



## EVALUATION OF THE ENTERAL NUTRITION THERAPY IN CRITICALLY ILL PATIENTS OF AN INTENSIVE CARE UNIT

*Avaliação da terapia nutricional enteral em pacientes críticos de uma unidade de terapia intensiva*

*Evaluación de la terapia de nutrición enteral de enfermos críticos de una Unidad de Cuidados Intensivos*

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### ABSTRACT

**Objective:** To evaluate the adequacy of enteral nutrition therapy in critically ill patients of an Intensive Care Unit. **Methods:** An observational, descriptive, analytical and prospective study was conducted from February to May of 2016 with patients aged 18 to 60 years, of both genders, admitted to an Intensive Care Unit of a public hospital in the city of Fortaleza. Data were collected from a hospital form containing data on enteral nutrition and on the reasons for the non-delivery of the diet. Data were analyzed using ANOVA with post-hoc Tukey's test with a 95% confidence interval. **Results:** Participants were 35 patients, 62.9% (n=22) of them were men, with a mean age of 42.86±10.84 years. Mean calorie intake needed was 1936.81±244.88Kcal, mean calorie intake prescribed was 1083.49Kcal±363.24Kcal, and mean calorie intake delivered was 876.0Kcal±389.97Kcal. The mean calorie intake prescribed represented 58.37% (p<0.001) of the mean calorie intake needed, and the mean calorie intake delivered represented 77.79% (p<0.001) of the calorie intake needed and 47.71% (p<0.001) of the calorie intake needed. As for the calorie intake prescribed, 75.6% were inadequate when compared to the calorie intake needed. Regarding the calorie intake delivered, 54.3% were in accordance with prescriptions and 81.4% were inadequate when compared to the calorie intake needed. The presence of gastric residual was the main reason for the incomplete delivery of the diet, representing 47.12% (n=49) of the complications. **Conclusion:** There were relevant calorie inadequacies in the calorie intake prescribed, in the calorie intake delivered and in the calorie intake needed, which suggest that patients had significant energy deficits.

**Descriptors:** Diet; Prescriptions; Nutrition Therapy.

### RESUMO

**Objetivo:** Avaliar a adequação da terapia nutricional enteral em pacientes críticos de uma Unidade de Terapia Intensiva. **Métodos:** Estudo observacional, descritivo, analítico e prospectivo realizado de fevereiro a maio de 2016 com pacientes entre 18 e 60 anos de idade, de ambos os sexos, internados na Unidade de Terapia Intensiva de um hospital da rede pública, na cidade de Fortaleza. Utilizou-se como instrumento de coleta o formulário adotado pela instituição para o preenchimento de dados relacionados à nutrição enteral e às causas do não fornecimento da dieta. Os dados foram analisados utilizando-se ANOVA seguido do teste de Tukey, com intervalo de confiança de 95%. **Resultados:** Foram avaliados 35 pacientes, sendo 62,9% (n=22) do sexo masculino, com média de idade de 42,86±10,84 anos. As necessidades calóricas tiveram média de 1936,81Kcal±244,88Kcal, as calorias prescritas de 1083,49Kcal±363,24Kcal e as calorias recebidas de 876,0Kcal±389,97Kcal. A média das calorias prescritas representou 58,37% (p<0,001) da média das necessidades calóricas, e a média das calorias recebidas representou 77,79% (p<0,001) das calorias prescritas e 47,71% (p<0,001) das necessidades calóricas. Quanto às calorias prescritas, 75,6% encontravam-se inadequadas quando comparadas às necessidades calóricas, e com relação às calorias recebidas, 54,3% encontravam-se adequadas em relação à prescrição e 81,4% inadequadas em comparação as necessidades calóricas. A presença de resíduo gástrico foi o principal motivo da dieta não ser administrada em sua totalidade, representando 47,12% (n=49) das intercorrências. **Conclusão:** Observaram-se relevantes inadequações calóricas entre calorias prescritas, calorias recebidas e necessidades energéticas, sugerindo que os pacientes se encontravam com déficits energéticos importantes.

