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Fresubin® Intensive

Achieving Cost Savings in ICU with Evidence-Based Enteral Nutrition Solutions

Early Enteral Nutrition (EEN) provides cost savings in the ICU

EEN can provide **€ 5,330 savings** per ICU patient when properly managed.[1,*] International practice guidelines endorse EEN for critically ill and haemodynamically stable patients within the first 24–48 hours of ICU stay.[2,3]

Most patients are underfed during their ICU stay. Nutritional support is slow to start, never reaches the recommended targets, and poor overall adherence to guidelines is seen[4], which impairs outcomes and increases healthcare costs.[5] Additionally, up to 37 % of critically ill patients are moderately or severely malnourished at the time of admission to the ICU[6] and 38–88 % of critically ill patients are malnourished at some time during their ICU stay.[6]

Malnutrition can lead to[1,7]:

- Increased length of stay (LoS).
- Higher hospitalisation cost (24 %).
- Increased risk of readmissions within 15 days (60 %).
- 40 % increase in mortality up to 3 years post discharge.
- Malnutrition was a significant predictor of overall mortality.

A full economic analysis of the cost implications of providing EEN to critically ill patients found that EEN significantly improved patient survival and reduced the overall healthcare costs.[1]

Achieving nutrition targets early through EEN resulted in[1]:

- Significant reduction in mortality (8.6 to 17.2 %)[8]
- Decrease in length of ICU stay (2.34 days)[1]
- Significant reduction in pneumonia (27 %)[6]
- Decrease in mechanical ventilation (MV) (2.49 days)[1]

Health Economic impact in EU[1,*]

6.21 more days of EEN × € 39.30	=	**+ € 244**
2.34 fewer ICU days × € 2,349	=	**- € 5,496**
2.49 fewer MV days @ € 514/d		
2.49 MV days – 2.34 fewer ICU days =		0.15
0.15 days × € 514	=	**- € 77.10**

Total: € 5,330 savings per treated patient

€ 5,330 savings per patient

For every € 1 spent, € 22.80 is returned

EEN provides additional cost savings from avoided nosocomial infections.

The incidence of nosocomial infections in the ICU is about two to five times higher than in the general in-patient hospital population.[9] Malnutrition is one of the most important factors for developing a nosocomial infection.[10,11] Patients who develop a nosocomial infection have increased length of stay in hospital.

The length of stay (LoS) is the single most important factor influencing cost savings and the LoS can be greatly increased by nosocomial infections.

Infections and associated increase in LoS (Days)[12]

Urinary-tract	5[13]
Surgical-wound	10–11[14]
Lower respiratory	18[14]
Bloodstream	14[14]

Approximate annual spend on nosocomial infections:

UK	£1 billion
US	$5 billion
Germany	€ 2.4 billion

*Total costs of 1 ventilated-ICU day taken as € 2,349, 1 non-ventilated-ICU day taken as €1,835 and costs of 1 day of EN taken as € 39.30.

Why protein nutrition targets are not achieved in the first days in ICU

Today, few enteral feeds are optimised for tolerance, and their protein content is not sufficient to provide the recommended ESPEN and ASPEN amounts of protein without a significant risk of energy overfeeding.

Critically ill patients lose nearly 20 % of skeletal muscle mass during the first 10 days on ICU.[15] Based on expert opinion, receiving at least 80 % of the protein that is prescribed is associated with optimised outcomes.[16]

Recommended daily protein intake

during the early phase of the ICU stay according to international guidelines[2,17]:

ESPEN	**ASPEN**
1.5 g/kg	1.2–2.0 g/kg

Reaching protein targets during the early days of ICU is extremely challenging.[16]

Reaching protein targets helps to reduce mortality

Studies have shown that reaching protein and energy targets with EEN is associated with a 50 % reduction in 28 day mortality (Figure 1).[18] However, reaching the energy targets alone does not reduce mortality and receiving at least 80 % of the protein target is more important than reaching the energy target when looking at 60-day mortality.[16]

