

Prescribed versus *infused enteral diet* and clinical outcome in critically ill elderly



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Camila Melo de Araújo

Paraíba Foundation for Health Management (PB Saúde)
– Hospital Metropolitano Dom José Maria Pires
Hospital Health Specialist with emphasis on critical patients

Adriana Gomes César de Carvalho

Brazilian Company of Hospital Services (EBSERH) –
Lauro Wanderley University Hospital (HULW/UFPB)
Master in Biotechnology and Innovation in Health

Janine Maciel Barbosa

Brazilian Company of Hospital Services (EBSERH) –
Lauro Wanderley University Hospital (HULW/UFPB)
Doctor in Nutrition

Gina Araújo Martins Feitosa

Brazilian Company of Hospital Services (EBSERH) –
Lauro Wanderley University Hospital (HULW/UFPB)
MSc in Gerontology

Edcleide Oliveira dos Santos Olinto

Brazilian Company of Hospital Services (EBSERH) –
Lauro Wanderley University Hospital (HULW/UFPB)
Specialist in Parenteral and Enteral Nutritional Therapy

Pollyana Paula Almeida de Araújo

Brazilian Company of Hospital Services (EBSERH) –
Lauro Wanderley University Hospital (HULW/UFPB)
Clinical Nutrition Specialist

Isabel Carolina Pinto Cavalcanti

Brazilian Company of Hospital Services (EBSERH) –
Lauro Wanderley University Hospital (HULW/UFPB)
Master of Science in Nutrition

Débora Silva Cavalcanti

Brazilian Company of Hospital Services (EBSERH) –
Lauro Wanderley University Hospital (HULW/UFPB)
Doctor in Nutrition

Aline Honor Lacerda

Brazilian Company of Hospital Services (EBSERH) –
Lauro Wanderley University Hospital (HULW/UFPB)
Specialist in Nutritional Bases of Physical Activity

Caroline Sousa Cabral

Brazilian Company of Hospital Services (EBSERH) –
Lauro Wanderley University Hospital (HULW/UFPB)
Doctor in Nutrition

ABSTRACT

The nutritional status of individuals is directly related to inadequate intake, absorption and utilization of nutrients in general. The changes resulting from aging associated with the continuous use of medications accentuate this picture. In the context of intensive care, this reality is even more challenging, since the severity of the patients' clinical condition, associated with the constant use of antibiotics and opioids, corroborate in worse tolerance to the diet offered. In view of the above, this study aimed to evaluate the association between prescribed versus infused enteral diet and the clinical outcome of elderly patients admitted to an Intensive Care Unit. This was a cross-sectional study conducted with elderly patients in the Intensive Care Unit of a University Hospital. Data collection was carried out using the nutritional follow-up form used in the nutritionist's daily routine and adopted by the nutrition service. The data obtained were analyzed using the statistical program SPSS version 13.0. Associations were tested using Pearson's chi-square test, where associations reaching $p < 0.05$ were considered significant. A total of 79 elderly patients of both sexes admitted to the Intensive Care Unit with exclusive Enteral Nutrition Therapy were evaluated, most of whom were female (62%), with a mean age of 72.5 years. Regarding nutritional status, in relation to Body Mass Index and Arm Circumference, there was a prevalence of underweight (43.7) and malnutrition (57.8%), respectively. Regarding enteral nutrition, 54.7% of the patients reached the prescribed volume. It was possible to list the main complications related to nutritional therapy, with the open nasal tube being significantly associated with the unsatisfactory volume infused versus prescribed.

Keywords: Aged, Enteral Nutritional, Intensive Care Unit.



1 INTRODUCTION

The nutritional status of individuals is directly related to inadequate intake, absorption and utilization of nutrients in general. The changes resulting from aging associated with the continuous use of medications accentuate this situation (SOUZA; GUARIENTO, 2009). The elderly are at greater risk of developing nutritional deficits, since there is an impairment of physiological function, reduction of lean mass and basal metabolic rate, sensory alterations, cardiac and respiratory complications, and a higher number of hospitalizations, infections, and pressure ulcers (SILVA; MANNARINO; MOREIRA, 2014). In the context of intensive care, this reality is even more challenging, since the severity of the patients' clinical condition, associated with the constant use of antibiotics and opioids, corroborates in worse tolerance to the diet offered (TEXEIRA, CARUSO AND SORIANO, 2006). In this sense, measures to cope with hospital malnutrition are urgent, especially in the context of Intensive Care Units (ICU).

The clinical prognosis of critically ill patients is closely related to adequate nutritional support (CUNHA; SALLUH; FRANCE, 2010). An adequate supply of nutrients, especially calories and proteins, is essential to reduce the incidence of hospital malnutrition, making it possible to reduce the morbidity and mortality of critically ill patients (GRACIANO; FERRETTI, 2008).

