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Evaluation of the provision of enteral nutrition in critically ill patients receiving mechanical ventilation

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ABSTRAK

Latar Belakang: *Pemberian terapi diet enteral pada pasien yang dirawat di Intensive Care Unit (ICU) seringkali menghadapi tantangan ketika pemberian diet enteral yang adekuat sulit dicapai. Hal ini dapat disebabkan gangguan motilitas gastrointestinal (GI) dan komplikasi lainnya yang terjadi selama pemberian terapi diet enteral. Oleh karena itu, penting untuk memahami bahwa tingkatan dukungan gizi dan tantangan berupa interupsi pemberian diet enteral pada pasien kritis dengan ventilasi mekanikal untuk dapat mengoptimalkan manfaat dukungan gizi diantaranya menurunkan lama rawat, biaya rawat dan mortalitas.*

Tujuan: *Penelitian ini bertujuan mengevaluasi pemberian terapi diet enteral dan mengidentikasi alasan interupsi pada pasien dengan ventilasi mekanikal yang dirawat di ICU salah satu rumah sakit tersier di Yogyakarta*

Metode: *Penelitian ini menggunakan rancangan penelitian potong lintang. Subjek penelitian adalah pasien yang memenuhi kriteria inklusi dan eksklusi. Kriteria inklusi yatu pasien yang menjalani perawatan di di ICU ≥ 72 jam dan menerima ventilasi mekanikal . Sedangkan kriteria eksklusi yaitu pasien yang kontraindikasi untuk diberikan terapi diet enteral seperti hemodinamik tidak stabil, obstruksi usus, ileus berat yang terus menerus, pendarahan saluran cerna, pemasangan NGT tidak dimungkinkan, pasien yang mendapat makanan per oral dengan ventilasi non-invasif, pasien dengan feeding tube sebelum admisi, atau pasien pindahan dari ICU ataupun HCU lain.*

Hasil: *Waktu yang dibutuhkan pasien untuk menerima inisiasi asupan enteral yaitu 13 jam (SD ±9,89 jam), dengan waktu rentang waktu antara 0 sd 50 jam sejak masuk ICU. Waktu rata-rata pasien menerima asupan full feeding (lengkap) adalah 3 hari ± 2,64 hari. Sedangkan untuk jumlah pasien yang tidak mencapai target asupan selama perawatan yaitu sebanyak 16 pasien dari 76 pasien (21,1%). Alasan interupsi pemberian diet enteral antara lain adanya residu/ volume sisa lambung, tindakan percutaneous dilatation tracheostomy (PDT), muntah, kembung, tindakan pembedahan, CT scan dan lainnya.*

Kesimpulan: *Meskipun asupan diet enteral dimulai dini, namun alasan interupsi pemberian diet mengakibatkan waktu mencapai target asupan menjadi lebih lama. Beberapa alasan interupsi sebenarnya masih dapat dihindari. Perlu kebijakan atau aturan bersama yang disepakati oleh anggota tim yang terlibat dalam dukungan gizi pasien di ICU. Adanya protokol pemberian diet enteral diharapkan dapat membantu mengoptimalkan praktik pemberian terapi diet enteral pada pasien yang sakit kritis.*

KATA KUNCI*:* *interupsi pemberian; nutrisi; terapi diet enteral; ventilasi mekanik*

ABSTRACT

Background: *Providing enteral nutrition to ICU patients is often challenging, leading to sufficient enteral nutrition that is hardly achieved. This condition is caused by gastrointestinal motility disorder and other complications that often happen during enteral nutrition provision. Therefore, it is important to understand the level of nutritional support and the challenges in the form of interruption during enteral nutrition to critically ill patients receiving mechanical ventilation to optimise the benefit of nutritional support for patients, including reducing the duration of hospitalisation and mortality.*

