

Management of gastrointestinal complications of enteral nutritional therapy in the ICU

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INTRODUCTION

Enteral nutrition therapy (ENT) is a common nutritional strategy for inpatients, playing a role in the nutritional needs of the disabled that is normally provided through an oral diet¹. Although several benefits have been reported, ENT can cause harm by its interruption in 85% of patients, with gastrointestinal occurrences as a major cause often occurring in critical patients¹⁻³.

Since critical illness causes several changes in gastrointestinal motility, the most frequently mentioned diseases in the literature include diarrhea, high gastric residual volume, and constipation, affecting approximately 92% of intensive care unit (ICU) patients, who may experience more than one of these complications².

The treatment of gastrointestinal complications in critically ill patients is fundamentally important for the adequate ENT supply and, consequently, for better patient clinical evolution².

There have been few studies on this issue that provide evidence and appropriate recommendations for clinical practice. Even the main clinical guidelines provide little information regarding the management of gastrointestinal complications.

Thus, the purpose of this integrative review was to collect data on the best approaches to gastrointestinal complications with the greatest impact in the ICU during ENT.

METHODS

This paper is an integrative literature review, an approach that allows the combination of several methodologies, both experimental and non-experimental, and the content of an empirical or theoretical nature⁴.

This was conducted in the PubMed, Lilacs, and Cochrane Library databases, with the following indexed terms and their respective synonyms of the Medical Subject Headings (MeSH), as well as the following Boolean connectors: # 1 Enteral Nutrition AND # 2 Intensive Care AND # 3 Food intolerance OR Diarrhea OR Constipation OR Vomiting OR Gastric Residual Volume NOT # 4 Pediatric. The term “gastric residual volume” and its synonyms are not part of the indexed terms in MeSH, but they were included to increase the number of studies that addressed the topic. Additionally, the references of the selected articles were analyzed to select other unidentified studies when searching the databases.

Specifically, articles that were published in the last five years, written in English, Spanish, or Portuguese, that addressed the management of high gastric residual volume (GRV), vomiting, diarrhea, and constipation in the ICU during ENT in adult patients were included. On the other hand, literature reviews, letters, editorials, and comments were excluded.

RESULTS

In the database search, 305 studies were found, of which 37 were included in this review following the steps described in Figure 1. The main characteristics of the included studies, except for the results described below, are presented in Table 1.

Initially, regarding high GRV and vomiting, ENT characteristics that were associated with its occurrence were those with lipid and protein compositions. Thus, a decrease in such complications was observed in patients who received ENT with medium-chain triglycerides (MCT), omega-3 polyunsaturated fatty acids, and peptide-based formulas⁵⁻⁸.

