

# Occurrence of complications and survival rates in elderly with neurological disorders undergoing enteral nutrition therapy

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## SUMMARY

**Objective:** To evaluate the occurrence of complications, as well as the survival rates, in elderly people having neurological diseases and undergoing enteral nutrition therapy (ENT). **Methods:** Patients aged over 60 years, assisted by a home medical service from a healthcare plan in the city of Belo Horizonte, MG, Brazil, were thoroughly evaluated. The mentioned evaluation occurred at their homes after hospital discharge with enteral nutrition (EN) after a three-month period, a six-month period, and at the end of the study. A nutritional assessment was performed along with data collection performed on the patients' electronic medical records, and interviews performed with patients' family members and caregivers. **Results:** Seventy-nine patients aged  $82.9 \pm 10.4$  years old were evaluated; of these, 49.4% presented dementia, and 50.6% presented other neurological diagnoses. 100% of patients presented a high dependence level, assessed by the Katz index. The majority of patients (91.2%) presented some complications such as: pneumonia, catheter loss, diarrhea, constipation, vomiting, fluid leakage, peristostomy, tube obstruction, reflux, and myiasis. Pneumonia was the most frequent complication, occurring in 55.9% of cases. The mortality rates were 15.2% at a three-month period, 22.8% at a six-month period, and 43% at the end of study. The median survival after starting EN was 364 days. Differences among the mortality rate and neurological diagnosis, EN routes of access, and complications were not observed. The survival rate was lower in patients having inadequate nutritional status and albumin levels  $< 3.5$  mg/dL. **Conclusion:** The population followed presented a high rate of complications and death at the end of the study. Diagnosis of dementia, EN routes of access, as well as complications, did not influence the survival rates. However, inadequate nutritional status according to the clinical assessment and albumin levels lower than 3.5 mg/dL significantly influenced the survival rates.

**Uniterms:** Enteral nutrition; dementia; ageing; mortality; swallowing disorders; nutritional status.

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## INTRODUCTION

The elderly population has been rapidly increasing all over the world<sup>1</sup>. In Brazil, prospective studies indicate that the proportion of elderly people will change from 8.6% in 2000 to almost 15% in 2020<sup>2</sup>. The rise in chronic disease prevalence is associated with population-ageing, and pathologies such as coronary disease, systemic arterial hypertension, diabetes mellitus, chronic pulmonary diseases, osteoarticular illnesses, stroke, and dementia.

Dementia and stroke deserve special care, as they can cause limitations compromising the quality of life of the elderly<sup>3</sup>.

The incidence of dementia in Brazilian elderly living in the community reaches a rate of 13.8 per 1,000 inhabitants/year<sup>4</sup>. It is an important cause for death in the United States, with over 71,000 deaths per year<sup>5-7</sup>. Cerebrovascular diseases are the third cause of death in developed countries, preceded only by other cardiovascular diseases and cancer. Statistics show that it is the main cause of death in Brazil<sup>8</sup>.

Patients with dementia and other neurological disorders may present functional and cognitive impairment for a long period of time before death, and may also develop dysphasia, nutritional deficiency, pneumonia, and immobility, becoming partially or totally dependent in activities of daily living<sup>5-7</sup>. Studies conducted in a Brazilian public hospital revealed an incidence of 76.5% for clinically assessed dysphasia after a stroke, rising to 91% when assessed by videofluoroscopy<sup>9</sup>. As these problems arise, healthcare professionals and familiars have to decide whether to use an alternative form of feeding and hydrating the patient. In those cases, enteral nutrition (EN) is frequently indicated<sup>7,10-12</sup>.

The decision-making process for starting EN in patients with dementia is quite difficult for family and health care professionals<sup>11,13</sup>. They often decide in favor of EN believing that it can improve nutritional status, prevent aspiration pneumonia, and promote the general well-being of the patient<sup>10,12</sup>.

Many studies have recently shown the benefits of EN in patients with oropharyngeal cancer and acute cerebrovascular accident<sup>12,14-16</sup>. However, long-term benefits for patients with dementia or cognitive impairment due to neurological disorders are not still clear<sup>14</sup>.

Evidence from observational studies suggest that enteral feeding in patients with dementia or cognitive impairment due to neurological disorders is not enough to reduce the risks for aspiration pneumonia; does not prevent or help in healing pressure ulcers; does not improve their nutritional status, quality of life, or survival rates; and is also associated with higher rates of complications and mortality<sup>7,10,12,14,16-21</sup>.

