteral feeding tube in hospitals. The campaign encourages simple steps for bedside nurses to ensure safe medication administration. These steps include avoidance of adding medication directly into an enteral feeding formula; administration of each medication separately through an appropriate access; and flushing with purified water before and after each medication.

Enteral misconnections that occur when an enteral feeding system is inadvertently connected to a non-ental system remain a hazard to patient safety in healthcare settings. Fatigue, lack of training, time pressure, poor lighting, luer connectors, use of IV syringes for oral medications, and universal spikes all contribute to enteral misconnections.

An awareness campaign to reduce enteral misconnections, “Be A.L.E.R.T.”, sponsored by Nestle and A.S.P.E.N., encourages bedside nurses to trace tubing back to origin, recheck connections during transfer or change of shift, label distal and proximal ends of all lines, identify and confirm enteral labels, and use only enteral-to-enteral-connectors.

Buying oral syringes for oral medication, refusing to purchase enteral feeding equipment that is compatible with female luer connections, and not relying on color coding of enteral feeding equipment are purchasing strategies to reduce enteral misconnections. Product redesign by manufacturers to make all connections for enteral feeding physically incompatible with IV equipment is critical to eliminate inadvertent enteral misconnections.

References

Dudrick Research Symposium – Evidence-based nutritional therapy for the critically ill child
C Valentine (Columbus, OH, USA)
N Mehta (Boston, MA, USA)
M Agus (Boston, MA, USA)

Giving amino acids in high doses that mimic intrauterine accretion (3–4.5 g/kg/d) supports growth in premature infants and is associated with improved neurodevelopment and decreased cerebral palsy, especially when used as the first fluids within 4 hours of birth. The optimal protein:calorie ratio to promote weight gain in the premature infant is 3.6 g protein:100 kcal.

Early lipid administration decreases the risk of necrotizing enterocolitis (NEC), a frequent cause of mortality and morbidity, and other morbidities in premature infants. In the first 14 days of life, there is a six-fold decrease in odds of NEC when human milk comprises at least 50% of enteral feedings. Since maternal milk is low in docosahexaenoic acid (DHA), supplementation of human donor milk for feeding preterm infants might be warranted. Valentine’s neonatal ICU has implemented a human milk bundle to provide mother’s own or donor milk to all infants for a minimum of the first 30 days of life, resulting in a decrease in NEC incidence and LOS and significant cost savings.

Effective nutrition therapy in the pediatric intensive care unit (PICU) depends on an accurate assessment of energy requirements because widely varying and unpredictable metabolic rates create the potential for both under- and overfeeding. Predictive equations fail to accurately estimate energy requirements in this population. The use of targeted IC to more accurately measure energy needs may reduce cumulative excesses and deficits in the PICU.

As demonstrated in academic medical centers, PICUs have difficulty achieving EN feeding goals. The 1st Pediatric International Nutrition Study found that by day 7 only 50% of patients received their prescribed nutrition goals. Preliminary results of this study suggest a correlation between adequacy of nutritional intake (kcal) and clinical outcomes. Multiple avoidable barriers to EN exist (eg, fluid restriction, interruptions for procedures, EN intolerance) and result in feeding interruptions in 30% of enterally-fed PICU patients. An EN protocol to minimize frequent interruptions may help to achieve EN goals.

The use of immunonutrition in the PICU is promising, but data in this population are scarce. Results from adult studies suggest that a careful and systematic research approach is required. Although immunonutrition using a cocktail of glutamine, arginine, antioxidants and fish oils in the PICU showed a trend to decreased nosocomial infections and regurgitation, there was no change in mortality and the study diet was less well tolerated than conventional EN. The Critical Illness Stress-induced Immune Suppression (CRISIS) Prevention Trial, an RCT designed to test the hypothesis that metoclopramide, zinc, selenium and glutamine supplementation would reduce nosocomial infection and sepsis in critically ill children, was terminated for futility.

Tight glycemic control is considered unsafe in pediatric patients due to high rates (25–44%) of severe hypoglycemia reported in all trials in PICUs using continuous glucose monitoring. Hypoglycemia is poorly tolerated in pediatric patients; exogenous hyperinsulinemia suppresses free FA and ketone production leaving no alternative fuel available to the brain. Clinical studies including the Safe Pediatric Euglycemia in Cardiac Surgery (SPECS) trial are
ongoing; however, tight glycemic control is currently not recommended.

References

President’s Address – Nutrition care and science in the 21st century
C Van Way (Kansas City, MO, USA)

In the past, withholding feeding was considered unethical. As a result, there were few prospective RCTs testing the efficacy of nutrition. However, the paradigm shift in medicine toward evidence-based practice demands that nutrition practice become more data-driven in the future. The American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.)'s new SUSTAIN program is a first effort to develop a database that will eventually help drive practice.

