Original Article

Enteral nutritional support in non-ICU hospitalized patients: current practice in Mexico

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Background and Objectives: Patients receiving ≥80% of their energy requirements by enteral nutrition (EN) have better clinical outcomes; unfortunately, there are discrepancies between the amount prescribed and amount received. The aim of this study was to explore the nutritional clinical practice, determine the adequacy and identify reasons for underfeeding. Methods and Study Design: A retrospective study was conducted in hospitalized, non-intensive care unit, adult patients receiving EN for ≥72 h. The following data were recorded: the prescribed target of energy and protein per day, daily energy intake, and the percentage of adequacy of the energy and protein requirement up to hospital day seven. Complications during administration or reasons for interruption and the proportion of patients who received ≥80% of the energy goals on days four and seven were also recorded. Results: In total, 52 patients were included (61.5% women), with a median age of 57.5 years; 20.4% and 6.1% of the patients received ≥80% of their energy and protein goals, respectively, on day four, which improved to 28% (p<0.005) and 19% (p<0.001), respectively, on day seven. During the first seven days, a statistically significant (p<0.001) difference was observed between the amount of prescribed and administered energy over 24 h. The patients who received <80% of their total energy requirement remained hospitalized for 29 days (IQR 16.5-45.5), while those who received ≥80% were hospitalized for 18 days (IQR 13.3-28.8) (p<0.05). Conclusions: Significant energy and protein deficits were documented. Furthermore, it is necessary to use strategies such as the implementation of an algorithm to optimize EN.

Key Words: enteral nutrition, malnutrition, nutritional support, energy deficit, complications

INTRODUCTION

Enteral nutrition (EN) is the preferred method of artificially administering nutrients to patients in whom it is not possible to manage their requirements via the oral route because it is impractical, inadequate, or unsafe. Although EN was previously only considered a means of operational logistics, gastrointestinal intolerance (diarrhoea, vomiting, pain, and abdominal bloating), accidental release of the enteral probe, medical and nursing procedures, and routine tests; 26-65% of these problems are preventable. These problems occur in addition to traditional heterogeneous prescription and management (initiation of the infusion at low rates, with progressive increases), which extend the time required for patients to reach their goal delivery rate. Studies evaluating EN intake in the intensive care unit (ICU) have shown that patients receive an average of only 61.2% of their energy target and 57.6% of their protein target during the first 12 days of EN; in addition, 74% of patients do not receive an optimal amount of their energy requirement. In Mexico, the patients in non-critical areas with EN are underfed, receiving (on average) 61% of their energy goals.

The aim of this study was to explore the clinical nutritional support practice of EN in hospitalized adult medical and surgical patients to determine the adequacy and factors involved in its administration.

METHODS

A retrospective study of EN support was conducted at Instituto Nacional de Ciencias Médicas y Nutrición

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Salvador Zubirán (INCMNSZ). The protocol for the research project was approved by the ethics committee (1557) at the institution and conformed to the provisions of the Declaration of Helsinki in 1995 (as revised in Edinburgh 2000). Adult hospitalized non-ICU medical and surgical patients receiving EN (via nasogastric, nasoenteric, gastrostomy, or jejunostomy) for ≥72 h, who had complete data during the first seven days of EN administration and were managed by the Clinical Nutrition Service during the period of May 2014 - April 2015, were eligible for inclusion. Patients in whom feeding was initiated by another route (oral, parenteral, or mixed) or for ≤72 h were excluded.

The Clinical Nutrition Service (composed of physicians and dietitians) provides nutritional assessments, recommendations, and consultations for in-patients who require nutritional support during their hospital stay. The current clinical EN practice is prescribed during the morning rounds each 24h, and the type of EN formulas prescribed depends on the clinical status of the patient. When the patients require protein supplements, modular protein supplements are added.

Demographics: Subjective Global Assessment (SGA), an integrated tool to identify patients at risk of or with malnutrition,15 clinical and EN practice data (administration route, infusion method, energy and protein requirements calculation method, prescription, type of enteral formula, energy and protein target, millilitres administered, and nutritional adequacy); gastrointestinal complications; and causes of interruption of EN were obtained from the clinical-nutritional record and nursing reports.

Continuous quantitative variables are expressed as medians and interquartile ranges, and nominal qualitative variables are expressed as percentages. The Wilcoxon ranks test was used to compare the energy prescribed with the amount administered on day four. A value of \( p<0.05 \) was considered statistically significant. Data were recorded with Excel 2013 and analysed using the SPSS (version 20) statistical program.

RESULTS
In total, 345 patients who had some indication of nutritional support during the course of their illness in the hospitalization area of the INCMNSZ were considered eligible; the data from 52 were analysed (Figure 1).

The demographic and clinical characteristics of the included patients are listed in Table 1. The median age was 57.5 years; 61.5% of the individuals studied were female; the average body mass index (BMI) was 20.6 kg/m²; 44.2% were classified as having severe malnutrition according to the SGA.