A better understanding of the clinical evolution of patients with neurological disorders undergoing EN is

critical for improving healthcare for those patients. The purpose of this study was to evaluate the complications and survival rates of elderly patients with neurological disorders undergoing EN.

## METHODS

This was an observational prospective study. The population studied was formed by patients undergoing EN assisted by the medical home service of a health plan in the city of Belo Horizonte. Patients aged over 60 years and diagnosed with neurological disorders were included; patients with neoplasias were excluded.

Information on EN initiation in patients discharged from the hospital or at home was emailed by the health plan's nutritionists to the authors. Family members or caregivers responsible for those patients were contacted by telephone in order to receive explanation of the study and grant permission for visitation. Once the visitation had been authorized, the researcher went to the patient's home, an informed consent was obtained, and initial data was collected, a procedure that would be repeated at three- and six-month periods. The population was divided into two groups for data analysis: patients with dementia and patients presenting other neurological disorders. Patients diagnosed with Alzheimer's disease, Lewy-Body dementia, vascular dementia, senile dementia, Creutzfeldt-Jakob's disease, and Parkinson's disease with cognitive impairment were included in the dementia group.

Data collection consisted of clinical and nutritional assessment. The nutritional assessment consisted of anthropometric measurements (triceps skinfold thickness [TSF], midarm circumference [MAC], midarm muscle circumference [MAMC], and calf circumference [CC]); determination of serum albumin levels, if available; and determination of clinical signs of malnutrition. Regarding this last item, patients were classified as inadequate nutritional status when they presented signs of atrophy of the temporal muscle, of the fatty ball of Bichat; of the supraclavicular, infraclavicular, paravertebral, and sternal furcula regions, of the thighs, and of the calves; thumb clamping; navicular abdomen; and edema, evaluated by abdominal palpation. The adequate percent ratio of TSF, MAC, and MAMC, regarding the 50<sup>th</sup> percentile by age and gender as recommended by NHANES III, 1988-1994<sup>22</sup> was calculated; those results were classified according to Blackburn and Thornton's recommendation.<sup>23</sup> CC was classified according to the 30.5 cm cutoff point suggested by Bonnefoy et al.<sup>24</sup>.

The evaluation also included an examination of the degree of dependence, which was assessed by the Katz index<sup>25</sup>; and the presence, development, and evolution of pressure ulcers, without classification. Complications related to nutritional therapy (pneumonia, catheter loss,

diarrhea, constipation, vomiting, fluid leakage, peristomy, tube obstruction, reflux, and myiasis), EN routes of access, types of enteral feeding used, hospitalization, and death were also assessed.

Information on access route, type of diet used, complications, and hospitalization were obtained through clinical data and information kept at homes by the healthcare plan. Regarding the type of EN, it was classified as a homemade diet when composed solely of *in natura* food, as a modular diet when composed of nutrient modules, and as a mixed diet when composed of a combination of the homemade and modular diets.

Information on complications and hospitalization were obtained by clinical data kept at homes by the healthcare; deaths were reported by telephone. Initial EN date was considered as the initial time of observation in order to evaluate patients' survival rates; in many cases, EN initiation occurred at the hospital, before home visitation, in situations of prolonged hospitalization.

At the end of the study, family members and caregivers were once again contacted by telephone, in order to verify the patients' evolution regarding EN therapy maintenance, hospitalization, and death.

#### SAMPLE

For sample calculation, a 30% mortality rate was considered during a year<sup>26</sup>, an error margin of 10%, and a reliability interval of 95% on estimates. Based on these values, the minimum required sample was 81 patients.

#### STATISTICAL ANALYSES

Data collected were submitted to univariate and bivariate analyses through the Statistical Package for Social Sciences (SPSS) version 15.0, and STATA 9.0. Mean, median, standard deviation, and first and third quartiles were used. The association between categorical features was made using the chi-squared test or Fisher's exact test. Significant differences in the three evaluation periods were verified by using Friedman's non-parametric test. Other differences between groups regarding continuous variables were evaluated using Mann-Whitney's non-parametric test. Kaplan-Meier survival curve and log rank test were used to assess general or stratified survival rates. Differences were considered as statistically significant when the significance level was lower than 5%.

#### ETHICAL ASPECTS

The present study was approved by the Ethics on Human Research Committee of the Universidade Federal de Minas Gerais, as per the official opinion ETIC No. 116/09. All family members or guardians of the participants in the study were informed of the research objectives and they agreed to their participation by an informed consent.

