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Adequacy of energy and protein balance of enteral nutrition in intensive care: what are the limiting factors?

Adequação dos balanços energético e proteico na nutrição por via enteral em terapia intensiva: quais são os fatores limitantes?

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ABSTRACT

Objective: To determine the factors that influence the adequacy of enteral nutritional therapy in an intensive care unit.

Methods: This prospective observational study was conducted in an intensive care unit between 2010 and 2012. Patients >18 years of age underwent exclusive enteral nutritional therapy for ≥72 hours. The energy and protein requirements were calculated according to the ICU protocols. The data regarding enteral nutrition, the causes of non-compliance, and the biochemical test results were collected daily.

Results: Ninety-three patients admitted to the intensive care unit were evaluated. Among these patients, 82% underwent early enteral nutritional therapy, and 80% reached the nutritional goal in <36 hours. In addition, 81.6%±15.4% of the enteral nutrition volume was infused, with an adequacy of 82.2%±16.0% for calories, 82.2%±15.9% for proteins, and a mean energy balance of -289.9±277.1kcal/day. A negative correlation of C-reactive protein with the volume infused and the energy and protein balance was observed. In contrast, a positive correlation was found between C-reactive protein and the time required to reach nutritional goals. Extubation was the main cause for interrupting the enteral nutritional therapy (29.9% of the interruption hours), and the patients >60 years of age exhibited a lower percentage of recovery of the oral route compared with the younger patients (p=0.014).

Conclusion: Early enteral nutritional therapy and the adequacy for both energy and protein of the nutritional volume infused were in accordance with the established guidelines. Possible inadequacies of energy and protein balance appeared to be associated with an acute inflammatory response, which was characterized by elevated C-reactive protein levels. The main cause of interruption of the enteral nutritional therapy was the time spent in extubation.

Keywords: Enteral nutrition; Nutrition therapy; Nutritional support; Energy requirement; Energy and protein balance; Intensive care; Critical care

INTRODUCTION

Hospitalized patients are at a high nutritional risk. In Brazil, approximately 48% of the hospitalized patients exhibit some degree of malnutrition. Among these malnourished patients, 12% are severely malnourished.[1] In intensive care units (ICU), the reported prevalence of malnutrition varies between 43% and 88%.[2,3] In a recent study, Heyland et al.[4] reported that most ICU patients present with sarcopenia prior to admission.

In addition to increased morbidity and mortality, multiple organ dysfunction, increased time spent on mechanical ventilation, and prolonged hospitalization,

critically ill patients are often affected by catabolic stress, which is caused by preexisting systemic inflammatory states. In this regard, C-reactive protein (CRP) is an important inflammation marker because the levels of CRP change rapidly during the onset of inflammation.[5]

Under these conditions, nutritional therapy (NT) is recognized as an essential therapy to prevent the loss of body mass, maintain a balanced immune system, and decrease metabolic complications.[6] Whenever feasible, enteral nutritional therapy (ENT) is the most commonly indicated route of nutritional support aimed at preventing and treating complications in critically ill patients.[7] Therefore, the establishment of an adequate NT helps meet the energetic and protein requirements of the patients and can thus potentially result in better clinical outcomes.[6]

Villet et al.[8] reported that a negative energy balance correlated with increased infectious complications, while Allingstrup et al.[9] concluded that a decreased protein supply was associated with a higher incidence of infectious complications, and patients suffering from these complications experienced early deaths. Therefore, increasing the efficiency and effectiveness of ENT and ensuring the quality and benefits of ENT for critically ill patients is essential.

In this context, the present study aimed to evaluate the factors that influence the adequacy of the ENT provided in the ICU of a university hospital.

METHODS

This prospective observational study was conducted in the adult ICU of the *Hospital Universitário* at the *Universidade de São Paulo* in São Paulo, Brazil, and was approved by the Research Ethics Committee of the hospital (CEP 603/05). Eligible patients or their legal guardians agreed to participate by signing an informed consent form.

The data were collected between 2010 and 2012, always in the second semester. Both male and female patients ≥18 year of age who were supported exclusively with enteral nutrition for ≥72 hours were considered eligible for the study. The only exclusion criteria was that patients in palliative care were excluded from the study.

