

Critical care 24 × 7: But, why is critical nutrition interrupted?

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Abstract

Background and Aims: Adequate nutritional support is crucial in prevention and treatment of malnutrition in critically ill-patients. Despite the intention to provide appropriate enteral nutrition (EN), meeting the full nutritional requirements can be a challenge due to interruptions. This study was undertaken to determine the cause and duration of interruptions in EN. **Materials and Methods:** Patients admitted to a multidisciplinary critical care unit (CCU) of a tertiary care hospital from September 2010 to January 2011 and who received EN for a period >24 h were included in this observational, prospective study. A total of 327 patients were included, for a total of 857 patient-days. Reasons and duration of EN interruptions were recorded and categorized under four groups-procedures inside CCU, procedures outside CCU, gastrointestinal (GI) symptoms and others. **Results:** Procedure inside CCU accounted for 55.9% of the interruptions while GI symptoms for 24.2%. Although it is commonly perceived that procedures outside CCU are the most common reason for interruption, this contributed only to 18.4% individually; ventilation-related procedures were the most frequent cause (40.25%), followed by nasogastric tube aspirations (15.28%). Although GI bleed is often considered a reason to hold enteral feed, it was one of the least common reasons (1%) in our study. Interruption of 2-6 h was more frequent (43%) and most of this (67.1%) was related to "procedures inside CCU". **Conclusion:** Awareness of reasons for EN interruptions will aid to modify protocol and minimize interruptions during procedures in CCU to reach nutrition goals.

Keywords: Critical care, enteral nutrition, interruption of feeds, malnutrition

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Introduction

Nutritional support is considered as standard of care for patients in critical care unit (CCU) and early enteral nutrition (EN) has been the preferred choice.^[1] The goals of nutritional delivery are to provide nutritional therapy consistent with patient's condition to improve outcome.^[2] Studies have shown benefits of early EN (before 36 h) over parenteral nutrition (PN).^[3-5] The value of EN is further supported by studies which have shown that nutritional deficit due to delayed initiation has an adverse effect, whereas institution of protocols to increase delivery often

improves patient outcome.^[6-9] It has been noted that the value of EN is closely related to disease severity; greater the severity of the disease, higher the benefit of EN.^[10-13] Optimal nutrition support during critical illness requires individualized assessment of timing, route and quantity of nutrients and protocolized feeding.^[6,14] However, delivery of enteral feeding remains suboptimal due to interruptions for various reasons, some of which are avoidable.^[15,16] Frequent interruptions may impact provision of calories and proteins and therefore, the clinical outcome.^[17,18] Factors leading to inadequate provision of EN include insufficient caloric targets, gastrointestinal (GI) dysfunction, diagnostic and surgical procedures, feeding tube displacement, routine nursing procedures, delayed administration or premature EN withdrawal.^[15,19,20] The implementation of feeding protocols has been a positive strategy to optimize delivery of nutritional support.^[21,22]

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This observational study assessed the reasons for interruptions in feeding procedures and the duration of interruptions.

Materials and Methods

An observational, prospective study to determine the cause and duration of interruptions in EN in critically ill-patients was conducted in a multidisciplinary CCU of a tertiary care hospital. Patients admitted to the CCU from September 2010 to January 2011 and who received enteral feed for more than 24 h were included in the study. There were no specific exclusion criteria. Individual patient days were counted and the data was used to compute the total hours of interruption, with reasons.

The study was approved by the hospital's ethics committee and "waiver of consent" was approved in view of the observational design of the study. All patients included in the study received continuous EN with no scheduled interruption at night as per the hospital's protocol. There were no patients on total parenteral nutrition during the study period. Interruptions in enteral feeds due to medical, surgical or procedural reasons were categorized into four groups: procedures inside CCU, procedures outside CCU, GI symptoms and other reasons. Feeding Interruptions due to bedside procedures, medical and diagnostic procedures, medical emergencies, patient care and ventilation-related procedures such as initiation and discontinuation of mechanical ventilation and suctioning were included under "Procedures inside CCU". "Procedures outside CCU" included diagnostic and imaging procedures, medical procedures and surgeries. Abdominal distension, melena, hematemesis, diarrhea and vomiting and nasogastric (NG) aspiration were grouped under "GI symptoms". Reasons such as initiation of oral feeds, patient discomfort, temporary withhold etc., were collated under "other reasons."

Data evaluation

This study was aimed to assess the reasons which hinder the delivery of EN and analyze the duration of interruptions. All data were collected by the Clinical Dietitian and Research Coordinator in CCU. The data were entered into a database using Microsoft Excel (Microsoft Excel, Microsoft Corp., Redmond, WA, USA).