Reaching protein target reduces mortality

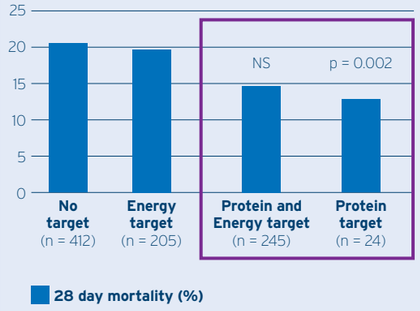


Figure 1: Protein and energy targets and mortality

There are two major reasons for failing to reach protein nutrition targets:

1. GI dysfunction in critical illness.

Over half of all ICU patients have the following GI dysfunction symptoms[19,20]:

- Vomiting and regurgitation
- Diarrhoea
- Constipation
- Bowel dilation
- Increased gastric residual volume (GRV)
- Abdominal distension
- Increased abdominal pressures, reflux/aspiration

Such GI intolerance is attributed to illness associated intestinal dysfunction, such as impaired motility, inadequate digestion and reduced absorption of feeds.[21,22]

GI dysfunction often leads to poor tolerance of EN and can result in a nutritional deficit which contributes to the loss of lean body mass. However, a carefully considered feed composition can modulate GI tolerance in terms of gastric emptying, digestion and absorption to help improve tolerance to EN.

2. Insufficient protein to calorie ratio of energy in available formulations.

Exceeding 110 % of measured energy expenditure is associated with higher hospital mortality.[18] Avoiding overfeeding is also important to protect respiratory function and reduce the risk of infection.[23] But as current feeds are relatively high in calories and contain insufficient protein, it is difficult to achieve the protein target without exceeding calorie requirements. Currently, ICU patients worldwide are achieving only approximately 60 % of the prescribed protein requirements.[24]

Overfeeding can be further exacerbated due to administration of non-nutritional energy via medications and fluids applied to patients during the first days of ICU stay.[25]

Clinical benefits of high protein peptide-based formulas lead to cost savings

85 % of patients given a high protein formula using whey hydrolysate* reach protein target after 48 h and 95 % after 96 h, while maintaining good tolerance.[26]

Peptide-based enteral formulas (PEF) also known as predigested feeds contain proteins that are hydrolysed into smaller units called peptides.

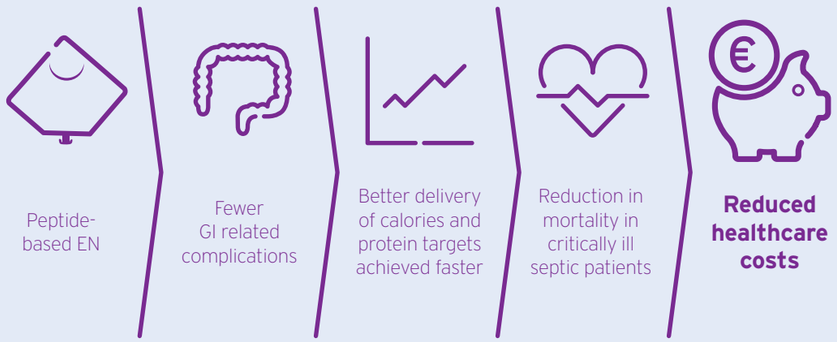
PEF have been developed to minimise malabsorption in critically ill patients[27], thus achieving protein targets faster and with fewer complications. PEF have many benefits, such as helping to recover and maintain gut integrity[28], helping to improve bacterial translocation[28], as well as overall patient outcomes.[26]

Additionally, PEF have many benefits which target tolerability, digestibility and availability.