Objectives: *This study aims to evaluate the provision of enteral nutrition and identify the cause of interruption for patients with mechanical ventilation in one of the tertiary hospitals in Yogyakarta, Indonesia who receive enteral nutrition.*

Methods: *This is a cross-sectional study. The subject of the study is patients who fulfil the inclusion and exclusion criteria. Inclusion criteria include patients who were in ICU for ≥72 hours, receiving mechanical ventilation. While the exclusion criteria include patients with contraindications for enteral nutrition such as unstable haemodynamic, bowel obstruction, persistent severe ileus, gastrointestinal bleeding, nasogastric tube (NGT) placement is not possible, patients receiving oral nutrition with non-invasive ventilation, patients with feeding tube before admission, or patients from other ICU or HCU.*

Results: *Patients needed, on average, 13 hours to receive initial enteral nutrition (SD ± 9.89 hours), with a period between 0 – 50 hours since admission to ICU. The mean time for patients to receive full feeding is 4 days ± 2.4 days. On the other hand, 16 out of 75 patients (21.2%) did not reach the targeted intake during admission. The cause of the interruption of enteral nutrition includes gastric residual volume (GRV), percutaneous dilatation tracheostomy (PDT) procedure, vomiting, bloating, surgery, CT scan, etc.*

Conclusions: *Many causes of interruption and inadequate intake of enteral nutrition can be prevented. The absence of protocol agreed upon by the patient care team could be one of the influencing factors.*

KEYWORD*:* *enteral nutrition, enteral nutrition interruption, mechanical ventilation*

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INTRODUCTION

Enteral nutrition is recommended to be administered as soon as possible in critically ill patients with good gastrointestinal functions; <24 hours since admission if the haemodynamic is stable to reduce infectious complications. The provision of enteral nutrition is safer compared to parenteral nutrition and correlates with a better outcome, prevents villous atrophy and maintains the normal intestinal mucosal barrier, thereby minimising bacterial translocation, stimulating intestinal perfusion to prevent ischemia-reperfusion injury, and maintaining gut immunity (1,2). However, there are several challenges in delivering sufficient enteral nutrition to ICU patients. These challenges include various gastrointestinal disorders and complications which happen during the provision of enteral nutrition. Intolerance to enteral nutrition variables and the level of intolerance vary from mild to severe. The gastrointestinal complication may come in the form of nausea, diarrhoea, constipation, and bloating (2).

Multiple studies documented gastrointestinal incidents during the provision of enteral nutrition in critically ill patients. For example, a prospective study with 1312 adult patients in ICU with gastrointestinal symptoms and the frequency include nausea and regurgitation (41.3%), gastric residual volume /GRV (22.7%), diarrhoea (14%), bowel distension (10.6%), gastrointestinal bleeding (7.4%) (3). Another prospective study showed that in 5 ICUs, GRV accounted for 56%, nausea and vomiting (50%), distention (28%), diarrhoea (11%), gastrointestinal bleeding (11%), and abdominal pain (7%) (4).

Other clinical studies reported gastrointestinal symptoms as the cause of intolerance to enteral nutrition and interrupted the provision of enteral nutrition (5). Several factors contributing to enteral nutrition inadequacy are not limited to gastrointestinal intolerance, displacement or change of position or obstruction of a feeding tube, therapeutic procedure, airway management or nursing procedures (6). Several studies demonstrated that implementing nutritional support protocol significantly increases enteral nutrition provision to ICU patients receiving mechanical ventilation (7-10).

In this study, the enteral nutrition is mostly provided by bolus either via NGT or OGT and some by gastrostomy or jejunostomy route, with frequency around 6-8 times in 24 hours. The interval of enteral nutrition provision is 2-4 hours. Enteral nutrition is not given to patients between 24.00 to 06.00, considering the time of break for their digestive system. In practice, enteral nutrition by bolus with irregular intervals often caused problems in their digestive system and intolerance to enteral nutrition. Thus, causing an interruption and subsequently affecting the adequacy of the nutrition intake. In addition, there is no specific feeding protocol for enteral nutrition.