The nutritional requirements were calculated from body weight measurements obtained with a crane scale upon admission (Scale-Tronix, 2002). The ideal weight, obtained from reference tables for each age group, was used only for patients who could not be mobilized.[10,11] For obese patients [body mass index (BMI) >30kg/m²],[6] the weight was obtained upon admission, followed by the calculation of the adjusted weight.[12] The values for

height were self-reported by the patients or by their legal guardians, and when not available, the estimated height was determined using equations that consider the knee height.[13,14] The patient classification on the basis of nutritional risk was performed according to the method proposed by Kovacevichi et al.[15]

The recommendations for energy balance and protein balance were estimated according to each clinical condition and following existing ICU protocols.[16] Recommendations of 25-30 kilocalories (kcal) per kilogram (kg) of body weight were adopted according to the guidelines established by the European Society for Parenteral and Enteral Nutrition (ESPEN),[17] while a recommendation of 20 kcal/kg of adjusted weight was adopted for obese patients.[12] For patients with acute-phase reaction, 1.25-1.50g protein/kg body weight was adopted, and for the remaining patients, 1.00g/kg of body weight was used.[18]

The enteral feeding tubes were placed according to the protocol established by the hospital. The feeding tube was placed in a post-pyloric position whenever possible; otherwise, the gastric position was used. All of the tube placements were followed by confirmation via an X-ray. Nasojejunal feeding tubes were used in all of the procedures. The enteral diets were administered continuously with infusion pumps for approximately 22 hours, and the remaining 2 hours were reserved for the performance of other medical procedures and the administration of medication.[19]

From the day the ENT was initiated until ICU discharge, patient death, or the initiation of other routes of nutritional support (oral, parenteral, or mixed), the data regarding the infused enteral nutrition volume and the factors associated with ENT interruption and gastrointestinal tolerance were collected daily. The assessment of gastrointestinal tolerance was based on a clinical evaluation of the occurrence of abdominal distension or vomiting and periodic checking of the gastric residuals, which were considered high when the residuals amounted to ≥50% of the infused volume over the last 2 hours in the post-pyloric position and ≥200mL in the pre-pyloric position.

After the data collection, the percentage of adequacy for calories and protein was calculated using the ratio of the amount of calories and proteins administered and the respective amounts prescribed daily. The prescribed values were adopted instead of the calculated values because the mean percentage for the prescribed values relative to the calculated values was 101.5% for calories and 100.2% for proteins, indicating that the prescribed values were similar to the calculated values. Subsequently,

the mean percentage of adequacy was calculated for each patient, and the mean adequacy of the sample was calculated per year.

Moreover, the plasma levels of CRP were collected using the nephelometric method upon admission to the ICU, and the Simplified Acute Physiology Score III (SAPS III) was used for rating severity. The data analysis was performed from the second day of the ENT according to the established ICU protocols.

The causes of interruption of the ENT were divided into internal and external causes. Internal causes included factors associated with gastrointestinal complications, extubation, feeding tube-related problems, routine procedures, and the reinitiation of the ENT. External causes included causes related to services other than the ICU, such as the fasting period required for the performance of procedures including tomography, bronchoscopy, upper digestive endoscopy, and tracheostomy. The diagnosis at admission was classified into respiratory, systemic inflammatory response syndrome (SIRS), neurological, cardiovascular, surgical, as well as diagnoses associated with trauma, cancer, pancreatitis, and liver disease.

The statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) software, version 17.0. The Kolmogorov-Smirnov test was used to assess the sample normality. When the quantitative variable had a normal distribution, the mean and standard deviation were used. Otherwise, the median and interquartile range were used. To compare the qualitative variables, the chi-square test was used. To compare the quantitative variables, *Student's t*-test for normally distributed variables or the Mann-Whitney test for the other variables were adopted. Furthermore, the analysis of variance (ANOVA) and Kruskal-Wallis tests were used to evaluate differences between three or more variables. Pearson and Spearman correlations were used to evaluate the correlations between variables with normal and non-normal distributions, respectively. The association models were tested using a partial correlation analysis, where age and/or gender were considered the control variables. For all of the tests, p values <5% (p<0.05) were considered significantly different.