Benefits of PEF related to tolerability, digestibility and availability:

- Efficiently absorbed in the small intestine.[29]
- Better tolerated, with fewer GI complications like diarrhoea.[28,30,31]
- Improved nitrogen retention/balance.[28]
- Notable improvement of pre-albumin and transferrin levels.[31]
- Improved visceral protein synthesis.[28]

Peptide-based EN leads to cost savings[27]



Hydrolysed based protein provision in critically ill patients improves patient outcomes and leads to cost savings through reduced side effects and complications.

*Fresubin Intensive

Fresubin Intensive: High protein early enteral nutrition to achieve protein targets

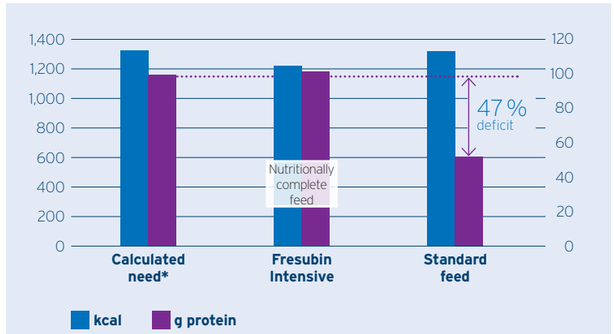
Fresubin Intensive meets the needs of critically ill patients[25,32]

Fresubin Intensive is formulated to meet ASPEN and ESPEN guidelines:

- Protein intake in the range of 1.2–2.0 g/kg BW/day (may be even higher in burn, multi-trauma or obese patients).
- Energy target of 20–25 kcal/kg BW/day during the initial phase of critical illness.
- Start enteral feeding early within 24–48 hours.

Fresubin Intensive is a source of EEN for critically ill patients, in particular for patients with high protein and moderate energy needs in the early acute phase.

The chart below compares the delivery of protein and energy of different tube feeds. Fresubin Intensive reaches protein targets without over-feeding energy. The graph represents protein and energy requirements versus delivery with 1 litre of tube feed for a 65 kg patient.



Based on ASPEN/ESPEN recommendation of 20 kcal/kg BW energy and 1.5 g/kg BW protein

Only **Fresubin Intensive** provides sufficient protein without exceeding energy target!

Optimal protein-energy ratio

49 patients were included in studies into the GI tolerance and time to reach protein targets with Fresubin Intensive. Fresubin Intensive was well tolerated and enabled clinicians to achieve protein targets early during ICU stay, without exceeding the defined energy target in adult patients.[26] The protein target was reached in 85 % of ICU patients after 48 h and in 95 % after 96 h. GI tolerance was also excellent with no diarrhoea.[26]

Fresubin Intensive – Who, when, how?

WHO?

Critically ill patients

- Including trauma, surgery, sepsis, burns and obesity

WHEN?

Guidelines recommend:

- Early enteral nutrition within 24-48 hours* of ICU admission[33]

HOW?

Guidelines recommend:

- High protein intake of 1.5 g/kg/d during the early acute phase of the ICU[32]
- Energy target of 20–25 kcal/kg BW[32]

Enteral Nutrition with Fresubin Intensive

- **Dietary management of critically ill patients with or at risk of malnutrition**
- **Particularly for patients with high protein and low to moderate energy needs**

High protein early enteral nutrition for the ICU

PROTEIN

High protein (10 g/100 ml), moderate energy (1.2 kcal/ml)

- to meet the increased protein needs without exceeding energy requirements[25,32]

100 % whey protein hydrolysate and low in fat with MCT

- help to improve digestion, absorption and GI tolerance[34,35]

Leu Cys Val

High biological value protein

- help to support lean body mass and catabolism[36]

Modified carbohydrate profile with low glycaemic index

- help to improve glycaemic control and to minimise blood glucose fluctuations[37,38]

3 g** of EPA and DHA from fish oil and antioxidant micronutrients

- to induce immune-enhancing effects[22]
- to meet the stress-induced elevated needs of critically ill patients[22,39]

*Haemodynamically stabilised patients; **Per recommended daily dose (RDD)