The provision of enteral nutrition at the moment is under prescription or doctor's request. However, due to the absence of a specified protocol for enteral nutrition provision, the author assumed that the time needed to start enteral nutrition and the duration to achieve targeted calorie intake becomes longer than needed, even before accumulating interruption time. Thus, this study aims to evaluate the provision of enteral nutrition among patients receiving mechanical ventilation in the ICU and identify the cause of the interruption.

This research helps identify the cause of interruption, initiation time and duration needed to achieve targeted calorie intake. These findings later can be used to compose steps to reduce the interruption of enteral nutrition. In the end, all patients can achieve the targeted calorie intake during their admission to ICU. These benefits are believed to eventually lower admission duration, complications, mortality and cost of care.

MATERIALS AND METHODS

Subject and Study Design

This study used an observational method and a cross-sectional design. The observation was conducted in ICU (Medical ICU and Surgical ICU) in one of the tertiary hospitals in Yogyakarta, Indonesia. Data was collected between October 2019 – September 2020. The sample size was calculated using the cross-sectional sample formula. This study has been approved by Joint Ethics Committee FKKMK UGM-RSUP Dr Sardjito.

Based on a calculation using the purposive sampling method, 76 patients were needed. Inclusion criteria include patients admitted to ICU ≥72 hours and receiving mechanical ventilation. In addition, exclusion criteria include several contraindications for enteral nutrition such as unstable haemodynamic, gastrointestinal obstruction, persistent severe ileus, gastrointestinal bleeding, placement of NGT not possible, patients who receive oral nutrition with non-invasive ventilation, patients with feeding tube before admission, and patients from other ICU or HCU.

Data Collection

Patients admitted to ICU were selected based on inclusion and exclusion criteria. Demographics of all patients were collected for medical records using a questionnaire. Enumerators collected the data needed to evaluate the provision of enteral nutrition, including initiation time for enteral nutrition, nutrition intake per day, and cause of interruption if happens.

Energy Requirement Calculation

This study was conducted in ICU among critically ill patients. The ICU in this study is split into two sections: Medical Intensive Care Unit (MICU) and Surgical Intensive Care Unit (SICU). Subjects of this study were patients from wards with emergency thus have to be moved to ICU, or new patients admitted to ICU and in need of intensive care. Anthropometric data collected were body weight and height. For patients from other wards, anthropometric data were collected from medical records because it has been collected in the previous ward or during their admission.

Meanwhile, anthropometrics data were collected from a family assessment using preadmission information, pre-operative or pre-injury for newly-admitted patients. If their body weight and height are unknown or cannot be measured, ideal body weight and height are used. If the patient's weight is more than 120% of the ideal body weight, adjusted body weight is used with the calculation:

Adjusted body weight = (actual body weight – ideal body weight) x 0.25 + ideal body weight.

The energy requirement is calculated based on a target of 25 kcal/kg body weight/day. Patients' energy intake was monitored every day and compared to the targeted energy intake for each patient. Enteral nutrition initiation time is calculated from the time the patients received invasive mechanical ventilation (day 1) until the first prescription of enteral nutrition was given. The used parameter was in hours. The time needed to achieve targeted enteral nutrition intake was collected from the chart as an explicit statement from the doctor in charge or from the fact that additional parenteral nutrition is stopped and enteral nutrition is no longer increased. The parameter used was in days. For each interruption, the cause was recorded.

Statistical Analysis

Data were analysed using SPSS 16 software. Descriptive analysis was performed to present the characteristics of the subjects using a frequency distribution table and percentage. Continuous variables are presented by mean and standard deviation.

RESULTS AND DISCUSSIONS

Subject Characteristics

There were 76 patients involved in this study with a mean age of 50.28 (±15.72) years. Thus, the highest age group is 50–59 years old. Most of the subjects are male (65.8%) and were admitted to MICU (56.6%).