The monitoring of nutritional therapy in ICUs has been widely discussed in clinical practice. In Brazil, this continuous evaluation is possible through the use of the Nutritional Therapy Quality Indicators (IQTN). Such parameters contribute to the management of the quality of nutritional therapy, aiming at better clinical outcomes for the patient (ILSI, 2018).

Considering the importance of adequate protein-caloric intake, one of the indicators related to this quality management is the evaluation of the adequacy rate of the infused volume in relation to that prescribed in patients using enteral nutritional therapy. The evaluation of this parameter is essential for the nutritionist to be able to evaluate whether or not the planning in relation to the protein-caloric supply has been achieved. This understanding is fundamental, since the identification of the factors that hinder the progression of the diet guarantees the professional the best clinical management of the patient, in order to outline corrective measures necessary to ensure adequate caloric-protein intake (ILSI, 2018).

In view of the above, this study aimed to evaluate the association between prescribed *versus* infused enteral diet and the clinical outcome of elderly patients admitted to an Intensive Care Unit.

2 METHOD

This is a cross-sectional cohort study developed with the elderly population hospitalized in an intensive care unit, whose length of stay was equal to or greater than 72 hours and who used enteral nutritional therapy at a University Hospital located in the city of João Pessoa. The sample consisted of



79 forms of elderly patients hospitalized from March 2018 to March 2019. The construction of this instrument was based on studies and bibliographic references on nutritional therapy in critically ill patients, as well as on the researcher's experience with nutritional care in patients hospitalized in intensive care units, using as a reference the model proposed by (SOBOTKA *et al.*, 2011). To enable the analysis of association, some variables were categorized as follows: Complications associated with Nutritional Therapy were categorized as present and absent. With regard to the clinical outcome, the categories of hospital discharge and death were created. Regarding the length of hospital stay, it was categorized by adopting as a cut-off point the moment of hospitalization in which these patients tend to become chronic < 21 days and > 21 days (TOLEDO & CASTRO, 2015). The follow-up time of the patients followed in this study was equivalent to the length of stay in the ICU.

The data were tabulated in Microsoft Excel® and analyzed using SPSS version 13.0. Then, the chi-square test, continuity correction and Fisher's exact test were used. Descriptive analyses of the study variables were performed by identifying absolute and relative frequencies of the data, as well as appropriate measures of central tendency and dispersion, assuming a significance level of $p < 0.05$ as the reference value for statistical significance. The research met all requirements and was approved by the Research Ethics Committee of the Lauro Wanderley University Hospital of the Federal University of Paraíba, according to opinion No. 3,449,341.

3 RESULTS AND DISCUSSION

Secondary data from the medical records of 79 elderly patients admitted to the ICU with exclusive Enteral Nutrition Therapy (ENT), of both sexes, were evaluated, most of whom were female (62%), with a mean age of 72.5 years. The length of stay ranged from 3 to 57 days, with a median of 14 days. The main clinical outcome was hospital discharge (55.7%). Regarding nutritional status, in relation to BMI and AC, the prevalence of underweight (43.7) and malnutrition (57.8%) was observed, respectively. Regarding enteral nutrition, 54.7% of the patients reached the prescribed volume. The mean length of hospital stay was 17.35 days (± 12.42), while the mean time of use of enteral nutritional therapy was 12.46 days (± 10.98). Descriptive data related to the characteristics are available in Table 1.

Table 1. Demographic and nutritional characteristics of patients using ENT in an ICU. João Pessoa, 2019.

Variable	n	%
Gender		
Male	30	38,0%
Female	49	62,0%



Age		
60-69,9	34	43,0%
70-79,99	28	35,4%
>=80	17	21,5%
Nutritional status (BMI)		
Low weight	31	43,7%
Eutrophy	25	35,2%
Overweight	6	8,5%
Obesity	9	12,7%
Nutritional status (BC)		
Severe/moderate malnourished	13	28,9%
Mildly malnourished	13	28,9%
Eutrophy	14	17,7%
Overweight	2	2,5%
Obesity	3	3,8%
Length of hospital stay	17.35 days \pm 12.42	
Time of use of TN	12.46 days \pm 10.98	

AC = arm circumference; BMI = body mass index; TN = nutritional therapy

Regarding the complications related to Nutritional Therapy, constipation was more frequent among the individuals evaluated (62%), followed by diarrhea (34.6%), open tube (32.9%) and vomiting (16.5%). Table 02 shows the association of these complications in relation to the Prescribed Volume indicator *versus* Infused.

Table 02. Association of the prescribed *versus* infused volume indicator and the complications related to Nutritional Therapy. João Pessoa, 2019.