Statistical methods

Descriptive statistical methods were used. Clinical factors influencing the EN were analyzed using

Chi-square function test and $P < 0.05$ was considered to be significant. Statistical analysis was done using the Statistical Package for Social Science (SPSS) version 17.0 (Chicago, IL, USA).

Results

A total of 327 patients with a combination of 224 male and 103 female, were included in the study for a total of 857 patient-days [Table 1]. The mean age of patients was 57.95 ± 16.95 year.

Interruptions due to procedure inside CCU were observed to be the most frequent (55.9%) followed by GI symptoms in 24.2%, procedures outside CCU in 18.4% and interruptions due to other reasons were observed in 1.5% patients. Individually, ventilation-related procedures were the most frequent cause (40.25%), followed by NG aspirations (15.28%), GI bleed (1%) and initiation of oral diet (0.5%) [Table 2].

Number of interruptions per patient was computed and analyzed against individual category. It was observed that NG aspiration had the highest incidence (48 patients had incidence of 131 interruptions) of "repeated interruptions" for the same patients (average of 2.7 interruptions per patient) followed by GI bleed, melena and hematemesis with an average of 2 interruptions per patient. Other important factors were abdominal distention (21 interruptions in 11 patients) and surgical procedures outside CCU (61 interruptions in 33 patients) and medical procedures outside CCU (23 interruptions in 13 patients) [Table 3]. Ventilation-related procedures, were the highest in incidence, with 345 interruptions in 205 patients (on an average 1.6 times/patient).

In total, the duration of interruptions recorded for 327 patients (857 patient days) was 6360 h (mean: 7.4 h, range: 1-24 h). The data pertaining to hours of interruption were categorized into 4 groups: <2, 2-6, 6-12

Table 1: Patient characteristics

Number of patients	327
Age (years)	57.95 ± 16.95
Gender (male/female)	224/103

Table 2: Reason for stoppage of feed

Reason for feed stoppage	Number of patients (%)
Procedure inside CCU	479 (55.9)
Procedure outside CCU	158 (18.4)
GI symptoms	207 (24.2)
Others	13 (1.5)

CCU: Critical care unit; GI: Gastrointestinal

and 12-24 h. Of the four categories, 43% of interruptions were observed in 2-6 h category, followed by 6-12 h (29%), 12-24 h (19%) and <2 h (9%) respectively [Table 4 and Figure 1]. Chi-square tests revealed a statistical significance ($P = 0.0001$) between the duration and cause

Table 3: Reasons for interruption of EN

Reasons for interruption	No. of interruptions	Percentage of interruptions	No. of patients
Procedure outside CCU	157	18.31	
Diagnostic procedures	15	1.75	13
Medical procedures	23	2.68	13
Surgical procedures	61	7.11	33
Radiology	58	6.76	53
Procedure inside CCU	478	55.77	
Bedside procedures	47	5.48	40
Medical and diagnostic procedures	48	5.6	38
Medical emergencies	22	2.56	18
Patient care	16	1.86	12
Ventilation related procedures	345	40.25	205
Others	16	1.86	
Initiation of oral diet	4	0.46	4
Patient discomfort	6	0.70	5
Temporary withhold	6	0.70	6
GI symptoms	206	24.03	
Abdominal distension	21	2.45	11
Diarrhea and vomiting	30	3.50	20
GI bleed	10	1.166	5
NG aspiration	131	15.28	48
Melena, hematemesis	14	1.633	7

CCU: Critical care unit; GI: Gastrointestinal; NG: Nasogastric; EN: Enteral nutrition

Table 4: Duration of interruption of EN

Duration of feed stopped	Number of patients (%)
<2 h	73 (8.5)
2-6 h	368 (42.9)
6-12 h	250 (29.2)
12-24 h	166 (19.4)
Total	857 (100)

EN: Enteral nutrition

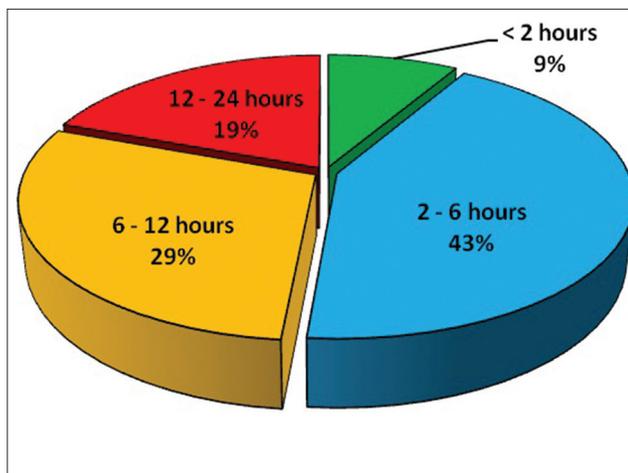


Figure 1: Hours enteral feed interrupted

of interruptions [Table 5]. Interruptions of 2-6 h were more frequent (43%) and most of these (67.1%) were related to procedures inside CCU. Interruptions were longer when it was due to GI symptoms. Of the 19% of interruptions occurring within 12-24 h, GI symptoms alone accounted for 42.7% [Figure 2]. Frequent interruptions like ventilator related procedures led to shorter interruptions (mean: 6.04 h). Interruptions like GI bleed led to longer duration of interruptions (mean: 13.5 h).