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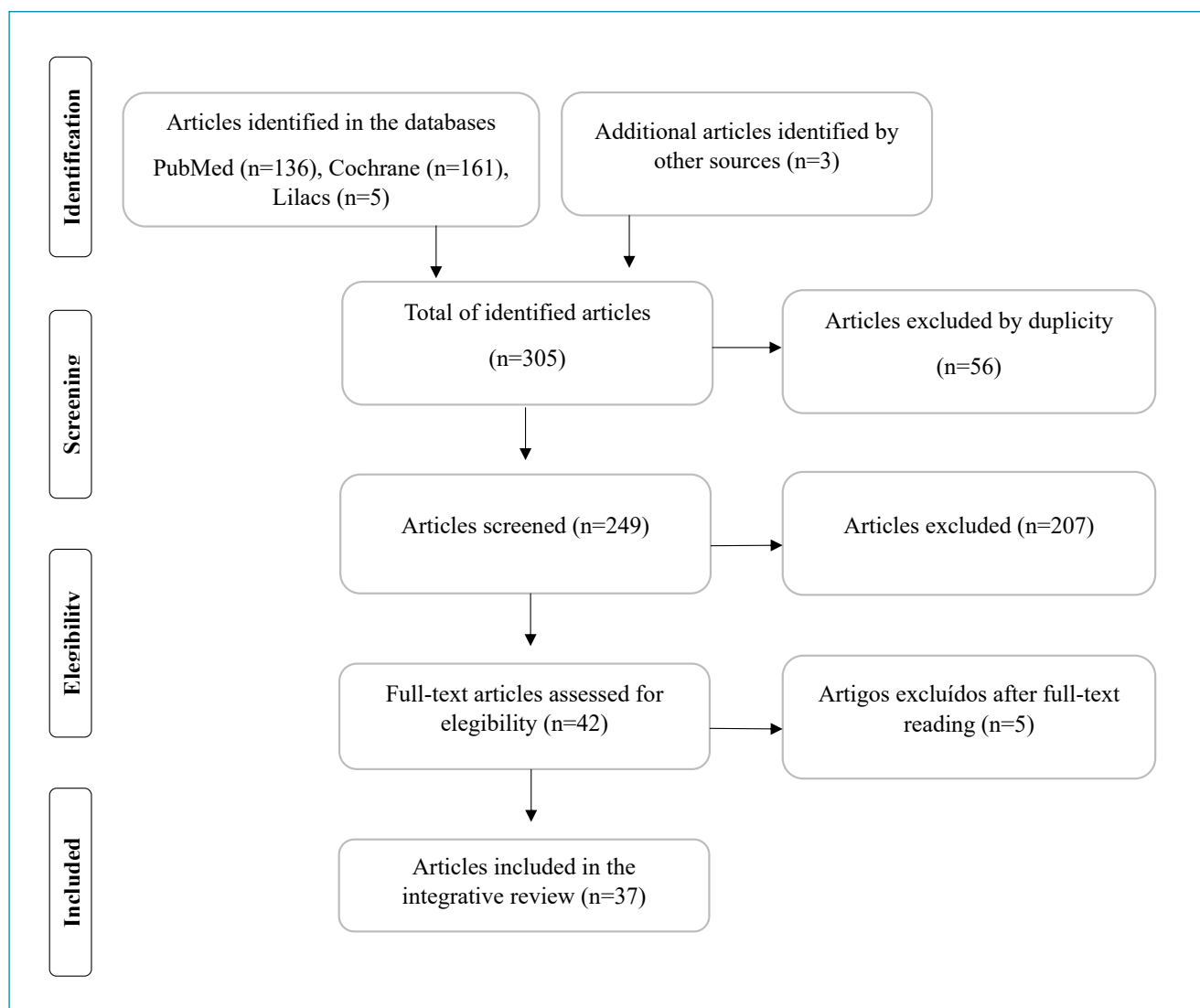


Figure 1. Flowchart of eligibility.

Many studies still aim to evaluate GRV monitoring, even though it has been largely abandoned in the ICUs, as already established and recommended by several guidelines.

Therefore, a significant reduction in elevated GRV, abdominal distension, diarrhea, and prescribed prokinetic agents was found in studies that removed GRV monitoring^{9,10}. Another benefit observed with this removal was the better achievement of nutritional goals, which were achieved more quickly without increasing complications^{5,11,12}.

Furthermore, it is emphasized that elevated GRV is not equivalent to gastrointestinal intolerance, does not always reflect aspiration risk, and that a single episode should not require reduction or immediate interruption of the ENT rate, but should lead to a careful examination of secondary causes¹³.

In contrast, only one study found favorable results for frequent GRV monitoring, showing lower vomiting and diarrhea incidences in the group that was monitored with shorter gaps; however, this group also had a smaller hourly infusion rate increase than the intervention group¹⁴.

Alternatively, the use of ultrasound imaging to evaluate GRV has proved to be beneficial, despite the need for standardization. This practice is based on data that point to a correlation between measurements of parts of the antrum and the aspirated volume, showing that gastric ultrasound can accurately estimate GRV in critically ill patients¹⁵.