**Descritores:** Dieta; Prescrições; Terapia nutricional.



## RESUMEN

**Objetivo:** Evaluar la adecuación de la terapia de nutrición enteral de enfermos críticos de una Unidad de Cuidados Intensivos. **Métodos:** Estudio observacional, descriptivo, analítico y prospectivo realizado entre febrero y mayo de 2016 con enfermos entre 18 y 60 años de edad, de ambos sexos ingresados en una Unidad de Cuidados Intensivos de un hospital de la red pública de la ciudad de Fortaleza. Se utilizó como instrumento de recogida de datos el formulario de la institución sobre los datos relacionados con la nutrición enteral y las causas por lo cual no se ofrecía la dieta. Los datos fueron analizados utilizándose la ANOVA y después la prueba de Tukey con intervalo de confianza del 95%. **Resultados:** Fueron evaluados 35 pacientes, el 62,9% (n=22) del sexo masculino con una media de edad de 42,86±10,84 años. La media de necesidades de calorías fue de 1936,81Kcal±244,88Kcal, de las calorías prescritas fue de 1083,49Kcal±363,24Kcal y de las recibidas de 876,0Kcal±389,97Kcal. La media de calorías prescritas representó el 58,37% (p<0,001) de la media de las necesidades de calorías y la media de las calorías recibidas representó el 77,79% (p<0,001) de las calorías prescritas y el 47,71% (p<0,001) de las necesidades de calorías. Respecto las calorías prescritas, el 75,6% estaban inadecuadas al compararlas con las necesidades de calorías y respecto las calorías recibidas el 54,3% estaban adecuadas respecto la prescripción y el 81,4% estaban inadecuadas al compararlas con las necesidades de calorías. La presencia de residuo gástrico ha sido el principal motivo de la dieta no haber sido administrada en su totalidad lo que representa el 47,12% (n=49) de las intercurencias. **Conclusión:** Se observaron importantes inadecuaciones de calorías entre las prescritas, las recibidas y las necesidades energéticas lo que sugiere que los pacientes tenían déficits de energía importantes.

**Descriptor:** Dieta; Prescripciones; Terapia Nutricional.

## INTRODUCTION

Enteral Nutrition Therapy (ENT) is used to provide nutrients through tubes (nasogastric, orogastric and nasoenteric) and ostomies (gastrostomy and jejunostomy)<sup>(1)</sup>. It is able to maintain a good nutritional status and prevent atrophy of the intestinal mucosa, preventing the bacterial translocation from the intestinal lumen to the immune system, thus avoiding serious risks to the already weakened organism, such as the occurrence of sepsis<sup>(2)</sup>.

Given that, this therapy should be used in critically ill patients who are in the Intensive Care Unit (ICU), since it leads to a decrease in the catabolic process generated by the stress caused by trauma or by the underlying disease of these patients<sup>(3)</sup>. This increase in the individual's response to traumatic stress can expose him/her to several nutritional risks<sup>(4)</sup>.

Therefore, ENT should be started as soon as possible in order to preserve the health of the individual while he or she is under physiological stress<sup>(5)</sup>. This early introduction favors the restoration and maintenance of the immune system, functional integrity of the intestine, prevention of gastrointestinal bleeding, and a subsequent increased tolerance to oral feeding<sup>(6)</sup>.

The prescription of ENT is a complex process involving nutritional and clinical knowledge, including assessment of the underlying disease. However, as important as prescribing therapy is to be sure that the patient will be receiving the prescribed diet<sup>(7)</sup>.

Commonly, the diet is not fully infused in the hospital practice, which can cause harms to the patient with respect to their nutritional status and to their general clinical picture<sup>(8)</sup>. This reduced calorie intake can lead to numerous injuries to patients, such as greater risk of malnutrition (which occurs in about 60% of patients), higher mortality risk, longer hospitalization, higher risk of developing other infections, and greater financial expenditure on health care<sup>(4)</sup>.

