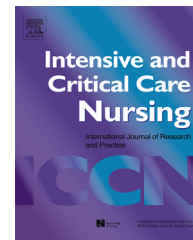




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RESEARCH ARTICLE

# The reasons for insufficient enteral feeding in an intensive care unit: A prospective observational study<sup>☆</sup>



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## KEYWORDS

Enteral nutrition;  
Intensive care;  
Gastrointestinal  
surgery;  
Underfeeding

## Summary

**Background:** Although enteral nutrition (EN) in critically ill patients is increasingly common, enteral underfeeding remains problematic. In the present study, we aimed to identify the reasons for insufficient EN.

**Methods:** In this single-centre, prospective, observational study in a general intensive care unit, the nurses documented cases experiencing enteral underfeeding during three-month study period. Decisions regarding EN were made and substantiated by the doctors. No feeding protocol was in use. The EN rate was assessed daily and considered insufficient if less than 50 kcal/h was administered and the rate had not increase in the previous 12 hour period.

**Results:** Eighty-seven patients were screened for 707 patient-days. Nurses documented 141 instances of insufficient EN in 49 patients (56.7% of all study subjects). EN was not initiated in 61% of these cases, EN was stopped in 14%, EN decreased in 2% and insufficient EN was not increased in 23%. EN was not initiated primarily due to surgical reasons. EN was not increased due to clinical instability. EN was decreased or stopped primarily due to high gastric residual volumes (GRV).

The study served as step one in a quality improvement process and resulted in the introduction of a nurse-driven feeding protocol.

<sup>☆</sup> These data were partially presented at the Annual Congress of European Society of Intensive Care Medicine in Paris, 06–09 October 2013.

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**Conclusion:** The main reasons for insufficient EN in intensive care patients include recent GI surgery, shock and large GRV. EN is commonly withheld for several days after GI surgery, whereas in shock there was a prohibition on increasing EN towards the target. Insufficient EN is highly prevalent; the incidence of EN should be reduced by training and the acceptance of more liberal EN policies.

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### Implications for Clinical Practice

- Common reasons for insufficient EN were documented at the bedside.
- Delaying EN initially and after discontinuation is a major problem.
- A feeding protocol was developed and introduced based on the current study.

## Introduction

Every critically ill patient with an intact gastrointestinal (GI) tract should receive enteral nutrition (EN) if in a stable condition and unable to eat orally (Kreymann et al., 2006; McClave et al., 2009). However, many critically ill patients are unstable and often have a dysfunctional GI tract. Accordingly, caloric targets are often not achieved in critically ill patients. It has been demonstrated that cumulative energy deficits up to 6000 kcal may occur during the first week in the intensive care unit (ICU) even when special attention was given to nutrition (Soguel et al., 2012). This deficit can be somewhat reduced with the involvement of a dietician and supplemental parenteral nutrition (PN), but the first is not always available, whereas the safety of the latter approach has been questioned (Casaer et al., 2011). Therefore, the causes of insufficient EN need to be documented and analysed to guide further efforts to optimize the enteral delivery of calories.

Although the indications to delay EN are not precisely defined (Reintam Blaser and Starkopf, 2013a, 2013b), the decisions to withhold or reduce EN are often guided by subjectivity, leading to considerable variability in nutritional practices. An earlier study identified important barriers to EN based on the opinions of nurses (Cahill et al., 2012). In present study, we aimed to identify the reasons for insufficient EN as documented bedside by intensive care nurses.

## Methods

The single-centre study was conducted in the general ICU of Tartu University Hospital from January 1st to March 31st 2013.

The Ethics Review Committee on Human Research of the University of Tartu approved this study (protocol nos. 191T-9 and 217/M-17). Informed consent was waived due to the observational design of the study.

### Feeding routine during the study period

EN was prescribed by doctors and administered as a continuous infusion by peristaltic pumps. No dietician was involved

in feeding decisions. No particular protocol was used for the adjustment of infusion speed, except that the infusion was stopped for four hours at night from 02:00 to 06:00. The infusion rate was therefore calculated to achieve the target over 20 hours per day. The caloric needs of all consecutive patients admitted during the study period were calculated as 20 kcal/kg ideal body weight (BW) (Hiesmayr et al., 2012) for the first two days in ICU and 25 kcal/kg ideal BW for the remainder of the time.

Gastric residual volume (GRV) was measured every morning at 06:00 in all patients and additional GRV measurements were obtained when problems were noted (i.e., vomiting, large GRV in previous measurement and abdominal distension). "Large GRV" was not predefined. If a doctor subjectively decided to withhold, stop, reduce or not increase EN due to "large GRV", the amount of GRV in each particular case was documented.

Metoclopramide was not routinely administered; it was only prescribed for GI motility problems. Erythromycin was not administered as a prokinetic drug.

Most of the patients received dextrose-based intravenous maintenance solutions supplemented with electrolytes to cover the physiological requirements of water, potassium and sodium, especially during the first days after admission. These maintenance fluids were not aimed to fully cover caloric deficiency and were gradually decreased and stopped when patients tolerated EN. If PN was initiated, then the dextrose-based maintenance solution was stopped. Calories gained from dextrose-based maintenance solution are reported among parenterally administered calories.

### Decisions leading to insufficient EN

All nurses were asked to document cases of insufficient EN during the study period. Study assessments were performed once daily (between 12:00 and 14:00) starting on day two in the ICU. EN was considered insufficient if at the time of assessment the actual infusion rate was less than 50 kcal/h and this rate had not increased during the previous 12 hours. This definition of insufficient EN was

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