Enteral Feeding via Nasogastric Tube. Effectiveness of continuous versus intermittent administration for greater tolerance in adult patients in Intensive Care

PROTOCOL

The Spanish Centre for Evidence Based Nursing: Collaborating Centre of the Joanna Briggs Institute
Enteral Feeding via Nasogastric Tube. Effectiveness of continuous versus intermittent administration for greater tolerance in adult patients in Intensive Care

**Review title**

Enteral Feeding via Nasogastric Tube. Effectiveness of continuous versus intermittent administration for greater tolerance in adult patients in Intensive Care: A systematic review

**Conductive Centre of the Revision**

The Spanish Centre for Evidence Based Nursing: Collaborating Centre of the Joanna Briggs Institute

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Review Questions/Objectives

The Review objective is to synthesise the best available evidence on the effectiveness of continuous versus intermittent enteral feeding in adult patients with nasogastric tube admitted to the ICU, in respect to their nutritional status, digestive tolerance and complications

Background

Nutrition via enteral tube in adults suffering from a critical condition is a controversial topic due to the great variability in nutritional support in different Intensive Care Units (ICUs) and in the performance of registered nurses. Studies researching nursing care have not reached a conclusion about which is the optimal way to administer enteral feeding 1-7 (EF).

In our clinical practice, we find critically ill patients that often need parenteral or enteral feeding due to the impossibility of feeding them orally 8-10.

Nowadays, evidence shows that, when possible, EF via nasogastric tube should be first choice versus parenteral feeding, in critically ill patients with preserved digestive function that are unable to be fed orally 1,2,5,6,10.

Parenteral feeding should only be used in situations where the digestive tract is not working or when the enteral route would not cover all the nutritional requirements of the patient 4,8,9. Nevertheless, the multi-pathological situation of these patients, their treatments and the multiple complications associated with EF lead us to slow down or even suspend their programmed feeding supply, thus their clinical condition deteriorates 7,9,10,11.

EF has two main aims. The first one is to meet nutritional needs and the second one is to preserve the intestinal barrier and prevent infectious complications resulting from a bacterial translocation. Many clinical studies have suggested that EF preserves the structure and function of the gastrointestinal mucosa by maintaining its barrier effect, preventing or reducing bacterial translocation, diminishing the catabolic response and reducing the rate of infection in critically ill patients 9-15.

The optimal time, after the patient’s admission, for starting EF has not been clearly established, although EF is considered early if applied within the first 48 hours. Early EF plays an important role in caring for these patients to ensure optimal recovery 2,4,9-15.
The nasogastric tube is the most used way for administering EF to critically ill patients because of its easier and physiological access\textsuperscript{10,12}.

However, in these patients, feeding via nasogastric tube is accompanied by numerous treatments, difficult clinical situations, as well as their underlying condition. All this can have an adverse effect on gastrointestinal motility, though it is difficult to assess which factor by itself is contributing to each of the complications. The few studies that have addressed this problem have not been able to pinpoint the actual weight of each of these factors because of the complexity of these patients\textsuperscript{9-15}.

In intensive care units (ICUs), continuous EF is the most widely used method for administering EF (once every 24 hours) and is recommended in clinical practice guidelines that are based on systematic reviews\textsuperscript{1-4} and in other guides that are based on the advice of experts, such as the one of the Spanish Society of Parenteral and Enteral Nutrition\textsuperscript{16,17}. Whilst the discontinuous, intermittent or bolus administration, which apparently follows a more physiological pattern, is discarded because it is attributed poor tolerance and increased frequency of bronchoaspiration. However, studies published in this regard do not conclude that continuous administration system is better than intermittent\textsuperscript{18-24}.

The most frequent gastrointestinal complications include increased gastric residue, constipation, abdominal distension, vomiting and regurgitation.

According to a narrative review by Wiesen et al\textsuperscript{19}, diarrhoea in critically ill patients is less associated with continuous that with intermittent administration, and interrupting enteral feeding during diarrhoea is not justified. It is advisable to treat the diarrhoea, as well as using high-fibre nutrition and administer prebiotics and probiotics as a novel treatment which has yet been little studied\textsuperscript{13-15,19,25}.