The future will see more research on the pharmacologic properties and specific benefits of nutrients such as glutamine, arginine, branched-chain amino acids and omega-3 FA. For example, arginine’s effects at the basic level of the cell may benefit patients after hemorrhagic shock.1

New definitions of malnutrition that distinguish the etiologies of malnutrition – starvation versus mild to moderate inflammation due to chronic disease versus severe inflammation due to acute disease – will allow nutrition support practitioners more precision in their clinical judgments.2

Interest is growing in the interaction between the patient, disease and nutrients, specifically in the critical role the gut microflora play in the evolution of the adaptive immune system.3

In the political arena, the demographic trap created by an aging population and a shortage of healthcare professionals will contribute to rising costs and limit services. Increased utilization, technology and drug costs will also affect healthcare costs. Redirecting healthcare expenses from the insurer or the government to the individual is being proposed as an option to contain costs, as the effectiveness of traditional methods to control costs, such as improvements in quality and efficiency, reduced compensation to providers, modified government regulation and prevention strategies, is questioned. A potential negative effect of cost shifting is limited access to care.

The Patient Protection and Affordable Care Act (PPACA) offers little support for nutrition, beyond restaurant menu labeling. Ensuring nutrition therapy is covered as regulations are written will be critical. Van Way predicts Medicare cuts will be reversed, new agencies will remain unfunded, mandatory insurance rules will be eased and new Medicaid coverage will be cut back. However, it is unlikely that the PPACA will be repealed.

Keynote Address – Healthcare economics and policy
S Butler (Washington, DC, USA)

The passage of PPACA, a landmark redesign of the US health system, ensures healthcare reform will dominate public policy in coming years. The high cost of health care, which accounts for 17% of US gross national product, and society’s deeply held values regarding the rights to health care create tensions in determining how health care should be delivered.

Expanding the federal government’s role in the delivery of the nation’s health care will provide more consistent healthcare services across the US. Conversely, shifting greater responsibility to the states increases variation across states. Butler predicted a contentious battle in the Congress and ongoing tensions at the state level with lawsuits challenging mandates, attempts to end Medicaid and shift costs to the federal level, and more businesses seeking waivers. He warned of an erosion of employer provided insurance and a shift toward government exchanges that could raise government health costs and increasingly drive cost containment as a factor in the redesign of health care.

Two ways to control healthcare costs are to alter the fees, prices and volumes of services that are provided, or to set a budget for health care and provide services within the allocations of the budget. PPACA establishes subsidies to qualified health plans that provide essential services; clinical effectiveness research could be used to determine which services are deemed essential, as is commonly done in other countries. Butler favors setting a budget for health care and allocating resources to individuals as vouchers to help purchase health insurance.

Because of the tensions inherent in the healthcare debate, Butler predicts that in the future health care in the US will likely look much different than either the current system or the system envisioned in the PPACA.

The views expressed in this newsletter are of the presenters and participants, not Nestlé Nutrition.
**Conference Calendar 2011**

### October

**Obesity 2011 – 29th Annual Scientific Meeting**

1–5 October 2011
Orlando, Florida, USA

**Organizer:** Obesity Society
Web site: www.obesity.org/obesity2011

**The 24th ESICM LIVES Annual Congress**

1–5 October 2011
Berlin, Germany

**Organizer:** The European Society of Intensive Care Medicine
Web site: www.esicm.org/Data/ModuleGestionDeContenu/PagesGenererees/07-congresses/0A-annual-congress/105.asp

**The 14th Congress of Parenteral and Enteral Nutrition Society of Asia (PENSA 2011)**

14–16 October 2011
Taipei, Taiwan

**Organizer:** Taiwan Society for Parenteral and Enteral Nutrition
Web site: www.pensa2011.com

**11th FENS European Nutrition Conference**

26–29 October 2011
Madrid, Spain

**Organizer:** Federation of European Nutrition Societies (FENS)
Web site: www.fensmadrid2011.com

### November

**The 2011 Annual Meeting of the American College of Allergy, Asthma & Immunology**

3–8 November 2011
Boston, Massachusetts, USA

**Organizer:** American College of Allergy, Asthma & Immunology (ACAAI)
Web site: www.acaai.org/about/Pages/Annual-Meeting.aspx

**Malnutrition, Gut-Microbial Interactions and Mucosal Immunity to Vaccines**

7–11 November 2011
New Delhi, India

**Organizer:** Keystone Symposia
Web site: www.keystonesymposia.org/meetings/viewMeetings.cfm?MeetingID=1170

**2011 ASHA Convention**

17–19 November 2011
San Diego, California, USA

**Organizer:** American Speech-Language-Hearing Association (ASHA)
Web site: www.asha.org/events/convention/

**GSA’s 64th Annual Scientific Meeting**

18–22 November 2011
Boston, Massachusetts, USA

**Organizer:** The Gerontological Society of America (GSA)
Web site: www.geron.org/annual-meeting

### December

**International Council on Active Aging Conference 2011**

1–3 December 2011
Orlando, Florida, USA

**Organizer:** International Council on Active Aging® (ICAA)
Web site: www.icaa.cc/convention.htm
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Clinical nutrition abstracts

Highlights of A.S.P.E.N. Clinical Nutrition Week