RESULTS

Table 1 displays the demographic and clinical profiles of the study sample. Only age, the CRP level, and the rate of recovery of the oral route differed between the years of follow-up (p<0.05). Therefore, it was possible to determine the quality of the ENT considering the total of 93 monitored patients. After the admission diagnoses inclusion, 40 (43%) patients presented with sepsis during the follow-up.

The duration of stay in the ICU, the duration of the ENT and of fasting for the initiation of the NT, the infused volume, the adequacy of the energy and protein balances, and the other ENT-associated variables are shown in table 2. Of note, 82% of the patients fasted for <48 hours before the initiation of the ENT, 80% achieved 100% of the nutritional goals in <36 hours, and only 1 patient achieved the nutritional goal 96 hours after admission.

Figures 1 and 2 show the protein and energy balance, including the data dispersion and the outlier values. No significant differences were observed between the protein and energy balances during the years of follow-up, and both values were negative. The median values for the energy balance were -178.4kcal/day, -249.9kcal/day, and -244.7kcal/day in 2010, 2011, and 2012, respectively, with the presence of only four outliers. The median values for the protein balance were -9.8g/day, -12.8g/day, and -10.6g/day in 2010, 2011, and 2012, respectively, with only six outliers.

In view of the results shown in tables 1 and 2, some association models were tested. As described below, the present study found correlations between some of the studied variables, and these correlations were significant, albeit weak. The CRP level negatively correlated with the energy balance (r=-0.208, p=0.045) and the protein balance (r=-0.205, p=0.049). Regarding the age-controlled partial correlation analysis, the CRP level had a negative correlation with the percentage of infused volume (r=-0.219, p=0.036) and a positive correlation with the time required to reach the established nutritional goal (r=0.246, p=0.018). Furthermore, there was an age- and gender-controlled partial and positive correlation between the caloric balance and the duration of the ENT (r=0.218, p=0.044).

By subdividing the sample according to those patients aged ≥60 years, we found that the younger patients had a higher percentage of recovery of the oral route (p=0.04). A similar profile was observed when the patients were stratified according to the SAPS values (cut off <50) (p=0.002).

Table 3 indicates that only the ENT interruptions caused by bronchoscopy, extubation, and routine procedures differed between the years evaluated. In 2011, there was more than one extubation procedure for eight patients, resulting in 212 hours of interruption of the ENT.

The internal causes were primarily responsible for the interruptions in the ENT, particularly those due to extubation (29.9%) and gastrointestinal complications (21.4%). Moreover, increased gastric residuals were responsible for 70% of the interruptions related to digestive tract complications. In this sense, it is important to consider that only nine patients (9.7%) were subjected to a pre-pyloric feeding tube placement. The external reasons

Table 1 - Demographic and clinical profiles of patients undergoing enteral nutrition therapy in 2010-2012

Characteristics	Total (N=93)	2010 (N=31)	2011 (N=31)	2012 (N=31)	p value
Gender					
Female	32 (34.4)	10 (32.3)	10 (32.3)	12 (38.7)	0.791
Male	61 (65.6)	21 (67.7)	21 (67.7)	19 (61.3)	
Age (years)	55.7±17.4	60.6±16.9	49.9±15.5	56.5±18.4	0.05*
Outcome					
Discharge from the ICU	66 (72.0)	19 (61.3)	25 (80.7)	22 (74.2)	0.161
Death	27 (28.0)	12 (38.7)	6 (19.4)	9 (25.8)	
Admission diagnosis					
Respiratory	25 (25.8)	9 (29.0)	9 (29.0)	6 (19.4)	0.384
SIRS	16 (17.2)	3 (9.7)	7 (22.6)	6 (19.4)	0.301
Neurological	13 (13.9)	6 (19.4)	5 (16.1)	2 (6.5)	0.749
Cardiovascular	16 (17.2)	8 (25.8)	3 (9.7)	5 (16.1)	0.101
Surgical	12 (12.9)	2 (6.45)	2 (6.5)	8 (25.8)	0.02
Other	12 (12.9)	3 (9.7)	5 (16.1)	2 (6.4)	0.607
SAPS	60.3±14.9	60.9±13.8	59.2±16.9	60.7±14	0.888
CRP level (mg/L)	172.6±120.5	126.9±94.8	201.5±123.9	189.4±130.7	0.031*
On invasive mechanical ventilation	73 (78.5)	21 (67.7)	28 (90.3)	24 (77.4)	0.059
Recovery of oral route	58 (62.4)	15 (48.4)	24 (77.4)	19 (61.3)	0.034*