Chen et al\textsuperscript{20}, of the Taipei Veterans General Hospital Nursing Department, in Taiwan, conducted a randomized clinical trial which compares intermittent versus continuous EF. A total of 107 participants were randomly assigned to receive continuous (51 patients) or intermittent (56 patients) EF. Gastric emptying and pulmonary aspiration were analysed during the first 7 days, presenting a lower risk of aspiration pneumonia in the group of intermittent EF (OR: 0.146, CI 95\%: 0.062-0.413 p 0.000)), this group also had a higher volume of nutrients on the seventh day and were extubated on day 21 (p =0.002). Patients treated with high doses of dopamine were almost 3 times (OR: 2.95) more likely to develop aspiration pneumonia than those receiving a low dose of dopamine, (CI 95\%: 1.076-8.107, p= 0.035), regardless of the form of
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administration of EF. There were no significant differences in the length of hospital stay between the two groups 20.

A randomized clinical trial conducted by MacLead et al 22 with 164 patients of over 18 years age admitted to the ICU, analysed the effectiveness of continuous versus intermittent EF, through a strict protocol. The outcome variables were nutritional volume, and number of days to reach 100% of the caloric needs in the first 10 days of their stay in ICU. The results show no significant differences in the complications of EF and emphasise that patients in the intermittent group reached more quickly (by the seventh day), the objectives described above, than patients with continuous EF. ($\chi^2 = 6.01, p=0.01$).

Existing studies on EF study different types of intervention and focus on ways to reduce gastrointestinal complications, bronchoaspiration and how to reach the nutritional goal 22. Increased gastric residuals, vomiting and regurgitation increase the risk of bronchoaspiration. 13,14,22,26,27.

Today, studies are trying to define a wider volume of gastric residue, with the aim of increasing the patients’ nutritional supply without increasing the risk of bronchoaspiration 13,14,23,26,27.

There are studies comparing 3,12,21 enteral with parenteral nutrition as well as the different access routes 10,12-15 for EF and the use of prokinetic agents to improve gastrointestinal tolerance 1. 3,11,13,15. Other studies analyse transpyloric versus gastric administration 15,21,28,29 and whether complications resulting from an increased gastric residue can be reduced through EF by transpyloric tube 1,27,28,29. However, placing and caring for these tubes is more complex and the results, when it comes to an increase of calorie supply, are not conclusive 28,29.

A meta-analysis conducted by Heyland et al 3, analysed eleven studies comparing gastric versus post-pyloric nutrition and the results, in those that refer to the nutritional requirements administrated, emphasize a major nutritional contribution in the group fed post-pylorically.

To the contrary, Marik et al 28, in another meta-analysis, found no differences in energy intake between the post-pyloric and the gastric nutrition group (RR 5.22; 95% CI; 7,53-17,97; p=0,4).

Transpyloric access for EF remains controversial. Therefore, only in cases of previously proven gastric intolerance or due to a pathology that prevents feeding through the stomach or when there are several risk factors for intolerance (mechanical ventilation, deep sedation, muscle relaxation, high doses of pressor amines) should feeding begin with the transpyloric tube 15.
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Numerous studies have analysed early versus late EF, and parenteral feeding as support to EF 1-3,13-15,21,25.

The form of nutritional intervention in ICU patients will depend on their clinical situation and is geared to prevent nutritional deficiencies, avoid complications related to administering nutrition and reduce disruption, in order to produce faster recoveries, fewer hospital and ICU stays and, possibly, a lower morbidity-mortality rate 1-4,6,10.

Currently, there are many primary studies, using small samples of patients to analyse which method of EF is more effective, but do not provide sufficient evidence of which one is better, continuous or intermittent, nor of the advantages or disadvantages each one. This favours variability in their use by health professionals, although, in most studies, the trend is to favour continuous EF.

Given this situation, it is considered necessary to conduct a systematic review to assess the effectiveness of continuous versus intermittent enteral feeding in adult patients admitted to the ICU, in order to obtain results that facilitate decision making for nursing professionals.

We performed a search of Cochrane Library of Systematic Reviews, JBI Library of Systematic Reviews, CRD DARE database and Medline and no existing systematic review (completed or in progress) or existing systematic review protocols to assess the effectiveness of continuous versus intermittent enteral feeding in adult patients admitted to the ICU was identified.

For the purpose of this systematic review we’ll use the following definitions:

Intensive Care Unit (ICU) refers to hospital units providing continuous surveillance and care to acutely ill patients.

Continuous enteral feeding is defined as administering nutrition through gravity systems or infusion pumps, without interruption, for a minimum period of twelve hours a day.

Intermittent enteral feeding is defined as non continuous administration of nutrition that can be done through: bowls, gravity systems or infusion pumps, repeating the operation several times a day, depending on the total volume to infuse.

A nasogastric tube is a tube that is inserted through the nose until it reaches the stomach and which allows the administration of enteral nutrition directly to the gastric cavity.

Patient’s nutritional status is the balance of the nutrient intake and requirements.
Digestive tolerance is defined as the capacity of the digestive system for digesting food.