## RESULTS

The sample consisted of 79 patients, 26.6% (n = 21) males. The mean age was 82.9 ± 10.4 years old. The mean time for diagnosing neurological disorders was 50.5 ± 52.9 months. At the beginning of the study, 100% of patients were classified, according to the Katz index, as totally dependent for all activities. Of this total, 3.8% (n = 3) of patients presented improvement in their dependence levels and 5.1% (n = 4) of patients became independent. Regarding the diagnoses, 49.4% (n = 39) of patients presented dementia; Alzheimer's disease was the main pathology in 26.6% (n = 21), followed by vascular dementia in 2.5% (n = 2), dementia related to Parkinson's disease in 6.3% (n = 5), Creutzfeld-Jacob disease in 1.3% (n = 1), and senile dementia in 11.4% (n = 9). 50.6% (n = 40) presented other neurological diagnoses as follows: Parkinson's disease with no cognitive deficit in 3.8% (n = 3), stroke in 39.2% (n = 31), cranioencephalic trauma in 5.1% (n = 4), hypoxic-ischemic encephalopathy after a cardiac arrest in 1.3% (n = 1), and amyotrophic lateral sclerosis (Lou Gehrig's disease) in 1.3% (n = 1).

Table 1 describes the specific parameters regarding the nutritional status of the sample during the course of the study. At the beginning of the study, except for serum albumin levels, whose results were obtained only from patients that had an examination (n = 24), all of the other criteria (clinical signs of malnutrition and anthropometry – MAC, TSF, CC, MAMC) showed significant percentages of nutritional status involvement, in accordance with the criteria defined by Blackburn and Thornton<sup>23</sup> and Bonnefoy et al.<sup>24</sup>; no changes in such parameters were observed during the course of the study (Table 1).

At the beginning of the study, 43% (n = 34) of the patients presented pressure ulcers. 41.2% of these (n = 14) had their ulcer healed during the study. From the 45 patients who did not present ulcers, 20% of these (n = 9) developed ulcers during the period of study.

In 86.1% of patients (n = 68), the indication for EN was due to dysphasia, and in 13.9% of patients (n = 11), due to refusal of food. Sixty-eight patients remained with EN until the end of the study or until death. Eleven patients returned to oral nutrition during the follow-up period.

Regarding the EN pathway, 59.5% (n = 47) of the patients presented a nasoenteric tube (NET) at their first evaluation, and 40.5% (n = 32) of patients already presented osteotomies.

Sixty-eight patients remained with EN until the end of the study. At final evaluation 36.8% of patients (n = 25) presented with a NET, and 63.2% of patients (n = 43) presented with ostomies. The main reason for pathway alteration was the presence of complications in 66.6% (n = 10).

The majority of patients, 73.45% (n = 58), started the study using an industrialized diet, and 26.6% (n = 21),

**Table 1** – Nutritional status parameters in patients submitted to enteral nutritional therapy at the beginning and after three and six months of the study period

Variables	Initiation (n = 79)		3 months (n = 66)		6 months (n = 50)		p value <sup>a</sup>
	n	%	n	%	n	%	
<b>Nutritional status</b>							
Adequate	36	45.6	27	40.9	23	46	> 0.050
Inadequate	43	54.4	39	59.1	27	54	
Variables	Initiation (n = 24)		3 months (n = 39)		6 months (n = 18)		p value <sup>b</sup>
	n	%	n	%	n	%	
<b>Albumin (g/dL)</b>							
Median	3.6		3.5		3.5		0.368
IIQ	3.3-4.0		3.0-3.7		2.9-3.7		
Variables	Initiation (n = 78)		3 months (n = 64)		6 months (n = 50)		p value <sup>a</sup>
	n	%	n	%	n	%	
<b>MAC (cm)</b>							
Median	24.5		24.5		24.0		0.573
IIQ	22.0-26.7		22.0-26.5		21.7-27.0		
<b>TSF (mm)</b>							
Median	10.0		10.0		10.0		0.459
IIQ	6.0-15.0		6.0-15.0		5.5-15.0		
<b>CC (cm)</b>							
Median	26.5		26		25		> 0.050
IIQ	24.2-29.7		24.0-28.7		23.0-29.5		
<b>MAMC (cm)</b>							
Median	21.2		21.0		21.4		0.403
IIQ	19.2-22.3		19.1-22.7		19.3-22.7		

<sup>a</sup>Fisher's exact test; <sup>b</sup>Friedman's non-parametric test; IIQ, interquartile interval; MAC mid-arm circumference; TSF triceps skinfold thickness; CC, calf circumference; MAMC mid-arm muscle circumference.

a homemade diet. At the end of the study, 61.8% (n = 42) of patients were using an industrialized diet and 38.2% (n = 26), a homemade diet.

