

## Commentary

# Toward protein-energy goal-oriented therapy?

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See related research by Strack van Schijndel *et al.*, <http://ccforum.com/content/13/4/R132>

### Abstract

Protein-calorie malnutrition is a concern in critically ill patients. Prospective studies to define the ideal calorie/protein intake to administer not only to meet requirements but also to change outcome are lacking. Strack van Schijndel and colleagues have observed an improvement in survival when patients reach the calorie target according to indirect calorimetry and a protein intake of greater than 1.2 g/kg per day. Their prospective observational study sheds new light on this field.

### Introduction

Using energy targeting and adequate protein-calorie supply, Strack van Schijndel and colleagues [1] have reported an improvement in the outcome of critically ill patients. Early enteral feeding has become the first line for nutritional support in critically ill patients [2]. However, reaching the calorie target remains difficult [3,4]. Additionally, there is still extensive debate on the amount of calories and protein to prescribe to severely ill patients. Guidelines of the European Society of Clinical Nutrition and Metabolism recommend that intensive care unit (ICU) patients be fed because starvation or underfeeding is associated with increased morbidity and mortality [2-4] and that all patients who are not expected to be on normal nutrition within 3 days receive parenteral nutrition (PN) within 24 to 48 hours if enteral nutrition (EN) is contraindicated or if they cannot tolerate EN. In patients who are not fed sufficiently by the enteral route, the deficit should be supplemented by the parenteral route [5] (grade C). Overfeeding should be avoided.

Guidelines of the American Society for Parenteral and Enteral Nutrition and the Society of Critical Care Medicine [6] recommend that, if energy requirements (100% of target goal calories) are unable to be met after 7 to 10 days by the enteral route alone, the physician consider initiating supplemental PN (grade E). Initiating supplemental PN prior to this

7- to 10-day period in a patient already receiving PN may not improve outcome and may be detrimental (grade C).

These conflicting recommendations result from the lack of answers, based on solid scientific evidence, to the following questions: Should calorie administration be guided by indirect calorimetry to reach a better outcome? How do different levels of feeding affect outcome (mortality and lengths of stay in the ICU or in the hospital), and should feeding be tailored to the estimated requirements of the individual or should a limited number of standard regimens be sufficient? What are the consequences of a cumulative calorie deficit?

Strack van Schijndel and colleagues [1] have answered some of these questions by using observations collected during nutritional support guided by good clinical practice. They use Harris-Benedict equations multiplied by 1.3 at admission to define a calorie target, and after 3 to 5 days, they are able to measure energy expenditure. Then they try to administer energy and protein according to a measured energy expenditure multiplied by 1.1 to cover activity expenses and more than 1.2 g/kg per day of protein. Should calorie administration be guided by indirect calorimetry? Yes, since doing so improves mortality.

### The available evidence is poor

In the available literature, the evidence is difficult to collect since the common practice is to underfeed ICU patients [7,8]. When McCowen and colleagues [9] planned to compare normocaloric with hypocaloric regimens, both groups were underfed (14 versus 18 kcal/kg per day). In addition, two more parameters interfere with the analysis of the data: the nutritional status of the patient at admission and the cumulative energy balance, which is a direct consequence of the length of stay of the patient. Two recent papers have shown that underfed patients and severely obese patients

EN = enteral nutrition; ICU = intensive care unit; PN = parenteral nutrition.

have a higher independent risk of mortality [10,11], and in most of the studies, the patients are not stratified according to their nutritional status. Second, the cumulative energy balance becomes an important prognostic factor if the ICU stay is longer than 5 to 7 days and if the balance exceeds -10,000 kcal. Bartlett and colleagues [12] have already demonstrated that this limit should not be exceeded. Villet and colleagues [3] and Dvir and colleagues [4] showed the importance of cumulative energy balance by using a computerized information system that allowed an easy way to calculate the negative balance. Using software that evaluates energy balance in a fast and easy way is becoming an important part of the nutritional assessment of the critically ill patient.

### Gender, protein, and outcome

This is not the first time that gender has influenced outcome in the multivariate analysis of critically ill patients [13,14]. The explanation provided by Strack van Schijndel and colleagues is that women have a lower body weight and thus their energy requirements are not as great. In addition, females reached nutritional goals more often than males (33.3% versus 17.7%). Gender impacts upon the inflammatory and metabolic response in pediatric burn patients [13] and outcome in nosocomial pneumonia [14], this time in favouring males. This study [1] was not planned to answer this question, and there are many confounders in the evaluation of gender impact on intensive care survival when nutrition is adequate.

Forse and colleagues [15] have suggested that the administration of enough calories should be associated with enough protein. They showed that high nitrogen intake markedly increased plasma insulin and glucagon concentrations but reduced glycerol, fatty acid, and 3-hydroxybutyrate concentrations, independently of glucose intake. This may explain the more efficient utilization of calories at higher levels of nitrogen intake. The effect of gender on calorie utilization has not been investigated. Prospective randomized studies administering calories according to indirect calorimetry and protein at different levels will define more precisely the true role of protein in the critically ill.

### Competing interests

The author declares that they have no competing interests.

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