Bronchoaspiration refers to the inhalation of oropharyngeal or gastric contents into the lower respiratory tract.

Length of hospital stay is expressed/measures as number of days in the hospital from admission till discharge or death.

Length of intensive care unit ICU stay refers to refers to number of days in the ICU, from admission till discharge from the ICU or death.

Duration of enteral feeding is the period of time from the first EF administration to the last EF administration, due to the completion of the treatment or cessation because of complications.

**Inclusion Criteria**

**Types of participants**

Patients of nineteen years of age or more, carrying a nasogastric tube, enteral feeding recipients and who were admitted to an intensive care unit, with either a medical or a surgical pathology, and that received enteral feeding during their stay in the Intensive Care Unit.

**Types of interventions**

Intervention: Continuous enteral feeding.

Comparator: Intermittent enteral feeding.

**Types of outcomes**

Studies must include at least one of the following primary outcomes:

Primary outcome:

1. Patient’s nutritional status.
2. Digestive tolerance.

The following secondary outcomes, will also be considered:

1. Start day and duration of enteral feeding.
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2. Length of hospital stay and ICU stay.
3. Causes of interruption of enteral feeding because of complications.

Types of studies
Randomised clinical trials, clinical trials without randomization and before and after studies that compared continuous versus intermittent enteral feeding.

Search strategy
The search aims to identify both unpublished and published studies written in Spanish, Catalan, English, French, Portuguese and Italian languages, published from database inception until 2011.

Searches will be conducted in both Spanish and English separately, depending on the database language, by each component of PICO format (Population, Intervention, Comparison, Outcome) and then combined using Boolean operators.

An electronic systematic search will be conducted in the following databases:

- Cochrane Library (Cochrane Central Register of Controlled Trials, CENTRAL); 1996 to 2011
- MEDLINE; from 1966 to January 2011
- EMBASE; from 1974 to January 2011
- AMED (Allied and Alternative Medicine Database); from 1985 to January 2011
- CINAHL (Cumulative Index to Nursing and Allied Health Literature); from 1982 to January 2011
- Database DARE Centre for Reviews and Dissemination; from 1996 to January 2011
- National Research Register; from 1998 to January 2011
- Cuiden: Index de enfermería; from 1987 to January 2011
- Lilacs, Base de datos Latinoamericana; from 1982 to January 2011
- IME, Índice Medico Español; from 1970 to January 2011

The search for grey literature will be conducted in:

- Google Scholar
- OpenSIGLE (System for Information on Grey Literature in Europe)
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- Dissertation Abstracts International
- Proceedings First Database
- National Library of Medicine Gateway
- Grey Literature Report (through New York Academy of Medicine website)
- AHRQ: Agency for Health Care Research and Quality
- CURRENT CONTENTS
- EXPANDED ACADEMIC INDEX

Will include papers presented at conferences and seminars sponsored by scientific societies of intensive care and nutrition: Sociedad Española de Medicina Intensiva, Critica y Unidades Coronarias (SMICYUC), Sociedad Española de Nutrición Parenteral y Enteral (SENPE), FC: Metabolismo y Nutrición y American Society for Parenteral and Enteral Nutrition (ASPEN). If necessary experts will be contacted.

A manual search will be conducted in the Journals that are most specialised in the topic of this review:

- Nutrición Hospitalaria
- FC: Metabolismo y Nutrición
- Journal Parenteral and Enteral Nutrition
- Nutrition in Clinical Practice
- Critical Care Medicine
- Nutrition Journal

Both controlled and natural languages will be used, through the most relevant descriptors for each of the databases searched. A methodological filter will be used for each database used in this review.

MeSH terms will be adapted and combined according to the rules of each database.

Descriptors or key words (MesH):

- Enteral Nutrition
- Nutrition status
- Critical care
- Critical Illness
- Feeding Methods
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- (Continuous next feeding) AND (Intermittent OR bolus).

Two reviewers will carry out an independent and blind eligibility check of the title and abstract using the eligibility check list described in Appendix I; where it is not clear there will be necessary to follow the same process with the full article. Disagreements will be resolved by consensus with a third reviewer. Duplicate works will be excluded.

**Assessment of methodological quality**

Selected articles will be evaluated by two independent reviewers.

The methodological quality will be assessed using the standardised criteria for critical appraisal of the Joanna Briggs Institutes Meta Analysis of Statistics Assessment and Review Instrument for experimental studies (JBI-MAStARI) (Appendix II).

Studies will be classified, according to their quality, as high, medium and low methodological quality. Studies of low methodological quality will be taken into account separately in the analysis.