Of the 91.2% (n = 62) of patients who remained with EN until the end of the study or until death, a total number of 131 complications related to nutritional therapy were observed (Table 2). Statistically significant associations among presented complications and demographic variables, gender, diagnoses, nutritional and clinical status, nutritional therapy pathways, and types of enteral diet (industrialized and homemade) were not observed.

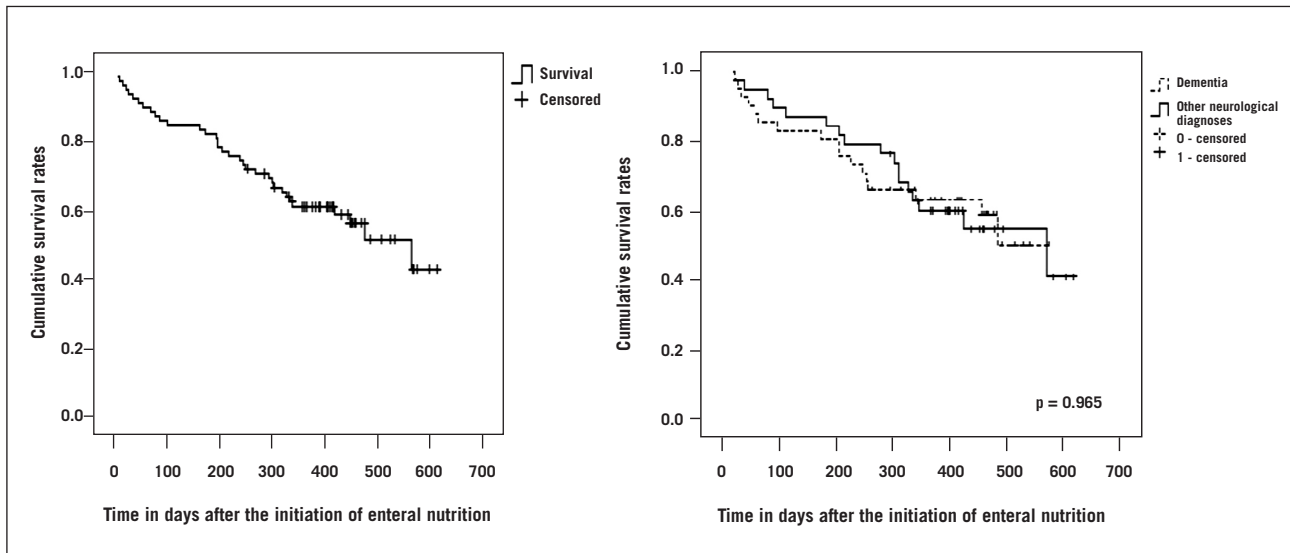
The mortality rate at three months of observation, which was initiated when patients were discharged from the hospital or when they started EN at home, was 15.2% (n = 12, 95% CI: 8%-25%); after six months, the mortality rate was 22.8% (n = 18, 95% CI: 14%-34%). The mortality rate observed at the end of follow-up, after an average period of 11 months, was 43% (n = 34, 95% CI: 32%-55%). The median survival rate counted from the beginning of EN was 364 days (95% CI: 243-455).

No statistically significant differences between the mortality rates of the dementia group and of the other neurological diagnoses group were found (Graphic 1).

**Table 2** – Main complications related to nutritional therapy presented by patients submitted to enteral nutrition therapy during six months of study

Variables	n	%
<b>Complications</b>		
Pneumonia	38	55.9
Loss of tube	31	45.6
Diarrhea	20	29.4
Constipation	13	19.1
Vomit	11	16.2
Periostomal extravasation	8	11.8
Tube obstruction	6	8.8
Reflux	3	4.4
Myiasis	1	1.5

No significant associations among mortality rates, anthropometric measures, and nutritional status (evaluated by the presence of clinical signs of malnutrition at the beginning of the study) were observed. Lower survival rates were observed in patients classified as inadequate nutritional status, after three and six months of study (p = 0.013 and



**Graphic 1** – Survival rates in patients using enteral nutrition and survival rates according to the presence of dementia and other neurological diagnoses.