Moreover, other advantages were found, proving that gastric aspiration did not provide an accurate GRV estimate compared to ultrasound¹⁶ and that ultrasound can reduce reflux occurrence and increase ENT supply¹⁷.

Table 1. Characteristics of the studies.

Author, country	Methodology	Sample size
Heinonen et al. ² , Australia	Observational retrospective	100 patients
Qiu C et al. ⁵ , China	Randomized controlled trial	144 patients
Tihista et al. ⁶ , Uruguay	Randomized controlled trial	92 patients
Liu et al. ⁷ , Taiwan	Observational retrospective	72 patients
Seres et al. ⁸ , United States	Pilot, prospective randomized	49 patients
Wiese et al. ⁹ , Australia	Observational retrospective	181 patients
Wang et al. ¹⁰ , China	Systematic review and meta-analysis	5 articles. 998 patients
Ozen et al. ¹¹ , Turkey	Randomized controlled trial	51 patients
Bruen et al. ¹² , United States	Retrospective historical cohort	61 patients
Pham et al. ¹³ , United States	Systematic review	26 articles
Büyükcoba et al. ¹⁴ , Turkey	Randomized controlled trial	60 patients
Sharma et al. ¹⁵ , United States	Pilot, prospective cohort	19 patients
Bouvet et al. ¹⁶ , France	Prospective cohort	61 patients
Chen et al. ¹⁷ , China	Randomized controlled trial	72 patients
Zhu et al. ¹⁸ , China	Randomized controlled trial	141 patients
Ge et al. ¹⁹ , China	Randomized controlled trial	70 patients
Taylor et al. ²⁰ , United Kingdom	Randomized controlled trial	50 patients
Li et al. ²¹ , China	Systematic review	8 articles. 835 patients
Wang et al. ²² , China	Systematic review and meta-analysis	5 articles. 325 patients
Friedman et al. ²³ , Brazil	Randomized controlled trial	115 patients
Nasiri et al. ²⁴ , Iran	Randomized controlled trial	60 patients
Reis et al. ²⁵ , Brazil	Systematic review	8 articles. 639 patients
Yagmurdur et al. ²⁶ , Turkey	Randomized controlled trial	120 patients
Tuncay et al. ²⁷ , Turkey	Randomized controlled trial	46 patients
Kamarul et al. ²⁸ , Malaysia	Systematic review and meta-analysis	14 articles. 1414 patients
Alberda et al. ²⁹ , Canada	Pilot, case-control	32 patients
Mahmoodpoor et al. ³⁰ , Iran	Randomized controlled trial	100 patients
Shimizu et al. ³¹ , Japan	Randomized controlled trial	72 patients
Manzanares et al. ³² , United States	Systematic review and meta-analysis	30 articles. 2972 patients
Jakob et al. ³³ , Switzerland	Randomized controlled trial	90 patients
Vieira et al. ³⁴ , Brazil	Prospective cohort	23 patients
Chen et al. ³⁵ , China	Observational prospective	533 patients
Wesselink et al. ³⁶ , Netherlands	Retrospective cohort	433 patients
Lewis et al. ³⁷ , Canada	Systematic review and meta-analysis	13 articles. 1341 patients
Pérez-Sánchez et al. ³⁸ , Spain	Observational prospective	139 patients
Fukuda et al. ³⁹ , Japan	Observational retrospective	282 patients
Prat et al. ⁴⁰ , France	Observational prospective	189 patients

Concerning the place of ENT administration, data are still controversial. Favorable results have been demonstrated for post-pyloric administration, with a reduction in the rate of vomiting, ventilator-associated pneumonia (VAP), abdominal distention, diarrhea, regurgitation, and aspiration¹⁸⁻²⁰. In contrast, other studies, despite confirming a significant VAP reduction, found no reduction in the incidence of vomiting and diarrhea with post-pyloric feeding²¹⁻²³.