Of note, more than 50% of interruption of feeding in critically ill-patients occurred due to "procedures inside CCU," in which, ventilation-related procedures (extubation and intubation), accounted for the majority (40%) and followed by NG tube aspirations (15.28%). Although GI bleed is often considered a reason for feed interruption,^[23] it was one of the least common reasons (1%) in this study.

Discussion

Several studies have demonstrated the benefits of EN in critically ill-patients, in the form of an association with improved nutritional status and decreased risk of death.^[1,2] Higher adequacy of EN has been observed with the use of a feeding protocol as well as early initiation of EN.^[3-5,24] However, studies have reported that in spite of initiating EN on time and adhering to protocols, the deliveries of nutrients remain suboptimal

Table 5: Reasons of interruption versus hours of interruption

Reasons for interruption	Hours feed interrupted				Total	P value
	<2	2-6	6-12	12-24		
GI symptoms	7	71	58	71	207	0.0001
Procedures inside CCU	38	247	151	43	479	
Procedures outside CCU	26	45	36	51	158	
Others	2	5	5	1	13	
Total	73	368	250	166	857	

CCU: Critical care unit; GI: Gastrointestinal

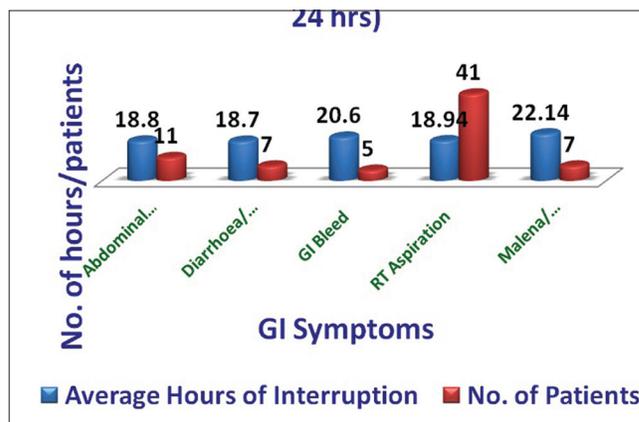


Figure 2: Enteral nutrition interruptions due to gastrointestinal symptoms

in patients.^[15,16] The present study was conducted to assess the underlying reasons affecting nutrition goals, with a focus on reasons for, interruptions.

The results of this study are consistent with earlier studies which revealed that calories delivered were below calculated requirements due to late initiation, interruptions, diagnostic procedures, airway management and other reasons.^[25-27]

It is also seen that sometimes the tolerability of EN is poor, especially in cases of shock, vomiting and digestive intolerance and also when vasoactive drugs or sedatives are used.^[17,28] During this study, feeds were interrupted as per protocol only if gastric residual volumes (GRV) were >500 ml. However, when GRV exceeded 250 ml, the nurses would alert the doctors in the CCU to consider initiation of prokinetic agents. In post-operative patients (GI surgeries), surgeons took a call on initiation of feeds and usually preferred NG aspirate <500 ml/6 h period. Presence or absence of bowel sounds was not considered to make a decision on initiation or maintenance of feeding. EN feeding was avoided if patients required high doses of two or more vasopressors or continued to require increasing doses. Feeding was resumed if the dose was titrated down, based on the clinical decision and not on actual numbers/dose of the vasopressors.

An important observation of this study was that the frequency of EN interruption was less; the number of times feed was stopped was once or twice. Of the 327 patients assessed, EN was stopped only once in 40% of patients and twice in the remaining 60%.

A limitation of our study is that we intended to find only the different reasons and duration of feeding interruptions in our intensive care unit and analyzing the calorie and protein deficit associated with interruptions was outside the scope of this study.

Conclusion

The present study reinforces the fact that interruption during enteral feeding to critically ill patients' may account significantly for suboptimal delivery of recommended calories and proteins. While some of the reasons leading to interruption of feeding may be unavoidable, a change in feeding protocol to suit the needs of patients can help in meeting the nutritional needs. In particular, a focus on avoiding or reducing the duration of holding enteral feeds for procedures in the CCU need to be incorporated in practice guidelines. The findings of the current study could be applicable to

other CCUs, which have a similar patient profile and aid in modifying the protocol and minimizing interruptions in feeding to reach nutrition goals.

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