Therefore, maintaining ENT with adequate calories and macronutrients is very challenging and requires a lot of effort from the multidisciplinary Nutrition Support Team (NST), considering the frequency with which interruptions in the supply of enteral diet in the ICU occur<sup>(9)</sup>. Fasting for exams, routine procedures, and factors related to gastrointestinal intolerance, in addition to the actual treatment itself and other interventions that are necessary in the critical patient during the course of the disease, often prevent adequate delivery of full ENT<sup>(10)</sup>.

The causes for the discrepancy between the calories of the prescribed and received diets are many, including some gastrointestinal tract disorders (nausea, vomiting, diarrhea, stasis, abdominal distension or high gastric residual volume), fasting for clinical or surgical procedures and accidental removal of the tube<sup>(11)</sup>. These factors are very frequent in the ICU and cause these patients to be at risk of receiving lower energy intake than that prescribed; consequently, the energy intake is below their needs, which increases the risks to their health<sup>(8)</sup>.

Thus, knowing the factors that prevent enteral nutrition from being fully infused allows the NST to adopt measures so as to offer an adequate energy supply. Therefore, the present study aims to evaluate the adequacy of enteral nutrition therapy in critically ill patients of an Intensive Care Unit.

## METHODS

This is an observational, descriptive, analytical and prospective study. The study was carried out from February to May 2016 with patients of both genders hospitalized in the ICU of an Infectious Disease Hospital (*Hospital São José de Doenças Infecciosas – HSJ*). This institution is a reference center for infectious diseases located in the city of Fortaleza, Ceará. The sample was calculated<sup>(12)</sup> based on the monthly average of adult patients hospitalized in the ICU. It included those who met the following inclusion criteria: age between 18 and 60 years and being under exclusive ENT in the ICU for a minimum period of 72 hours. Patients with a concomitant diet administered through any routes other than enteral were excluded.

During the data collection period, 92 patients were admitted to the ICU of HSJ. Of these, 26 were over 60 years old, 2 were under 18 and 64 were between 18 and 60 years of age. Of the adults, five patients remained in the ICU for less than 72 hours and were then referred to other hospitalization units; 13 died before the first 72 hours of hospitalization; three received oral and enteral diet simultaneously; five fasted throughout the entire period of hospitalization; and three received oral diet exclusively. Thus, none of the aforementioned patients met the inclusion criteria established for the research. Therefore, the remaining 35 patients were analyzed.

Data collection started on the first day of ENT after the patient was admitted to the ICU. Patients were monitored for a minimum of three days until the seventh day of hospitalization, death, referral to another unit or introduction of another concomitant route of nutrition – whichever came first. The option to analyze the delivery of ENT during the period from three to seven days was based on the expectation that 50-65% of the calorie needs would be met in the first 72 hours and 100% of the calorie needs would be met up to seven days after the start of ENT in critically ill patients<sup>(13)</sup>.

The data were collected from the ENT monitoring form available in the patients' records and used by the hospital's nutrition service. A daily follow-up form was used to collect data on the following variables: gender, diagnosis, age, calorie needs, prescribed calories, received calories and reasons for non-delivery of full diet. The calorie needs present in the patients' records were calculated by the professionals that make up the hospital's nutrition service using the basal energy expenditure equation<sup>(14)</sup> taking into consideration injury and physical activity factors<sup>(15)</sup>.

Regarding the parameters assessed, the percentage of caloric adequacy of the prescribed diet was determined as the ratio of prescribed calories by the calorie requirement. Then, the percentage of caloric adequacy of the received diet was determined as the ratio of received calories by prescribed calories. Finally, the final percentage of adequacy of the diet was obtained by calculating the ratio of the received calories by the calorie requirements.

Adequacy percentages greater than 90% were considered adequate; those between 70% and 90% were partially adequate; and those below 70% were inadequate<sup>(3,10)</sup>. Adequacy percentages below 70% were considered inappropriate considering that ENT should be indicated when the patient's oral diet does not provide two-thirds to three-quarters of the nutritional requirements<sup>(16)</sup>.