Intercurrence	Prescription vs . infused volume		p-value
	Satisfactory	Not satisfactory	
Constipation			0,281
Present	29 (59,2%)	20 (40,8%)	
Absent	12 (46,2%)	14 (53,8%)	
Diarrhoea			0,613
Present	16 (59,3%)	11 (40,7%)	
Absent	25 (53,2%)	22 (46,8%)	
Open SNG			0,007
Present	8 (32,0%)	17 (68,0%)	
Absent	30 (65,2%)	16 (34,8%)	
Puke			0,498
Present	6 (46,2%)	7 (53,8%)	
Absent	35 (56,5%)	27 (46,5%)	

SNG= Nasogastric tube

According to the data shown in Table 02, the use of open NGS was significantly associated with the prescribed volume *versus* infused not satisfactory. Of the total number of patients who presented this complication, 68% did not have the volume infused according to what was prescribed ($p=0.007$). Regarding the other complications, none of them was significantly associated with non-compliance with this indicator.

Table 3 presents an analysis of the association between the care or not of the prescribed *versus* infused volume indicator in relation to the respective clinical outcomes, as well as in relation to the days of hospitalization.



Table 3. Association between prescribed *versus* infused volume indicator with days of hospitalization and clinical outcome in a university hospital in João Pessoa - PB, 2019.

	Prescription vs . infused volume		p-value
	Satisfactory	Not satisfactory	
Length of Stay			0,014
≤ 21 days	26 (46,4%)	30 (53,6%)	
> 21 days	15 (78,9%)	4 (21,1%)	
Denouement			0,010
Discharge	29 (69,0%)	13 (31,0%)	
Death	12 (36,4%)	21 (63,6%)	

The data showed a significant association between the variables evaluated. Regarding the length of hospital stay, 15 (78.9%) patients whose volume was prescribed *Versus* were hospitalized for more than 21 days (p=0.014). Of the total number of patients discharged from the hospital, 29 (69.0%) satisfactorily received the prescribed volume *Versus* Infused. On the other hand, 21 (63.6%) of the total number of deaths were associated with non-compliance with this indicator (p=0.010).

4 DISCUSSION

Regarding the indicators of nutritional status, the BC showed a higher frequency of malnutrition (57.8%) versus (31.1%) normal weight and BMI higher frequency of underweight (43.7%) versus (35.2) normal weight. Similar findings were found by Detregiachi, Quesada and Marques (2011) regarding BMI, in which a frequency of underweight (54.2%) versus (32.2) normal weight was observed. Martins et al. (2017) found that most patients were malnourished, which is in line with the present study. The importance of perceiving the patient's nutritional status through BMI and AC as soon as admission makes the professional have an incipient notion of the risk of malnutrition or already installed, being able to use an appropriate and individualized therapy. The lack of early detection of nutritional status is a risk factor for mortality, slower wound healing, increased length of hospital stay, increased number of complications, and thus higher costs related to the treatment of hospitalized patients (DETREGIACHI; QUESADA; MARQUES, 2011).

Anthropometry is an important predictor of nutritional status. As for elderly individuals, there are limitations of this age group in relation to the measurement of measurements (skinfolds, weight, height), thus using the reference standards for the elderly. BMI is widely used as an indicator of nutritional status, but its limitations in this population (decrease in height, increase in adipose tissue, reduction in lean mass and in the amount of water) should be considered (FIDELIX; SANTANA; GOMES, 2013). The literature does not show a "gold standard" method for assessing the nutritional status of ICU patients, hence the importance of adding nutritional information to objective methods, which makes the nutritional diagnosis more real (MARTINS *et al.*, 2017)

Regarding the prescribed vs. infused volume indicator, 54.7% (n = 41) of the hospitalized patients reached the appropriate value, which should be \geq to 70%. Similar data were found by Ypi,



Rai and Wong (2014) in a study with 77 patients on mechanical ventilation in enteral nutrition, in which 66% of patients reached 80% of caloric requirements.

The analysis of the Regarding gastrointestinal complications observed in hospitalized older adults, similar findings were found in the study by Medeiros et al., 2019, where complications related to enteral nutrition were evidenced in 65.3% of patients, with constipation being the most prevalent (20.8%) followed by diarrhea (18.1%). The literature shows that some factors influence the adequacy of the infused volume supply, such as internal causes (gastrointestinal complications, extubation, tube problems, routine procedures, and reintroduction of enteral nutrition) and external causes (fasting for tomography, bronchoscopy, upper gastrointestinal endoscopy, or tracheostomy) (RIBEIRO *et al.*, 2014).