ICU - intensive care unit; SIRS - systemic inflammatory response syndrome; SAPS - Simplified Acute Physiology Score; CRP - C-reactive protein. Results are expressed as percentages or the means±standard deviation. * 2010 versus 2011.

Table 2 - Characteristics of enteral nutritional therapy in 2010-2012

ENT	Total	2010	2011	2012	p value
ICU time (days)	12 (8.5-18.5)	15 (10-26)	12 (9-17)	12 (7-15)	0.082
Fasting before ENT (hours)	23 (14.5-42)	28 (12-42)	21 (17-31)	26 (15-40)	0.766
Time to reach the nutritional goal (hours)	24 (14-34.5)	24 (18-35)	26 (20-43)	13 (12-25)	<0.001*
Duration of ENT (days)	8 (6-15)	11 (7-18)	8 (5-13)	8 (6-14)	0.269
Calories administered (kcal/day)	1,339.5±298.9	1,349.5±335.9	1,355.5±266.1	1,313.7±298.7	0.841
Protein administered (g/day)	61.7±16.0	57.4±14.6	62.1±15.7	65.5±17.0	0.133
Volume administered (%)	81.6 (15.4)	82.2±15.5	82.1±14.9	80.4±15.9	0.953
Calories administered (%)	82.2±16.0	82.2±17.0	82.7±15.0	81.6±16.1	0.959
Protein administered (%)	82.2±15.9	82.2±17.0	82.3±14.9	82.1±16.0	0.999
Energy balance (kcal/day)	-289.9±277.1	-259.2±271.8	-305.0±259.2	-305.6±302.2	0.754
Protein balance (g/day)	-13.6±11.7	-13.5±10.7	-14.9±12.1	-12.4±12.4	0.72

ICU - intensive care unit; ENT - enteral nutritional therapy. Results are expressed as the median and interquartile range, or as the mean±standard deviation; * difference between the year 2012 relative to 2010 and 2011; The percentages of calories and proteins administered were expressed as the ratio of the calories or proteins administered to the prescribed amount of calories or proteins. Significance level of p<0.05.

accounted for 21.9% of the non-conformities, and 9.5% were due to the fasting period for tracheostomy procedures.

DISCUSSION

Among the patients evaluated, 82% initiated the ENT before completing 48 hours of fasting, which is in agreement with international guidelines on intensive care.[20,21] Consistent with these results, a multicenter cohort study conducted by Heyland et al.[22] involving 5,497 patients indicated that the average time until the initiation of ENT was 42.1 hours. O'Meara et al.[23] evaluated 59 patients on mechanical ventilation and found that the average time for the initiation of ENT was 18.2 hours. Early ENT (24-48 hours) has been associated with fewer clinical complications, a gradual decrease in mortality, and a decreased duration of stay in the ICU.[21,24]
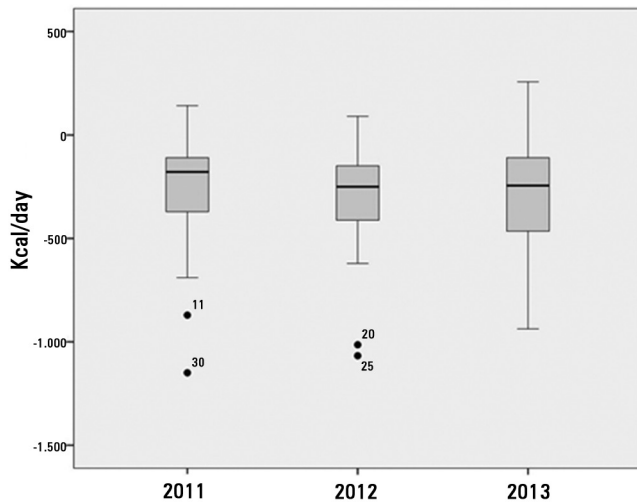
Figure 1 - Dispersion of the energy balance values during the enteral nutritional therapy according to the year evaluated.
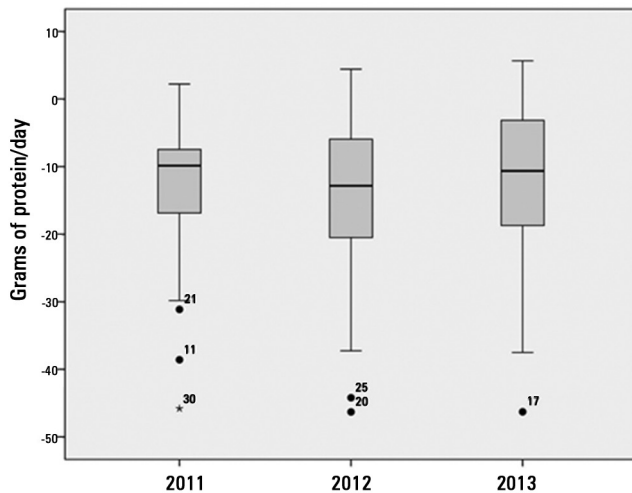