The data collected were tabulated and analyzed in the Statistical Package for the Social Sciences (SPSS), version 20.0 for Windows. Nominal or ordinal variables (gender, diagnosis and reasons for non-delivery of the diet) were described using relative and absolute frequencies. Continuous variables (age, calorie needs, prescribed and received calories) are described using standard deviations and maximum and minimum values. Normality of the data was checked using the Shapiro-Wilk test. Differences between the correlations (prescribed calories/calorie needs, received calories/prescribed calories and received calories/calorie needs) were checked using ANOVA with post-hoc Tukey test with a confidence interval of 95% ( $p < 0.05$ ).

The research was approved by the Research Ethics Committee of the HSJ under Approval No. 1.413.172 and is in compliance with Resolution 466/12 of the National Health Council, which provides for studies involving human beings<sup>(17)</sup>.

## RESULTS

A total of 35 patients were analyzed, 62.9% ( $n=22$ ) of them were men and 37.1% ( $n=13$ ) were women, with a mean age of  $42.86 \pm 10.84$  years (minimum age of 20 years and maximum of 60 years). Patients were followed up for a mean period of  $6.31 \pm 1.30$  days (minimum of three and maximum of seven days).

Regarding the most prevalent diagnoses in the patients analyzed, 45.71% ( $n=16$ ) were hospitalized with Acquired Immunodeficiency Syndrome (AIDS). Other important diagnoses included respiratory failure in 22.86% ( $n=8$ ); neurotoxoplasmosis, tuberculosis and pneumonia, all with 17.14% ( $n=6$ ) of cases; and meningoenzephalitis, which was present in 11.43% ( $n=4$ ) of the sample.

The mean prescribed calories accounted for 58.37% ( $\pm 30.98\%$ ,  $p < 0.0001$ ) of the mean caloric requirements of the patients, and the mean received calories accounted for 77.79% ( $\pm 31.54\%$ ,  $p < 0.0001$ ) of the prescribed calories and 47.71% ( $\pm 32.62\%$ ,  $p < 0.0001$ ) of the caloric requirements. Characterization of calorie requirements and prescribed and received calories is shown in Table I.

Table I - Characterization of calorie requirements and prescribed and received calories in critically ill patients admitted to an Intensive Care Unit in the city of Fortaleza, Ceará, 2016.

Calories	Mean (Kcal)	±SD* (Kcal)	Minimum value (Kcal)	Maximum value (Kcal)
Calorie requirements	1936.81	±244.88	1523.09	2510.41
Prescribed calories	1083.49	±363.24	675	2220
Received calories	876.0	±389.97	185	2050

Source: ICU/HSJ, 2016; \*SD = standard deviation.

As for prescribed calories, most of the diets (75.6%, n=187) were inadequate in relation to calorie requirements. Regarding received calories, most of the diets (54.3%, n=120) were adequate in relation to the prescribed calories and inadequate in relation to calorie needs (81.4%, n=180). The percentages of adequacy of the calorie needs and of the prescribed and received diets are shown in Table II.

Table II - Percentages of adequacy of calorie requirements and prescribed and received calories in critically ill patients admitted to an Intensive Care Unit in the city of Fortaleza, Ceará, 2016.

Correlation	Classification	% found	p value*
Prescribed Kcal/ Calorie requirements	Inadequate	75.6%	<0.0001
	Partially adequate	14%	
	Adequate	10.4%	
Received Kcal/ Prescribed Kcal	Inadequate	25.8%	<0.0001
	Partially adequate	19.9%	
	Adequate	54.3%	
Received Kcal/ Calorie requirements	Inadequate	81.4%	<0.0001
	Partially adequate	11.8%	
	Adequate	6.8%	

Source: ICU/HSJ, 2016; \*statistically significant difference (p<0.05).

During the research period, there were 104 interurrences that prevented the prescribed diet from being fully administered. The presence of gastric residuals was the main reason why the diet was not fully administered (47.12%, n=49), followed by diet suspension to perform tests (19.23%, n=20). The reasons that prevented the diets from being fully received are shown in Table III.