Furthermore, the educational background of most of the subjects was high school, as shown in **Table 1**.

Table 1. Characteristics of Subjects

Category	N	%
Gender		
Male	50	65.8
Female	26	34.2
Age	*50.28	(15.7)
Age group		
13-19	3	3.9
20-29	8	10.5
30-39	12	15.8
40-49	11	14.5
50-59	19	25
60-69	15	19.7
70-79	6	7.9
80-89	2	2.6
Ward		
Medical ICU (MICU)	43	56.6
Surgical ICU (SICU)	33	43.4
Education		
None	6	7.9
Elementary	11	14.5
Junior High	12	15.8
Senior High	30	39.5
University	17	22.4

*Mean (±D)

Patients' general conditions when they were first admitted to ICU were in the decreased level of consciousness (35.53%), followed by respiratory failure up to ROSC, and the other 21.05% were post-operative patients (**Figure 1**).

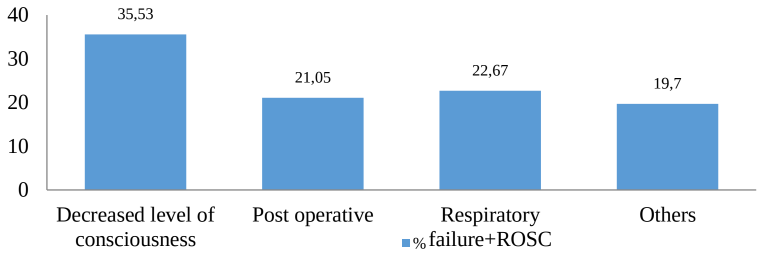

Figure 1. Patients' general conditions when they were first admitted to ICU

The initiation time of enteral nutrition was seen on an integrated patient monitoring sheet, calculated from the initiation of invasive mechanical ventilation until the first prescription of enteral nutrition was given. During this study, the initiation time of enteral nutrition was 11.5 hours (IQR 9 hours). Therefore, the mean time needed for a patient to receive initial intake was 13 hours (SD ± 9.89 hours). Enteral nutrition used in this study consists of blenderised formula and commercial formula (polymeric and semi-elemental). The mean time to receive full feeding is 4 days ± 2.4 days. Thus, around 26.32% of subjects received sufficient intake according to their calorie requirement within 48 hours of their admittance to the ICU. On the other hand, 16 patients (21.1%) did not meet their targeted intake during their admittance.

Table 2. Initiation Time of Enteral Nutrition

N	Mean	Min	Max	SD	Median	IQR
76	13	0	50	9.890	11.50	9

Table 3. Time Needed for Patient to Achieve Targeted Intake

Time	SICU		MICU		TOTAL	
	N	%	N	%	N	%
Not achieved	3	9.09	13	30.23	16	21.05
≤ 48 hours	11	33.33	8	18.60	20	26.32
> 48 – 72 hours	7	21.21	8	18.60	14	18.42
> 72 hours	12	36.36	14	32.56	26	34.21
Total MICU	33	100	43	100.00	76	100
Mean (SD) – day	4	2.45	4	2.38	4	2.4
Median (IQR) – day	3	3	3	2.75	3	3

During this study, interruptions happened to 70 subjects (92%) of 76 subjects—only 6 patients (8%) did not experience interruptions during their admittance. A patient can have multiple interruption episodes with more than one cause. The cause of enteral nutrition interruption, as shown in Table 4, includes GRV, PDT procedure, vomiting, bloating, surgery, CT scan, etc. The most common cause of the interruption is GRV, which accounted for more than 50%, followed by the PDT procedure (30%).