Figure 2 - Dispersion of the protein balance values during the enteral nutritional therapy according to the year evaluated.

In the present study, 80% of the patients reached 100% of the nutritional goal in <36 hours. This result differs from that found in a Brazilian study conducted by Martins et al.,[7] wherein 80% of the nutritional goal was reached on the fourth day of the ENT (96 hours) by 80% of the patients. Of note, these authors included both ward and ICU patients who received enteral nutrition through an open system, a process that requires manipulation of the enteral diet with the filling of vials for administration in intermittent periods. In contrast, our patients received industrialized diets that were administered exclusively and continuously through a closed system using infusion pumps, thereby allowing more stringent control of the infusion rate.

The ideal length of time to achieve the nutritional goal must be better established because this parameter depends on the clinical condition of each patient and the logistics of each treatment unit. Notwithstanding the particular circumstances of each study protocol, the consensus proposed by McClave et al.[6] and the Spanish consensus of NT in intensive care[24] suggest that the nutritional goal has to be reached within 48 to 72 hours, and our results are in agreement with those values. The algorithm proposed by the PEP uP protocol considers that, if 80% of the caloric goal is not achieved within 72 hours and the patient is at high risk, then the use of prokinetic agents is indicated, and the feeding tube should be placed in the intestinal region to help achieve the nutritional goal.[25]

In addition, the results reveal that the average infused enteral nutrition volume was 81.6%, which is similar to the results found by Petros & Engelmann[26] (86.2%) when evaluating 231 critically ill patients. In contrast, in a previous study conducted in an ICU, Faisy et al.[27] reported that the patients evaluated received an average of 60-70% of the prescribed infusion volume. McClave et al.[6] found that the patients who received an enteral nutrition volume close to 100% had a lower rate of infectious complications, decreased hospital stay, and decreased mortality rates.

The present study found an adequacy of 82.2% for both the energy and protein balances. In a prospective multicenter study conducted in 352 ICU in 33 countries and involving 7,872 patients on mechanical ventilation, Heyland et al.[28] suggested that the adequacy goals for energy balance should be between 80% and 90% of the prescribed value. This same range was suggested in a recent review published by Heyland,[4] aiming to lead patients toward a positive clinical outcome.

The supply of protein deserves special attention in intensive care, although achieving hyperproteic nutrition (1.25-1.50g/kg) with commercially available enteral diets often represents a limiting factor, primarily due to the high cost of such diets. An alternative strategy involves complementary nutrition using a protein supplement diluted to 10%-15% in a volume of 150-400 mL/day as needed, which would allow an increment of up to 25g protein/day. However, even with this intervention, a protein deficit occurred due to the infusion-related limiting factors surveyed in this study, and this deficit negatively correlated with the CRP level, suggesting that protein catabolism is more intense in patients with inflammation.