Disagreement between reviewers will be resolved by discussion; when no agreement is reached there will be resorting to a blind third reviewer.

**Data Collection**

Data will be extracted by two independent and blinded reviewers to assess whether they reach the same results. Data will be extracted from the articles included in the review using a data extraction standardized tool JBI-MAStARI (Appendix III) to reduce extraction error. The data extracted will include specific details about the interventions, populations, study methods and outcomes of significance to the review question and specific objectives.

**Data Synthesis**

Quantitative papers will, where possible, be pooled in statistical meta-analysis using JBI-MAStARI. All results will be subject to double data entry. Effect sizes expressed as odds ratio (for categorical data) and weighted mean differences (for continuous data) and their 95% confidence intervals will be calculated for analysis modify text as appropriate. Heterogeneity will be assessed statistically using the standard Chi-square, with statistical significance if p<0.05; because the low power of the test to detect heterogeneity the I2 index will also be used,
Enteral Feeding via Nasogastric Tube. Effectiveness of continuous versus intermittent administration for greater tolerance in adult patients in Intensive Care considering the values of 0%, 25%, 50% and 75% as none, low, moderate and high heterogeneity. If Studies are heterogeneous, data will be pooled with using an aleatory effect model.

If possible, subgroups analysis will be conducted (studies with common features) according to primary and secondary outcomes.

The presence of publication bias will be assessed through funnel plot analysis.

Where statistical pooling is not possible the findings will be presented in narrative form including tables and figures to aid in data presentation where appropriate.

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To the following nurses:

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Esther Santoro Sánchez. RN, MSc, Atención Primaria Centro de Salud Muchamiel (Alicante).

**Conflict of interest**

Authors declare no conflicts of interest in the review conducted.
References

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Appendices

Appendix 1

Eligibility Check list

Study Identification: __________________ Language: __________________
Record number: __________________ Year of publication: _________________
Title: ___________________________________________________________________
Authors: ___________________________________________________________________
Complete reference: __________________________________________________________

❖ INCLUSION CRITERIA*

1. Type of study:
   a. Randomized clinical trials: YES / NO
   b. Clinical trials without randomization: YES / NO
   c. Before and After study: YES / NO

2. Type of intervention:
   Continuous enteral feeding vs Intermittent enteral feeding: YES/ NO

3. Participants:
   ICU patients; YES / NO
   Nineteen years of age or more: YES / NO

4. Outcome measures:
   a. 1.-Patient’s nutritional status.
   b. 2.-Digestive tolerance.
   c. 3.-Bronchoaspiration.

* Exclude the study if criteria 1, 2, 3 and 4 are not fulfilled. Specify the reason for exclusion

Selected_____________________ Excluded____________________________
Reviewer 1_________________________ Date _____________________
Reviewer 2_________________________ Date _____________________
Reviewer 3**________________________ Date _____________________
** Only if disagreement between reviewers.
Appendix II

JBI Critical Appraisal Form for experimental studies

Reviewer_________________ Date____________________
Author____________ Year____________
Record Number__________________

Was the assignment to treatment groups truly random?
   Yes   No   Unclear

Were participants blinded to treatment allocation?
   Yes   No   Unclear

Was allocation to treatment groups concealed from the allocator?
   Yes   No   Unclear

Were the outcomes of people who withdrew described and included in the analysis?
   Yes   No   Unclear

Were those assessing outcomes blind to the treatment allocation?
   Yes   No   Unclear

Were the control and treatment groups comparable at entry?
   Yes   No   Unclear

Were groups treated identically other than for the named interventions?
   Yes   No   Unclear

Were outcomes measured in the same way for all groups?
   Yes   No   Unclear

Were outcomes measured in a reliable way?
   Yes   No   Unclear

Was appropriate statistical analysis used?
   Yes   No   Unclear

Overall appraisal: Include ___ Exclude ___ Seek further info ___

Comments (Including reasons for exclusion)
________________________________________________________________
________________________________________________________________
________________________________________________________________
Appendix III

JBI Data extraction Form for Experimental/Observational studies

Author/s __________________________________________ Year ___________
Journal _________________________________________________________
Title____________________________________________________________

Record Number/Article Reference No: ____________________________
Reviewer: _________________________________

Study design: __________________________________________________
Setting _________________________________________________________

### Total Participants

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<th>Intervention 2</th>
<th>Control or placebo</th>
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### Outcome Measure 1

### Outcome Measure 2

### Outcome Measure 3

### Outcome Measure 4

### Outcome Measure 5

### Dichotomous Data

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**Continuous Data**

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**Authors Conclusion**

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**Reviewer's conclusion**

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