Table 4. Cause of Enteral Nutrition Interruption

Cause of Interruption	N	%
Gastric residual volume (GRV)	60	59.4
PDT procedure	30	29.7
Vomiting	4	4.0
Others	3	3.0
Surgery	2	2.0
Distention	1	1.0
CT Scan	1	1.0
Total	101	100

Most of the patients moved to ICU were in a decreased level of consciousness (35.53%) followed by post-operative, respiratory failure, etc. The decreased level of consciousness refers to the absence of a physiological response to external stimuli or needs in oneself. Impaired consciousness of patients treated in ICU can be caused by several factors, including impaired blood circulation to the brain in stroke patients, infections, metabolism disorders, head injury, also electrolyte and endocrine disorders (11). The incidence of loss of consciousness was 30.8%; a patient with loss of consciousness is at risk to be administered to ICU, airway management, pain management, and CVC procedure (12).

Respiratory failure is a clinical condition that happens when the respiratory system failed in maintaining its main function, gas exchange, which means the PaO2 level is < 60 mmHg and/or PaCO2 is > 50 mmHg (13). Respiratory failure is a condition with disturbances caused by the lungs, chest wall, or brain resulting in no oxygenation of arterial blood and incomplete carbon dioxide removal. Other than the decreased level of consciousness and post-operative, there are other conditions of patients admitted to MICU and SICU, including patients with distressed respiratory and post-ROSC. The failure of multiple organs has a mortality rate of 15-28%, and when more than one organ system fails, the mortality rate rises to 61%, followed by sepsis with a mortality rate of 51% (14).

The mean time needed for a patient to receive initial intake in this study was 13 hours (SD ± 9.89 hours) faster compared to a study conducted by O'meara et al. (15) and Yip et al. (16). Meantime needed before initial enteral nutrition since admittance to MICU was 39.7 hours (SD ± 36.3 hours; median 26 hours; 95% CI 16.3 – 36.6) (15). Meanwhile, Yip et al. (16) reported quite a wide range between 0 – 110 hours before the initial provision of enteral nutrition for patients in the ICU, with a median of 15 hours (IQR 6 – 59 hours).

This finding follows the new recommendation (2016) from the Society of Critical Care / American Society of Parenteral and Enteral Nutrition Guidelines for the Provisions and Assessment of Nutrition Support Therapy in the Adult Critically Ill Patient Guidelines (SCCM / ASPEN Guidelines), which states that the provision of enteral nutrition can be started within 24 to 48 hours since the admittance to ICU for all critical patients, which cover all patients receiving mechanical ventilation. Another reason to support the early provision of enteral nutrition also that fibre can prevent intestinal mucosal atrophy and attenuation of gastrointestinal peristalsis since the energy substrate for the intestinal mucosa is partially supplied via intraluminal. In addition, it is believed that early initiation of enteral nutrition can prevent bacterial translocation (17). The early provision of sufficient energy and protein for ICU patients is proven to affect clinical outcomes such as ventilator-free days, ICU-free days, duration of hospitalisation, wound healing, the incidence of nosocomial infections, and mortality (10,18).

After the early initiation of enteral nutrition, the next step is to determine whether enteral nutrition can be systematically increased to achieve the target volume. In general, the amount of enteral nutrition administered to critically ill patients in the first week is set at around 80% of the target volume (19).

The success rate in achieving the targeted volume of enteral nutrition within 72 hours is reported to be 30-85%, when enteral nutrition is initiated after haemodynamic stabilisation, even before confirmation of peristalsis. Criteria for assessing haemodynamic stabilisation vary among facilities. Kozar et al. (20) used the criterion of administering a small dose of an inotropic agent (for example, 0.1 g/kg/min norepinephrine) or when the inotropic agent could be reduced.

The mean time needed for patients to achieve full feeding was 4 days ± 2.4 days. Thus, around 26.32% of the subjects received sufficient intake according to calorie requirements within 48 hours of their admittance to the ICU. The mean time is comparably lower than reports by Yip et al. (16), which recorded that 36 (47%) out of their 77 patients achieved full feeding in 12 hours since admittance to ICU and 12 (15.6%) patients did not achieve full feeding during their admission. While in this study, 16 subjects (21.1%) out of 76 patients did not achieve full feeding, which is comparably higher than the study by Yip and Wong (16).