Fresubin Intensive – Prescribing information

Nutritional Information

Average content per 100 ml:		
Energy value	kcal kJ	122 512
Caloric density	kcal/ml	1.2
Fat	g	3.2
of which saturated fatty acids	g	1.66
of which MCT*	g	1.28
of which monounsaturated fatty acids	g	0.82
of which polyunsaturated fatty acids	g	0.72
of which EPA** + DHA***	g	0.30
Carbohydrate	g	12.9
of which sugars	g	8.0
of which lactose	g	≤ 0.5
Fibre	g	0.64
Protein	g	10.0
Salt	g	0.44
Water	ml	80.5
Osmolarity	mosmol/l	600
Osmolality	mosmol/kg H_2O	740
Minerals and trace elements		
Sodium	mg/mmol	175/7.6
Potassium	mg/mmol	295/7.5
Chloride	mg/mmol	160/4.5
Calcium	mg/mmol	105/2.6
Magnesium	mg/mmol	30/1.2
Phosphorus	mg/mmol	70/2.3
Iron	mg	2.0
Zinc	mg	1.5
Copper	µg	230
Manganese	mg	0.48
Iodine	µg	22.0
Fluoride	mg	0.20
Chromium	µg	11.0
Molybdenum	µg	14.0
Selenium	µg	10.5
Vitamins		
Vitamin A	µg RE*	130
β-Carotene	µg	300
Vitamin D_3	µg	2.0
Vitamin E	mg α-TE**	3.0
Vitamin K_1	µg	9.0
Vitamin B_1	mg	0.23
Vitamin B_2	mg	0.24
Niacin	mg NE***	2.4
Vitamin B_6	mg	0.27
Vitamin B_{12}	µg	0.50
Pantothenic acid	mg	0.90
Biotin	µg	6.8
Folic acid	µg	31.5
Vitamin C	mg	22

Caloric distribution (energy %)
Fat 24 %, carbohydrate 42 %, fibre 1 %, protein 33 %

*MCT: medium chain triglycerides, **EPA: eicosapentaenoic acid, ***DHA: docosahexaenoic acid,
*RE: retinol equivalents, **α-TE: alpha-tocopherol equivalents, ***NE: niacin equivalents

Prescribing Information

Indications

Fresubin Intensive is a source of early enteral nutrition for the dietary management of critically ill patients with or at risk of malnutrition, in particular for patients with high protein and low to moderate energy needs, e. g. after trauma, surgery, sepsis or burns.

Dosage

To be determined by the health care professional according to patients' needs. Recommendation for complete nutrition ≥1000 ml/day (1220 kcal) or supplementary nutrition ≥500 ml/day (610 kcal).

Important notes

Fresubin Intensive is free from gluten, clinically free from lactose and purine, and low in cholesterol. To be used under medical supervision. Monitor feeding rate. Suitable as sole source of nutrition. Consider high protein levels. Not suitable for children < 10 years. Not suitable for patients with galactosaemia. Ensure adequate fluid intake. Not for parenteral (I.V.) use. Carefully monitor patients with gastric motility disturbances receiving antacids as antacids may cause protein precipitation.

Handling and storage

Store at room temperature. Once opened, use within 24 hours. Shake well before use! Do not use if bag is damaged or swollen or content is coagulated. Do not mix with drugs.

Contraindications

Not suitable whenever enteral nutrition is not permitted, such as in acute gastrointestinal bleeding, ileus and others. Use with caution in severe forms of malassimilation. Not suitable for patients with congenital inability to metabolise nutrients contained in Fresubin Intensive. Use with caution in patients with severe kidney or liver insufficiency, depending on the patient's tolerance of nitrogen.

Fresubin Intensive

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FRESENIUS KABI
caring for life

Fresenius Kabi Deutschland GmbH
61346 Bad Homburg
Germany
Phone: +49 (0) 61 72 / 686-0
Enteral.nutrition@fresenius-kabi.com
www.fresenius-kabi.com