$p = 0.027$ , respectively, log-rank), in patients who presented albumin level lower than 3.5 mg/dL at any moment of the study ( $p = 0.026$ , log-rank), and in patients who were hospitalized during the course of study ( $p = 0.039$ , log-rank).

No significant differences at patients' survival rates were observed for those who initiated the study with pressure ulcers, as well as for those who developed ulcers during the course of study. However, lower survival rates were observed for patients who presented ulcers at the end of six months of observation ( $p = 0.001$ , log-rank). Higher survival rates were observed in patients presenting pressure ulcers at any moment of the study who had evolved to healing ( $p = 0.007$ , log-rank).

No statistically significant associations were observed among survival rates, enteral nutrition pathway (NET and osteotomy), and types of enteral diet used (industrialized or homemade). Similarly, no significant associations among survival rates and complications presented were observed.

## DISCUSSION

The results of present study demonstrate that the majority of elderly patients with neurological disorders on ENT presented complications, of which pneumonia was the most frequent. The mortality rate at the end of the study was higher, and the median survival rate after starting EN was 364 days.

The mean age of the population studied was 82.9 years old; the prevalence of female patients (73%) is similar to other medical literature observations on EN effectiveness in patients with advanced dementia. A systematic review, consisting of seven observational studies, observed ages between 63 and 107 years old (mean age of 82 years old) and a prevalence of female patients<sup>17</sup>.

Diagnosis and causes for dementia in the present study were similar to other studies in the medical literature<sup>17,27</sup>. Even though the diagnoses for dementia established by physicians of the healthcare plan were accepted with no review, the higher incidence of functional impairment by Katz method tends to confirm the high incidence and the cognitive deficit severity of the population studied.

Despite the fact that there is considerable evidence to show that EN does not offer benefits in patients with advanced dementia, it is observed that approximately 50% of patients who used EN presented dementia, a fact also verified by other authors<sup>19</sup>. These data reaffirm the importance of obtaining better knowledge of the evolution of these patients in order to define better therapeutic proposals.

No significant changes in clinical signs of malnutrition and anthropometry were observed in the periods evaluated. These findings are in accordance with the medical literature, in which changes in the nutritional parameters of patients with neurological disorders using EN were not observed<sup>10,28</sup>.

In the present study, quantitative evaluation of nutrient intake of patients on EN was not performed. However, patients were followed-up by a team of nutritionists from their healthcare plan, who systematically reviewed patients' diets according to their needs. The authors opted to correlate the nutritional status (and its changes during the course of study) with the main outcomes, with no reference to their adequacy, similar to studies included in Cochrane's systematic review<sup>17,19,21,29-31</sup>.

At the beginning of the study, 43% of the patients presented pressure ulcers; 20% of the patients who did not present such pathologies developed them later. These data are compatible with other observations in medical literature.



According to Mitchell et al.<sup>32</sup>, 38.7% of patients with dementia presented with ulcers at any moment during an 18-months follow-up period.

Regarding type of diet, the majority of patients used the industrialized diet at the beginning, as well as at the end of the study. Nevertheless, 13.8% of patients changed to homemade diet.

Fifteen hundred calories from a standard industrialized diet in a liquid open system may cost approximately USD 230.00 per month. Considering other expenses such as flasks, equipment, diapers, medicines and so on, the total diet cost can be expensive; this aspect could be the reason for changing to a homemade diet.

The financial issues mentioned, along with cost-covering aspects of industrialized diet supply by the Unified Health System (Sistema Único de Saúde – SUS) or by healthcare plans make its supply to patients using EN at home difficult; as a result, the homemade diet has become a frequent practice in patients using EN at home in Brazil. As there is no difference between the two types of diet regarding mortality rates and complications, the use of such a diet can be safe and adequate.

The rate of complications related to EN was high; a total number of 131 complications occurred in 91.2% of patients. The most frequent complication was pneumonia (55.9%), loss of tube (45.6%), and diarrhea (29.4%). Pneumonia was also the most frequent complication in the studies discussed below. In a study involving 67 patients, complications were reported in 77.6% of patients, in whom pneumonia occurred in 29.9%.<sup>30</sup>

Sanders, Leeds and Drew<sup>28</sup> reported that pneumonia was the cause of death in 27% of patients. Sanders et al.<sup>14</sup>, in a study involving 87 patients, reported that 25% of patients presented with pneumonia after percutaneous endoscopic gastrostomy (PEG), besides obstruction (5.7%), tube replacement (8%), tube outflow (6.9%), replacement of fitting (5.7%), breakup of connection (8%), cuff emptying (43.4%), local sepsis (8%), and granuloma (8%).