Table III - Intercurrences that prevented the diet from being fully delivered in an Intensive Care Unit in the city of Fortaleza, Ceará, 2016.

Intercurrence	n	%
Gastric residuals	49	47.12%
Fasting for examinations	20	19.23%
Hemodynamic instability	18	17.31%
Diarrhea	8	7.69%
Fasting for procedures	5	4.81%
Vomiting	3	2.88%
Accidental removal of the tube	1	0.96%

Source: ICU/HSJ, 2016.

## DISCUSSION

Since the present study was carried out in a reference infectious diseases hospital in the state of Ceará, the majority of the patients admitted to the ICU of the institution had this type of clinical condition. Individuals with these diseases generally present inadequate dietary intake and changes in anthropometric, biochemical and clinical indicators, which show an important nutritional impairment<sup>(18)</sup>.

Still because it is a reference hospital, AIDS was the most prevalent diagnosis in the individuals analyzed in the present study. The diet therapy used in these patients should be associated with the constant occurrence of malnutrition in addition to the side effects of medication that, even in patients taking highly effective antiretroviral therapy, lead to weight loss and important changes in body composition. Nutrition therapy should therefore be started as quickly as possible to prevent weight loss, delay immunosuppression of nutritional origin and the occurrence of opportunistic infections<sup>(19)</sup>.

The mean of the calorie requirements found in the present study ( $1936.81\text{Kcal} \pm 244.88\text{Kcal}$ ) was higher than those found in studies carried out at the Clinics Hospital (*Hospital das Clínicas*) of the Federal University of Pernambuco<sup>(20)</sup>, at the University Hospital of the University of São Paulo<sup>(10)</sup> and at the Clinics Hospital (*Hospital das Clínicas*) of the Federal University of Goiás<sup>(21)</sup>. In those studies, the mean calorie requirements of patients admitted to the ICU were  $1717.9 \pm 243.6$  Kcal,  $1587.6 \pm 224.8$  Kcal and  $1438.2 \pm 342.2$  Kcal, respectively.

However, the method for calculating the calorie needs found in the literature was different. Instead of using predictive equations<sup>(14,15)</sup>, the authors<sup>(10,20-22)</sup> used formulas based on international nutrition consensus for critically ill patients that take into account the calories per kilo of weight of the individual, whose requirements are calculated more quickly<sup>(13,22,23)</sup>.

It is known that predictive equations tend to overestimate patients' needs. This hypernutrition can lead to hyperglycemia, besides favoring the appearance of respiratory acidosis, difficulty weaning from ventilator, increased gastric residual volume and bronchoaspiration<sup>(24,25)</sup>.

The prescribed and received calories in the present study were far below the calorie needs of the patients. The mean percentage of adequacy of the prescribed diet was 58.37%. In the study carried out with 201 patients in the ICU of the *Santa Casa de Misericórdia* in Porto Alegre<sup>(26)</sup>, it was 97.2%, and in the studies carried out in the ICU of the University Hospital of the University of São Paulo<sup>(3,5,10)</sup>, these adequacy percentages exceeded 100%.

Regarding the mean percentage of adequacy of the received diet, the data found in the literature corroborate the present findings. Studies carried out in the ICU of the University Hospital of the University of São Paulo<sup>(3,5)</sup> found 74.4% and 81.6% of adequacy, respectively, while in the present study, adequacy was 77.79%.

Critically ill patients generally receive a lower volume of enteral nutrition and do not reach the prescribed energy target, which may compromise nutritional status even in the short term, mainly due to their current clinical condition and catabolic stress during the hospitalization period<sup>(27)</sup>.

A lower calorie supply in ICU patients is associated with increased episodes of hypoglycemia<sup>(28-30)</sup>, severe infections<sup>(31)</sup>, longer hospitalization periods<sup>(32)</sup>, patient's higher health expenditures<sup>(33)</sup>, and increased mortality rates<sup>(31,34)</sup>. The Canadian consensus for nutrition therapy in critically ill patients recommends that the daily follow-up and strict control of the ICU enteral nutrition protocol should optimize the delivery of the prescribed diet<sup>(35)</sup>.