To estimate the daily energy requirement, prediction formulas (Harris-Benedict, Mifflin, and Ireton-Jones prediction formulas with the ideal or actual weight) were used (94.2%). In total, 69.2% of patients received gastric EN (48% by nasogastric tube); 19.2% received EN by jejunostomy, and 11.6% received EN by nasoenteric

<table>
<thead>
<tr>
<th>Table 1. Characteristics and clinical outcomes of study patients (n=52)</th>
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<td><strong>Age, years</strong></td>
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<td><strong>Sex, women (%)</strong></td>
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<td><strong>Discharged alive, n (%)</strong></td>
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<td><strong>Length of hospital stay, days</strong></td>
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SGA: subjective global assessment

![Nutritional support flow chart](image)

**Figure 1.** Nutritional support flow chart. Eligible criteria were non-ICU hospitalized patients with nutrition support (n=345). Patients without exclusive enteral nutrition (EN) were excluded (n=217): oral (ON, n=11), parenteral (PN, n=139), or mixed (PN+ON, n=67). Patients in whom feeding was initiated by another route: EN+ON (n=14), EN+PN (n=25), or ≤72 h (n=37). Patients with exclusive EN for >72 h were analysed (n=52).
among the gastrointestinal complications, diarrhea was reported most frequently (26.9% of subjects), followed by vomiting (19.2%) and bloating (15.4%). Patients who received <80% and ≥80% of their total energy requirement were compared, and it was found that patients who received ≥80% of their total energy requirement remained hospitalized for 29 days (IQR 16.5–45.5), while those who received ≥80% of their total energy requirement were hospitalized for 18 days (IQR 13.3–28.8), resulting in a statistically significant difference (p<0.05).

**DISCUSSION**

This study was conducted only on non-ICU hospitalized adult patients who received EN, and we found that the patients with this nutritional support were underfed, as in previous reports, for several reasons. One reason was the under-prescription provided for 24h that was subsequently increased at low rates; this resulted in less energy and protein prescribed per day, which led to fewer patients reaching their total energy requirement by the fourth day and increased the accumulated protein-energy deficit each day. Additionally, interruptions for procedures occurred during the course of hospitalization for different reasons, which further increased the macronutrient deficits.

Gastrointestinal complications are a factor that is described worldwide, and our results were similar to those of other studies. While a frequency of diarrhoea <10% is a quality indicator of EN, in our studied population, the definition of diarrhoea was not homogeneous, as has been described by other institutions. While a frequency of diarrhoea <10% is a quality indicator of EN, in our studied population, the definition of diarrhoea was not homogeneous, as has been described by other institutions. While a frequency of diarrhoea <10% is a quality indicator of EN, in our studied population, the definition of diarrhoea was not homogeneous, as has been described by other institutions.

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involved in the EN prescription and administration, gastrointestinal complications, and interruptions in nutrition. Avoidable interruptions must be taken into account to optimally feed our patients.11

Our study showed that administering macronutrients to stable hospitalized adult patients using EN was not consistent with international recommendations. This difference is related to the lack of a uniform guide for clinical practice in Mexico or the use of international guides. Our data indicate a similar gap between the prescription and administration of EN reported in patients with critical illness. Thus, we can conclude that a deficit in calories and protein exists during the first seven days of EN. Similarly, we observed that the protein requirements required a longer period to be satisfied than the energy requirements did; therefore, greater emphasis should be placed on protein intake in hospitalized patients.

In Canada, Heyland et al implemented an EN protocol (PEP uP protocol) designed to overcome the main barriers of administration in ICU patients, demonstrating that patients on the PEP uP protocol received more protein and energy than the control group.23 Recent publications have proved that implementing algorithms for nutritional support improves the clinical practice of EN, reaching optimal values that reduce the complications associated with malnourishment.24-28

Most articles are focused on evaluating patients who are in critical areas, while our study evaluated patients who were in inpatient non-critical areas. Reviewing the literature related to patients in critical areas served as a guideline, although we did not expect such similar results. This study was also limited because it was retrospective. In future investigations, the follow-up period should be extended.

Our investigation has limitations that must be acknowledged. First, the results were based on a retrospective study and involved the loss of valuable information that may have the effect of reducing the sample size and power of a study; however, its strength was that the patients were unselected. Second, the subjects included were not a random sample. Third, the study was performed in a single centre, which might limit the generalizability of our findings. Finally, there was a small sample size. Consequently, the above limitations must be considered when interpreting our results.

This study documented significant energy and protein deficits during the first seven days of EN administration. Therefore, it is necessary to implement strategies such as management algorithms to optimize EN administration and to prevent or limit associated complications.

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AUTHOR DISCLOSURES
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REFERENCES
16. Verotti CC, Torrinhas RS, Cecconello I, Watzberg DL. Selection of top 10 quality indicators for nutrition therapy.