A study in a Korean hospital ICU that assessed the adequacy of energy and protein intake of patients admitted to the first four days of enteral intake showed that as many as 62% of patients did not receive adequate energy intake, while the rest 29% received adequate energy intake. Logistic regression analysis showed that the factors associated with energy underfeeding were early initiation of enteral nutrition, lack of energy prescription and prolonged interruption/interruption of prescribed enteral nutrition (21).

The most common cause of interruption was the presence of gastric residue (> 50%), followed by the PDT procedure (30%). Similar findings regarding the cause of interruptions were also reported (16, 22,23).

Several factors can cause interruption of the provision of enteral nutrition; (re) intubation/extubation, bedside procedure including airway and proximal gastrointestinal tract, and imaging studies (10). Another study disclosed several other causes of interruption, including airway manipulation, T-piece trial, tracheostomy, surgery, intermittent dialysis, other procedures outside the ICU, ICU procedures, and physiotherapy (24).

The longer duration of gastrointestinal break may prolong the weakening of gastrointestinal peristalsis. Discontinuation of enteral nutrition or interruption of enteral nutrition can cause prolongation and deterioration of the paralytic ileus; it is critical to minimise the duration of fasting for diagnostic and treatment procedures. Patients' intolerance has been reported to be one-third of the reasons for discontinuing enteral nutrition (17)

Apart from enteral nutrition, some altered gastrointestinal function and symptoms can still occur in critically ill patients, triggered by multiple factors like diseases, general condition, the metabolic state before onset, respirator setting, and medication. In addition, an altered gastrointestinal function may be associated with intestinal intolerance during the provision of enteral nutrition. The mechanism of an altered gastrointestinal function in critically ill patients or postoperative patients can be classified as mucosal barrier failure, attenuation of gastrointestinal peristalsis and atrophy of intestinal mucosa, decreased gut-related lymphatic tissue and so on (17).

Gastrointestinal dysfunction often happens in critically ill patients between 7% - 46% in ICU. Gastrointestinal dysfunctions are impaired gastric emptying (NGT residue/gastric residual volume) and intestinal dysmotility, which can cause regurgitation, increasing the risk of aspiration and pneumonia associated with ventilator use. Monitoring gastric residual volume is becoming a routine practice to assess enteral nutrition tolerance and gastric emptying in the ICU. The gastric residual volume was obtained by suctioning the gastric contents through an enteral tube using a syringe. Therefore, the gastric residual volume can reflect the contents retained in the stomach. Still, scientific evidence proving that the gastric residual volume can be used to accurately determine food intolerance remains scarce. Thus, it is still a controversial topic (25).

In this study, the gastric residual volume was determined by the aspiration of a syringe through a feeding tube every 3-4 hours. The intervention administered to the measured gastric residual volume did not follow a defined protocol. Until this study was conducted, there was no specific protocol set for enteral nutrition in our institution. Therefore, the decision to increase the volume of enteral nutrition tends to be slower, despite good acceptance from the patients.

A report by Wang et al. (25) found that not monitoring gastric residual volume does not increase the incidence of enteral nutrition intolerance, ventilator-related pneumonia, mortality, the duration of mechanical ventilator usage or duration of hospitalization in the ICU. However, not monitoring gastric residual volume is associated with a significant increase in the incidence of vomiting.

Guidelines from the Society of Critical Care Medicine (SCCM) and the America Society for Parenteral and Enteral Nutrition (ASPEN) recommend measuring gastric residual volume every four hours. A gastric residual volume between 200-500 ml should raise concern and lead to the implementation of measures to reduce the risk of aspiration. However, automatic discontinuation of feeding should be avoided for a gastric residual volume of <500 ml in the absence of other signs of disturbance (26).