In this respect, several studies have highlighted the importance of quantifying the energy and protein balances in critically ill patients. The mean energy balance observed

Table 3 - Distribution of hours of interruption according to the cause for non-compliance

Type	Total N (%)	2010 N (%)	2011 N (%)	2012 N (%)	p value
External causes					
Tomography	159 (5.3)	67 (5.9)	30 (2.5)	62 (8.5)	0.182
Bronchoscopy	50 (1.6)	0 (0)	11 (0.9)	39 (5.4)	<0.015*
Endoscopy	168 (5.5)	59 (5.2)	96 (8.1)	13 (1.8)	0.127
Tracheostomy	290 (9.5)	144 (12.8)	115 (9.6)	31 (4.2)	0.102
Total external causes	667 (21.9)	270 (23.9)	252 (21.1)	145 (19.9)	0.779
Internal causes					
Routine/non-specific	272 (8.9)	135 (11.9)	117 (9.8)	20 (2.8)	<0.039*
Feeding tube**	548 (17.9)	221 (19.6)	169 (14.2)	158 (21.7)	0.365
Extubation	911 (29.9)	215 (19.1)	484 (40.6)	212 (29.2)	<0.021***
Gastrointestinal complications****	651 (21.4)	288 (25.5)	171 (14.3)	192 (26.4)	0.072
Total internal causes	2,382 (78.1)	859 (76.1)	941 (78.9)	582 (80.1)	0.779

Results are expressed as percentages. * Difference between the year 2012 relative to 2010 and 2011; ** feeding tube: unintentional removal, obstruction, and reintroduction; *** difference between the three years analyzed; **** gastrointestinal complications include gastric residuals, vomiting, and abdominal distension.

in the present study reached -289.9kcal/day, similar to that found by van den Broek et al.[29] in a study with 55 ward and ICU patients (-259.9kcal/day). This energy deficit is believed to be related to the occurrence of health complications. Previous studies have indicated that the energy deficit was correlated with the duration of hospital stay, health complications, infections, the days in which antibiotics were used, the enteral nutrition, and mechanical ventilation.[8] However, the influence of this deficit on the mortality rate has not been fully elucidated.[27,30]

In the study conducted by Villet et al.,[8] after a regression analysis, the energy deficit did not correlate with albumin, pre-albumin, or CRP levels. In the present study, we found a negative correlation of the CRP level with the energy and protein balances and with the volume infused. In contrast, there was a positive correlation between the CRP level and the time required to reach the nutritional goal. Although these correlations were weak, these results suggest that metabolic and hormonal changes that occur during systemic inflammation, as indicated by the CRP levels, may result in a decreased tolerance to enteral nutrition and consequently interfere with the nutritional supply and the time to reach the established nutritional goal. Moreover, it is necessary to investigate the possible causes for receiving inadequate ENT. Lichtenberg et al.[31] found that the main causes for not receiving ENT were interruptions for the performance of extubation, in addition to other procedures, including surgery and bronchoscopy. These results are consistent with those obtained in the present study because we observed that interruptions due to extubation were the primary reasons for non-compliance.

In 2011, the time spent in extubation was significantly higher than the extubated time spent in 2010 and 2012, most likely because of the increased number of patients undergoing invasive mechanical ventilation. In the present study, interruptions due to extubation involved disruptions caused not only by the procedure itself but also by the period of fasting required before and after the procedure. The ICU staff, following medical recommendations, tended to remove the patient from invasive mechanical ventilation as soon as possible.[32] In that situation, the risk of reintubation is higher, and consequently, the reinitiation of ENT must be postponed until the clinical conditions of the patient are favorable.

The leading cause of gastrointestinal complications was the presence of gastric residuals, which accounted for 70% of the cases. The protocols adopted in the ICU include the use of prokinetic agents with the aim of improving the nutritional supply. However, it is necessary to consider the effects of an acute-phase reaction on the digestive tract and the possible interference with the tolerance to diet. In addition, there is no consensus on the acceptable amount of gastric residuals and the need to control the residuals to prevent pulmonary aspiration; a volume of 250-500mL was suggested in a recent Canadian medical guide.[21] However, in the ICU studied, most of the feeding tubes were positioned posterior to the pylorus, and reflux control was considered by the medical team as a measure to ensure patient safety until more evidence leads to procedural changes.