Regarding the administration method, no differences were found between bolus and intermittent administration related to vomiting, high GRV, constipation, diarrhea, and bloating²⁴.

Finally, concerning the risk factors observed, the patient's positioning with a bed angle <30° had a significant influence on the GRV increase².

Concerning diarrhea, improvements have been demonstrated with the use of fibers, as well as better nutritional offers, recommending specifically soluble fibers as safe for critically ill patients who are hemodynamically stable²⁵⁻²⁷.

Only one study found results that were not favorable to the use of fibers in critically ill patients, noting that fiber reduces diarrhea in ENT patients, but not in critically ill patients²⁸.

Regarding probiotics, two studies were favorable for their use, but the results were not statistically significant. The first study tested the use of two bottles per day of a drink containing 10 billion *Lactobacillus casei*, resulting in a lower rate of diarrhea associated with antibiotics²⁹. Similarly, in another study, *Lactobacillus (casei, acidophilus, rhamnosus, bulgaricus)*, *Bifidobacterium (breve, longum)*, and *Streptococcus spp.*, were used as probiotics, which also resulted in a decrease in diarrhea³⁰.

In this perspective, a study evaluated the effect of symbiotics, using probiotics *B. Breve* and *L. casei*, and prebiotic galactooligosaccharides on the intestinal microbiota of critically ill patients. As a result, a decrease in diarrhea incidence was observed, suggesting its prophylactic use in modulating the intestinal microbiota³¹.

However, a meta-analysis including only studies with critically ill patients which evaluated both probiotics and symbiotics found benefits, such as reducing infections, including VAP; however, no improvement in diarrhea was found³².

Although these studies show evidence that probiotic use favors diarrhea prevention and treatment, there was no statistical significance in the results presented, and further research in critical patients is necessary, especially because of the existence of different strains and dosages to be tested.

Another characteristic of ENT was addressed in a study that reported decreased diarrhea in the group that received ENT with MCT⁵. In contrast, another study failed to show

this relationship with fat (MCT and fish oil) and protein content (hydrolyzed) modifications³³.

Finally, regarding risk factors, it was observed that antibiotic use, prokinetic therapy, high Acute Physiology And Chronic Health Evaluation II (APACHE II), post-pyloric ENT, and post-pyloric hyperosmolar drug administration were associated with increased diarrhea^{2,34-36}. Only one study found no relationship between prokinetic therapy and a significant increase in the rate of diarrhea³⁷.

In the case of constipation, few studies have addressed the ENT management for its treatment, all of which use an observational methodology. In this context, a higher constipation occurrence was observed in patients receiving a fiber-free diet³⁸. In addition, late ENT is considered a risk factor for constipation³⁹.

Drugs reported as risk factors for constipation were sedatives, muscle relaxants, iron and calcium supplements, antihypertensives, and vasopressors^{2,33,38-40}. Finally, another risk factor found for constipation was surgery performance³⁹.

Constipation causes many detriments to ENT, such as increases in the mechanical ventilation time, length of ICU stay, and VAP incidence and mortality, influencing the achievement of nutritional goals⁴⁰; however, this may receive less importance in clinical practice as reflected in the studies found.

CONCLUSIONS

It stands out from this review that in the management of gastrointestinal complications in ICU patients, such as high GRV, vomiting, and diarrhea, ENT formulas with fat content (such as MCT) modification are possibly more effective. Furthermore, it has been shown how fibers, particularly soluble fibers, can be used to treat diarrhea. However, constipation is poorly discussed in the literature.

This work demonstrates the importance of knowing the formula compositions used in ICUs. There is a need for more publications addressing ICU gastrointestinal complications when ENT is indicated, especially for constipation.

AUTHORS' CONTRIBUTIONS

CPC: Conceptualization, Data Curation, Formal Analysis, Methodology. **DLG:** Conceptualization, Methodology, Project Administration, Writing – Review & Editing. **MCAF:** Conceptualization, Methodology, Project Administration, Writing – Review & Editing.

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