Regarding the mean final percentage of adequacy that compares the calories received with the calorie needs, the literature showed much higher rates when compared to the present study. However, studies carried out in the ICU of the University Hospital of the University of São Paulo<sup>(5,10)</sup> found values of 88.2% and 88.7%, respectively, while the present study found only 47.71% of adequacy.

As for the prescribed calories, the majority (75.6%) of the diets found in the present study were inadequate (<70%) in relation to the calorie needs. Regarding the calories received, the majority (54.3%) of the diets were at adequate (>90%) in relation to the prescribed calories, and 81.4% were inadequate (<70%) in relation to the calorie needs. In the study carried out in the ICU of the University Hospital of the University of São Paulo<sup>(10)</sup>, 47.6% of the diets received were at adequate in relation to the prescribed calories, corroborating the data found in the present study. On the other hand, in a study of 36 patients in a hospital in Santa Cruz do Sul, Rio Grande do Sul, only 36.1% of the diets received were adequate in relation to the prescribed calories<sup>(36)</sup>.

The reason for the received diets being far below the nutritional requirements is probably the preference of the NST of the present study to prescribe more conservative diet therapies to the patients as they are admitted to the unit in critical conditions<sup>(37)</sup>.

The NST chooses to provide a minimum diet just to keep the GI tract functioning and to prevent gastroparesis, without worrying at first about providing adequate intake of macro and micronutrients in the first days of hospitalization. As the clinical condition of the patients progresses and pharmacotherapy has the desired effect, the diet volume progressively increases<sup>(37,38)</sup>.

Generally, the process of evolution of the diet is slow and occurs over a period of more than seven days, which was the time limit set for daily follow-up of patients in the present study. In the literature, critically ill patients under ENT were followed up for a longer period of time. In the studies carried out in the ICU of the University Hospital of the University of São Paulo<sup>(3,5,10)</sup>, the mean follow-up time was 12.8 days, 8 days, and 12.8 days, respectively. In the study carried out in the ICU of the Clinics

Hospital (*Hospital das Clínicas*) of the Federal University of Pernambuco<sup>(20)</sup>, the mean follow-up time was 9.3 days. The longer follow-up of these patients may have influenced the achievement of greater adequacy percentages.

A lower calorie intake accumulated in the first week of ICU hospitalization is seen as a strong predictor of clinical outcomes and may expose patients to energy deficits that are unlikely to be compensated during the remaining period of hospitalization<sup>(38)</sup>.

Moreover, in diet therapy for patients with respiratory failure, which was the second most prevalent clinical condition in the present study, excessive supply of carbohydrates should be avoided, since it results in an increase in CO<sub>2</sub> production. As the nutrition service of the institution in which the research was carried out does not have a specific diet to be offered to the patient with this condition, the calorie volume of the diet is reduced in order to minimize risks to these individuals<sup>(39)</sup>.

In order to prevent worsening of the patient's disease due to low energy intake, the American consensus for nutrition therapy in critically ill patients recommends that if at least 60% of the nutritional and protein requirements are not met in the period between 7 and 10 days after the start of ENT, supplemental parenteral nutrition should be prescribed<sup>(13)</sup>.

Regarding the reasons for non-delivery of full prescribed diet in the present study, the occurrence of gastric residuals was the main cause, accounting for 47.11% of the interurrences. In the study carried out in the ICU of the Clinics Hospital (*Hospital das Clínicas*) of the Federal University of Pernambuco<sup>(20)</sup>, the gastric residuals represented 39% of the interurrences, being also the main cause of non-delivery of the diets, thus corroborating the data found in the present study.