Differences in the definition and interpretation of abnormal gastric residual volume affect clinical practice. Increasing the volume of enteral nutrition to the optimal volume or according to the target is determined based on routine monitoring and interpretation of the remaining gastric residual volume and colour. Colours such as bile stains, especially dark green gastric residue, are often interpreted as enteral nutrition intolerance and are discarded. Nevertheless, there is no evidence to support such a practice. Eliminating dark green gastric residue containing bile acids is a potential barrier to optimizing enteral nutrition. Bile acids have physiological roles in regulating intestinal motility, liver lipids, glucose, and energy homeostasis. In addition, bile acids have anti-inflammatory agents and may have an important role in regulating innate immunity's gut and hepatic components (27).

The next most common cause of an altered gastrointestinal function is percutaneous dilatation tracheostomy (PDT). Procedures such as PDT, tracheostomy, surgery, and radiological imaging often require fasting before the procedure. Evaluation and timing of fasting should be made on a case-by-case basis, and decisions should be made based on the type of procedure and surgery (abdominal, airway, or peripheral) or imaging requirements at the discretion of the ICU consultant. In practice, PDT in our institution does not always require fasting before the procedure, which is decided by the consultant who will carry out the procedure. Nonetheless, interrupting the provision of diet for any reason in the ICU can be avoided, especially if there is a delay in the previously planned PDT for reasons unrelated to the patient's condition being unable to proceed. The delay in PDT in patients can occur two to three times during the hospitalization period.

A cohort study conducted on 94 ICU patients at Boston teaching hospital regarding the cause and consequences of interrupting enteral administration showed that as many as 26% of those who experienced diet interruptions considered the interruption to be avoided. Group 1 (n = 64) had a higher mean daily and cumulative calorie deficit than Group 2 (n = 30). In addition, patients in Group 1 had a three times higher risk of being underfed and 30% more risk of prolonged ICU stay and 50% more risk of prolonged hospitalisation (10).

Several studies highlight the importance of feeding protocols in the ICU. The existence of a nutrition protocol can optimise enteral nutrition practice in critically ill patients (8,28-30). Based on the evidence, protocol implementation promotes enteral nutrition compared to parenteral nutrition, unless there is a contraindication to early enteral nutrition, provides prokinetic administration, tolerates gastric residue (≤ 250 ml), uses duodenal access when available, and seeks to minimise interruption of diet (29).

Furthermore, Kozar et al. (20) reported that this rate reached 70-85% of the target when an enteral nutrition protocol was used. The use of an enteral nutrition protocol is recommended to achieve the target number of enteral nutritionists. Factors considered in the protocol include criteria, condition and contraindications to initiate enteral nutrition; route of administration (gastric vs jejunal/postpyloric); the method used (bolus, intermittent, continuous); the target volume of enteral nutrition formulas; the selection of the type of formula, the flow rate of the initiation and the change of the flow rate; evaluation of gastrointestinal tolerance (gastric residual volume or abdominal X-ray); complications management; and routes administration management (flushing a feeding tube, etc) (17).

Enteral nutrition protocol is important to optimize the quality of the provision of enteral nutrition. However, successful implementation requires an active strategy for the dissemination/ deployment of the protocol included with the opinions of leaders and experts, education at different levels, audits and feedback, involving all medical professionals and other related professions (31).

CONCLUSIONS AND RECOMMENDATIONS

Even though enteral nutrition was initiated early, the cause of interruption may impact the time needed to achieve targeted intake and make it longer. However, several causes of interruption can be prevented. First, a policy or rule needs to be approved by all teams involved in patient nutrition care. Second, a nutrition provision protocol can help the provision of enteral nutrition to critically ill patients. Finally, future research should control any confounding variable that may interfere with the provision of enteral nutrition or mechanical ventilation interruption.

CONFLICT OF INTEREST

The authors state that there is no conflict of interest in this study.

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