Patients with dysphasia and risk of aspiration usually have their oral feeding suspended and start ENT. However, it is well known that aspiration pneumonia may be caused by both types of aspiration, that is, gastric acid secretion and oropharyngeal, and due to this fact ENT, which is normally indicated for preventing aspiration pneumonia, may not be effective.

The high mortality rate, 15.2% after three months, 22.8% after six months, and 43% after an average period of 11 months, was equivalent to that found in other studies. Figueiredo et al.<sup>26</sup>, in their study involving 168 patients after PEG, found a mortality rate of 6.5% in 30 days; 17.3% in 90 days and 33.9% in one year. Carey et al.<sup>11</sup>, in a study involving 288 patients, found a mortality rate of 21% in three months and of 30% in six months.

In the present study, the median survival rate was 364 days considering the date in which ENT (in the hospital or at home) was started. The mean elderly survival rate in the general population evaluated by Maciel and Guerra<sup>33</sup> was 24.6 months, and 17.4 months for elderly patients presenting with a functional limitation.

The survival curve did not show significant differences among patients with dementia when compared to patients bearing other neurological disorders.

These data are opposed to other data pointing to a lower survival rate in the dementia patient group as compared to other diagnoses<sup>28</sup>. Despite the fact that advanced dementia is related to a high mortality rate in patients using ENT, there was no difference regarding other neurological disorders in association with mortality rates; this may be due to the severity of patients with other diagnoses, attested by the high level of dependence in 100% of the population studied.

Patients presenting with an inadequate nutritional status attested by the presence of clinical signs of malnutrition and albumin levels lower than 3.5 mg/dL showed significantly lower survival rates. Nair, Hertan and Pitchumoni<sup>29</sup> have demonstrated that albumin levels higher than 2.8 mg/dL were associated with an improvement in survival. Varnier et al.<sup>34</sup> have also reported higher survival rates in patients with higher levels of albumin.

By the end of the study, patients with pressure ulcers presented significantly lower survival rates, whereas those who had their pressure ulcer healed during the course of the study presented significantly higher survival rates. It is likely that malnutrition performed a significant role in both healing or non-healing ulcers. However, other factors such as clinical severity, immobility, and inadequate care may also have had a relevant role. In addition, patients with pressure ulcers probably present higher catabolism and higher risks of developing infection, which may contribute to increasing mortality rates.

No differences in survival rates as related to routes of access, types of diet, and complications were observed. These data contradict the findings by Dwolatzky et al.<sup>35</sup> who found higher survival rates in patients with PEG.

Significantly lower survival rates were observed in patients hospitalized during the course of the study, which attests to the probable clinical severity in this group.

This study's main limitation was the data collection by medical records kept by home care providers, with no review or criticism. Since the research team was not related to the healthcare plan or to home care providers, this methodological option was found to interfere minimally with families' routines and to limit questioning of the providers' conduct. The authors also decided not to collect samples for albumin dosages, and used those samples already or occasionally collected. The only interference

was the nutritional status evaluation, performed by the research team. Thus, neurological diagnoses review, classification of ulcers, pneumonia diagnosis, and calculation of adequate caloric-protein needs were not carried out.

## CONCLUSION

The elderly population with neurological disorders and using followed-up enteral nutrition therapy (ENT) presented a higher rate of complications and death at the end of the study period. Presence of dementia, EN access routes, and complications did not influence on survival rates. However, the inadequate nutritional status according to clinical evaluation and albumin levels lower than 3.5 mg/dL significantly influenced survival rates.

As this was an observational study, it was not possible to infer what evolution patients would have without ENT. Notwithstanding, the significant mortality rates at the end of the study, and the high incidence of complications and hospitalization, according to other observations in medical literature regarding ENT in patients bearing advanced and severe neurological pictures suggest that there may be a subgroup of patients who do not benefit from this therapeutic approach. Subsequent studies should try to determine the features of this subgroup in order to avoiding complex and expensive therapeutic approaches for patients who are not in need for them, especially at the end of their lives, as well as to guide adequately family members to prevent unrealistic expectations and unnecessary suffering.

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