It is known that critically ill patients can present gastroparesis and consequent accumulation of gastric residuals, with gastric stasis being one of the main measurable causes that prevent the delivery of enteral nutrition<sup>(5)</sup>. It should be noted that, in the present study, the protocol used by the NST already includes the use of prokinetics with the objective of potentializing the nutritional supply. However, it is necessary to consider acute phase reactions in the digestive tract, such as the occurrence of diarrhea and vomiting, which may interfere with tolerance to the diet<sup>(5,40)</sup>.

In the present study, the incidence of diarrhea was low (7.69%) when compared with the rates found in the literature. In the studies carried out in the ICUs of the Clinics Hospital (*Hospital das Clínicas*) of the Federal University of Pernambuco<sup>(20)</sup>, Hospital (*Hospital das Clínicas*) of the Federal University of Goiás<sup>(21)</sup>, Emergency Hospital of Goiânia<sup>(40)</sup> and the University Hospital of the University of São Paulo<sup>(3)</sup>, diarrhea accounted for 23.4%, 28.95%, 31.8% and 36% of interurrences, respectively. Regarding the incidence of vomiting, the study carried out in the ICU of the Clinics Hospital (*Hospital das Clínicas*) of the Federal University of Pernambuco<sup>(20)</sup> found a value of 2.66%, corroborating the data presented in the present study (2.89%).

Complications in the GI tract are the most prevalent due to hemodynamic instability, which is one of some of the factors inherent to the underlying diseases<sup>(39)</sup>. In the present study, hemodynamic instability represented 17.31% of the interurrences. This physiological disorder alters the intestinal absorption of nutrients, leading to changes in blood glucose, heart and respiratory rates, blood pressure and body temperature. In addition to these changes, there are also effects on the metabolic capacity, altering pH and O<sub>2</sub> pressure values, as well as the metabolite excretion capacity, with effects on diuresis, CO<sub>2</sub> pressure, urea, creatinine and water balance<sup>(6)</sup>.

In the present research, arterial or lumbar puncture, tomography, bronchoscopy and endoscopy were considered examinations. As for the procedures, they were: tracheostomy, intubation, extubation and placement of central line.

The interruptions due to exams represented 19.23% of the interurrences found. Studies carried out in the ICU of the University Hospital of the University of São Paulo<sup>(3,5)</sup> corroborate the data found, with 11% and 12.4% of the interurrences, respectively. The interruptions of diet delivery due to procedures in the present study represented 4.81% of the complications, far below the 21% and 39.4% rates found in the studies carried out in the ICU of the University Hospital of the University of São Paulo<sup>(3,5)</sup> and the 44.1% rate found in a study carried out with 92 patients in the ICU of the Clinics Hospital (*Hospital das Clínicas*) of Porto Alegre<sup>(41)</sup>. It is of the utmost importance that NST minimize fasting time for routine exams and procedures by delivering the diet shortly after exams and procedures are completed<sup>(10)</sup>.

Therefore, there are reasons to suggest that the interurrences presented by the patients limit the adequate energy supply, since the excessive interruptions of enteral nutrition in certain patients prevented the diet from being delivered effectively.

Some limitations were found during the research – the study had a smaller sample when compared with other studies and patient follow-up was shorter than that reported in the literature. Few recent studies on the theme were found, which also influenced the moment of selecting them through their methodology. The different way the other authors calculate the patients' energy needs clearly characterize these differences.

The present research may contribute to the development of strategies by NST aimed at improving the quality of care by establishing new protocols for ENT follow-up in order to improve these adequacy rates. Some of the strategies that may be suggested to NST are: to check more carefully if the prokinetic drugs prescribed are actually being administered by the nursing team; to use formulas that take into account the calories per kilo of weight of patients for a quicker calculation of calorie needs; and to encourage the prescription of supplemental parenteral nutrition for patients whose diet does not meet their calorie needs within 10 days after the start of ENT.

## CONCLUSION

There were relevant calorie inadequacies in the calorie intake prescribed, in the calorie intake delivered and in the calorie intake needed, which suggest that patients had significant energy deficits. The main reasons for interruption of ENT were: the presence of high gastric residuals volume and the suspension of the diet to perform exams.

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