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Does the quantity of enteral nutrition affect outcomes in critically ill trauma patients?

Jennifer L. Ash, Jane M. Gervasio, Gary P. Zaloga, George H. Rodman Jr.

Background: The quantity of nutrition associated with optimal outcomes in the critically ill patient remains uncertain. Studies evaluating hypo caloric nutrition in the critically ill obese patient have shown benefit. Recent literature evaluating nutrient intake and clinical outcomes in critically ill, non-obese adults has shown a decreased morbidity and mortality in those fed 33-65% of recommended intake. However, there are no studies evaluating the relationship between the quantity of enteral nutrition and outcomes in the non-obese trauma patient. The investigators hypothesized that early enteral administration of nutrients at less than weight based calculated requirements is associated with improved outcomes in critically ill trauma patients.

Methods: This study is a retrospective chart review evaluating the quantity of enteral nutrition administered to trauma patients during their initial stay in the ICU. Adult patients sustaining a traumatic injury with a minimal length of stay (LOS) in the ICU of 3 days and receiving enteral nutrition were included. The affect of varying amounts of nutrition upon organ function (renal, pulmonary, cardiovascular, central nervous system), blood glucose concentrations, ventilator days, ICU LOS, hospital LOS, number of infections, and survival were evaluated.

Results: One hundred and twenty adult patients were divided into quartiles based upon both average daily caloric intake [10.1 ± 2.5 (Quartile 1), 15.8 ± 1.4 (Quartile 2), 19.6 ± 1.0 (Quartile 3), 26.2 ± 4.4 (Quartile 4) kcal/kg/day] and protein intake [0.5 ± 0.1 (Quartile 1), 0.8 ± 0.1 (Quartile 2), 1.0 ± 0.1 (Quartile 3), 1.4 ± 0.2 (Quartile 4) g/kg/day] for the first seven days

following initiation of enteral nutrition (EN). Patients were well matched for demographics, admission injury severity, and site of enteral feeding.

Results from the entire hospital LOS are summarized in the following table:

Outcome	Group	Quartile 1 (mean ± SD)	Quartile 2 (mean ± SD)	Quartile 3 (mean ± SD)	Quartile 4 (mean ± SD)	p-value
ICU LOS	Calories	15.5 ± 8.8	17.5 ± 9.2	15.9 ± 9.3	21.1 ± 10.6	0.09
(days)	Protein	16.1 ± 8.7	15.4 ± 8.4	18.3 ± 9.3	20.3 ± 11.6	0.19
Hospital LOS	Calories	23.7 ± 11.1	23.0 ± 8.1	23.9 ± 8.4	29.4 ± 12.3	0.05
(days)	Protein	23.5 ± 11.1	22.9 ± 7.8	26.5 ± 12.4	27.1 ± 9.4	0.29
Ventilator	Calories	12.5 ± 10.0	13.1 ± 8.8	12.1 ± 10.1	17.7 ± 9.7	0.10
Days	Protein	12.0 ± 10.2	11.7 ± 7.9	13.3 ± 8.9	18.4 ± 11.0	0.03
Number of	Calories	1.4 ± 0.9	1.7 ± 1.7	1.5 ± 0.9	2.0 ± 1.1	0.08
Infections	Protein	1.3 ± 0.9	1.6 ± 1.0	1.9 ± 1.1	1.8 ± 1.0	0.12

Results from the first seven days following initiation of enteral feeds are summarized in the following table:

Outcome (Days)	Group	Quartile 1 (mean ± SD)	Quartile 2 (mean ± SD)	Quartile 3 (mean ± SD)	Quartile 4 (mean ± SD)	p-value
Pulmonary	Calories	5.2 ± 2.4	5.8 ± 2.0	5.2 ± 2.8	6.4 ± 1.8	0.11
Failure	Protein	5.0 ± 2.5	5.7 ± 2.4	5.5 ± 2.5	6.5 ± 1.7	0.09
CV Failure	Calories	0.6 ± 1.3	1.2 ± 1.8	0.6 ± 1.2	1.7 ± 2.3	0.04
	Protein	0.6 ± 1.3	1.1 ± 1.7	0.8 ± 1.6	1.6 ± 2.2	0.15
CNS	Calories	2.4 ± 2.8	1.5 ± 2.4	3.7 ± 3.1	3.0 ± 3.3	0.03
Failure	Protein	2.0 ± 2.6	2.3 ± 2.8	3.1 ± 3.2	3.2 ± 3.2	0.32
Renal	Calories	0.2 ± 1.3	0.2 ± 1.3	0.2 ± 1.3	0.0 ± 0.2	0.86
Failure	Protein	0.2 ± 1.3	0.5 ± 1.8	0.0 ± 0.2	0.0 ± 0.0	0.33
Hyperglycemia	Calories	3.0 ± 2.6	3.8 ± 2.4	3.6 ± 2.5	4.0 ± 2.2	0.45
	Protein	2.9 ± 2.6	3.9 ± 2.6	3.9 ± 2.3	3.7 ± 2.3	0.30

The quantity of nutrient intake in the first 7 days did not significantly affect patient survival.

Conclusions: Trauma patients receiving the greatest amount of calories (26.2 ± 4.4 kcal/kg/day) or protein (1.4 ± 0.2 g/kg/day) within the first 7 days of EN had poorer outcomes than those fed 25-61% less calories or 29-64% less protein. During the acute injury phase, feeding trauma patients below their calculated nutritional requirements may be advantageous.