Interruptions caused by extubation, when added to those caused by gastrointestinal complications, feeding tube-related problems, and routine ICU procedures,

accounted for 78.1% of the total interruption time and represented a significant interruption of the nutritional supply. The causes internal to the ICU were the main causes of the ENT interruption, and for this reason, the mobilization of the entire medical team is critical to optimize the control of such causes. At the same time, the external causes depended on interactions with other hospital wards (endoscopy, examinations, surgery), and the establishment of flowcharts for improving the logistics may become necessary. However, we must consider that CRP levels correlated negatively with the energy and protein balances, and 43% of the patients presented with sepsis during the follow-up. This underscores the importance of future research in this subgroup of patients who experience inflammatory outcomes and have an increased likelihood of nutritional inadequacy.

In addition, some of these factors may be related to the characteristics of each patient. Considering that age is an important factor in determining the occurrence of morbidity and mortality and that age is also one of the factors considered for the severity ratings used in ICU [Acute Physiology and Chronic Health Evaluation (APACHE) and SAPS], we found that patients >60 years of age had a lower percentage of recovery of the oral route when compared with the younger group. This result can be explained by the fact that older patients exhibit an increased risk of post-extubation dysphagia, which may prolong the use of the enteral route for nutrition.

One of the limitations of the present study involves the evaluation of patients from a single hospital, which has a single adult ICU that receives patients from both the medical and surgical services, thereby resulting in a reduced study sample and a limited number of professionals. Furthermore, the significant correlations found in this study were weak, which may compromise the interpretation of the results. Therefore, these results should be viewed as hypotheses and not as evidence of a real association between the variables studied.

CONCLUSION

The enteral nutritional therapy was introduced early. In addition, the volumes infused and the percentage of adequacy of the energy and protein balances followed the guidelines for nutritional therapy in an intensive care unit. The greatest risk for an inadequate supply during enteral nutritional therapy appears to be associated with those patients with exacerbated acute-phase reactions because these patients took longer to reach the nutritional goal and had more negative energy and protein balances. In contrast, the percentage of recovery of the oral route was lower in the patients >60 years of age, most likely because of the increased risk of dysphagia. The causes of non-compliance included the interruption of the enteral nutritional therapy due to extubation and gastrointestinal complications, and these causes accounted for more than 50% of the interruptions.

RESUMO

Objetivo: Determinar os fatores que influenciam na adequação da terapia nutricional enteral em uma unidade de terapia intensiva.

Métodos: Estudo prospectivo e observacional realizado em uma unidade de terapia intensiva entre 2010 e 2012. Foram incluídos pacientes >18 anos em terapia nutricional enteral exclusiva por ≥72 horas. As necessidades de energia e proteínas foram calculadas segundo protocolo da unidade. Foram coletados diariamente dados relacionados à nutrição enteral, causas de não conformidade e exames bioquímicos.

Resultados: Dentre os pacientes internados na unidade, 93 foram avaliados, 82% iniciaram a terapia nutricional enteral precocemente e 80% atingiram a meta nutricional em <36 horas. Foram administrados 81,6% (±15,4) de volume de terapia nutricional enteral, com adequação de 82,2% (±16,0) de calorias, 82,2% (±15,9) de proteínas e balanço energético médio de -289,9 kcal/dia (±277,1). Houve correlação negativa da proteína C-reativa com o volume administrado e os balanços energético e proteico, e correlação positiva com o tempo para atingir a meta nutricional. A pausa para extubação foi a principal causa de interrupções (29,9% das horas de pausa) e os pacientes >60 anos apresentaram menor porcentagem de recuperação da via oral em relação aos mais jovens (p=0,014).

Conclusão: O início precoce da terapia nutricional enteral, e a adequação do volume administrado, de energia e de proteínas estiveram de acordo com as diretrizes. A inadequação dos balanços energético e proteico parece estar associada à resposta inflamatória aguda (proteína C-reativa elevada). A principal causa de interrupção da oferta da terapia nutricional foi a pausa para extubação.

Descritores: Nutrição enteral; Terapia nutricional; Apoio nutricional; Necessidade energética; Balanço energético e proteico; Terapia intensiva; Cuidados críticos

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