Therefore, the benefits of ENT are known, however, its use can often cause complications, which are the factors responsible for the interruption in the supply of the diet, causing a nutritional offer below the real needs of the patient, which can be deleterious, as it will affect their nutritional status. with reduced lean body mass (TELLES *et al.*, 2015). No correlations were observed between most of the complications related to Enteral Nutritional Therapy and the volume prescribed *Versus* infused, except for an open tube, being directly related to the low volume of diet offered. Showing that other external factors, other than gastrointestinal complications may be related to the non-optimal achievement of the prescribed volume indicator *Versus* Infused. This is similar to the study by Poltronieri (2006), which showed that of the total of 308 reasons related to non-administration of the diet, the following were more representative: incorrect calculation of the infusion speed practiced by the nursing team, performance of diagnostic or therapeutic tests, surgical procedures, attempted intubation and extubation. Factors such as lack of justification for the event, obstruction or displacement of the tube, introduction of the insulin pump, and failure or delay in the delivery of the EN by the nutrition service were also reasons found, but less frequently. Other important findings found by the authors were that avoidable motives, i.e., preventable motives, were more representative than non-avoidable ones, incurring in the non-administration of the volume of enteral diet prescribed.

The study by Santos and Alves (2018) found that patients with fewer complications had average intake volumes between 90 and 100%. In the same study, a significant percentage received a volume considered low or very low, which reflected in a worsening of nutritional status. Other findings of the authors show that the main causes for not receiving the diet as prescribed are logistical problems, gastric stasis, and accidental loss of the tube.

The results showed that there was an association between infused x prescribed volume and clinical outcome, which can be inferred that patients who received a higher volume of diet throughout hospitalization had a high outcome. Showing how the adequacy closer to the ideal ($\geq 70\%$) provided a more favorable evolution to the prognosis of these patients.



Vieira (2019), in a study with 155 patients with a mean age of 73 years, analyzed daily EN infusion values at 5 to 10 days, seeking to investigate the association of caloric adequacy through a cut-off point ($> 70\%$ of the prescription and $< 70\%$) with the outcomes. When comparing patients who received more than 70% of the diet with those who received $< 70\%$, the former had a lower number of deaths in the last 30 days. The length of hospital stay can affect the supply of energy, since patients with longer stays tend to achieve a greater adequacy relative to the proposed calorie goal, because in the first days patients tend to present a more unstable condition, that is, some studies show that a low-calorie diet has beneficial effects on clinical results. because it would represent a lower physiological load and a lower risk of autophagy suppression for ICU patients, considering that feeding becomes more difficult in critically ill patients, since they cannot tolerate higher caloric intake (Tsai *et al.*, 2011).

Singh *et al.* In a prospective cohort study with 93 patients over 15 years of age, they found that the supply of 50% of daily calories constitutes a risk factor for mortality, additional findings of these authors showed that patients who died took longer to start nutritional support after admission to the ICU, and this factor is related to the greater severity of critical illness in this group. Also related to discrepancies between calorie prescription and delivery, factors such as intolerance to enteral feeding and diagnostic procedures.

Choi, Park and Park (2014) point out that to date there is no ideal intake of NE calories for critically ill patients, emphasizing that the literature provides conflicting data and recommendations for both complete calorie support and permissive underfeeding. In this context, studies show that undernourishment of critically ill patients can lead to malnutrition and will result in several adverse effects, particularly infections, longer duration of mechanical ventilation and muscle loss. Therefore, increased intake may be associated with reduced mortality in critically ill patients. A counterpoint of this meta-analysis shows that patients who received a diet beyond the ideal were more vulnerable to death or were dependent on mechanical ventilation for a longer time. Although it is difficult to provide 100% of the goal, studies show that the use of a protocol to increase volume delivery of enteral nutrition, where the level of calories and protein provided is closer to the goal, improves outcomes such as fewer infectious complications, shorter hospital stay, and lower mortality than patients who received lower volume (McClave *et al.*, 2009).

5 CONCLUSION

This study concluded that the complications related to Enteral Nutritional Therapy can impact the offer of enteral diet, it also found a significant association between reaching the goal $\geq 70\%$ and higher ICU discharge, as well as a higher volume of infused diet in a longer hospitalization time. There are controversies about the optimal offer of diet infusion in critically ill patients. It is important to consider that hyponutrition may be feasible in the first few days, given the seriousness of the condition.



Once these patients become stable and chronic, a greater supply is ideal for the prevention of malnutrition. It can be observed in the literature that death is associated with an inadequacy of the volume infused and prescribed. Due to those who were discharged, it was noted that most of them satisfactorily received the volume prescribed versus infused, showing that mortality may be associated with non-compliance with this indicator, since quality nutritional therapy is needed more broadly to improve the evaluation of nutritional care for elderly people in the ICU.



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