Original Article

The impact of implementation of an enteral feeding protocol on the improvement of enteral nutrition in critically ill adults

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Background and Objectives: The optimal delivery of enteral nutrition (EN) may improve clinical outcomes in critically ill patients; thus, optimal EN protocols should be developed. The purpose of this study was to evaluate the impact of implementing an EN protocol on the improvement of EN practices and on the clinical outcomes of critically ill patients. **Methods and Study Design:** This was a retrospective study with prospectively collected data. Multidisciplinary working group developed an evidence-based EN protocol based on an extensive review of literature and existing guidelines. Subjects included patients consecutively admitted to the ICU who received EN for more than 24 hours. EN practices and clinical outcomes were compared before and after implementation of the protocol. **Results:** A total of 270 patients were included, 134 patients before implementation and 136 after implementation of the protocol. EN was initiated earlier (35.8 vs 87.1 hours, p=0.001) and more patients received EN within 24 hours (59.6% vs 41.0%, p=0.002) after implementation of the protocol. The interval between starting EN and reaching the caloric goal was not different, but more patients reached the caloric goal after implementation (52.2% vs 38.3%, p=0.037). The post-implementation group was given more prokinetics and less parenteral nutrition. The incidences of diarrhea and gastrointestinal bleeding significantly decreased following implementation of the protocol. There was no difference in clinical outcomes including in-hospital mortality and length of hospital and ICU stay. **Conclusion:** The implementation of the EN protocol significantly improved the practices of EN and decreased complications in critically ill patients. Clinical outcomes were not different before and after implementation.

Key Words: intensive care units, critical illness, nutrition therapy, enteral nutrition, clinical protocols

INTRODUCTION

Adequate nutrition administered via enteral nutrition (EN) and parenteral nutrition (PN) is essential to critically ill patients and helps to prevent malnutrition and accompanying complications.[1-3] The use of enteral nutrition and early enteral feeding has been shown to improve clinical outcomes in critically ill patients.[1,2] Despite its benefits, not all eligible patients receive optimal enteral nutrition because of factors such as delays in physician decision-making, under-estimation of caloric requirements, and frequent interruption of feeding.[4]

There are many ways in which the practice of enteral feeding can be improved. The development and use of an evidence-based protocol is one such example. A nutrition management protocol is known to help overcome the barriers to proper EN and play an essential role in improving nutritional support for critically ill patients. In addition, applying a protocol allows standardization of daily clinical practice. Therefore, it improves the quality and safety of EN feeding.

In countries with limited medical resources, it is difficult to deliver optimal nutrition support because of shortages innutrition support team (NST) staff as well as lack

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of adequate medical insurance. In the present study, we evaluated the usefulness of an evidence-based enteral feeding protocol to improve the practice and clinical outcomes in an intensive care unit (ICU) that had previously had limited nutritional support structures in place.

METHODS

Study design and population

This was a retrospective study that evaluated the impact of an enteral nutrition protocol (Figure 1) on the nutrition practices and clinical outcomes in a medical and surgical ICU at a university teaching hospital. The institutional review board at our center approved the study protocol (2011-10-075).

Samsung Medical Center is a Sungkyunkwan University School of Medicine teaching hospital with 1,951 beds located in Seoul, Korea. There are 23 beds in the surgical intensive care unit and 30 beds in the medical ICU. Patients treated in the medical or surgical ICU were enrolled in this study.

This study reviewed the patients who were admitted to either the medical or surgical ICU from January 2010 to August 2011. The group prior to implementation of the program included patients admitted between January 2010 and May 2010. The post-implementation group included patients admitted between April 2011 and August 2011. Patients who were admitted between June 2010 and March 2011 were excluded because the protocol was developed during this time period.

The study population consisted of patients admitted to the medical and surgical ICU who received EN for more than 24 hours. All patients were adults (>18 yrs old) whose stay in the ICU was greater than 48 hours. Exclusion criteria included those who were under 18 years of age, patients eligible for oral diet or who were going to be put on an oral diet within 24 hours, those whose life expectancy was less than 24 hours, those who were going to be put on palliative care, and those who were brain dead or in imminent danger of becoming brain dead. Also excluded were those who were coded as Do Not Resuscitate

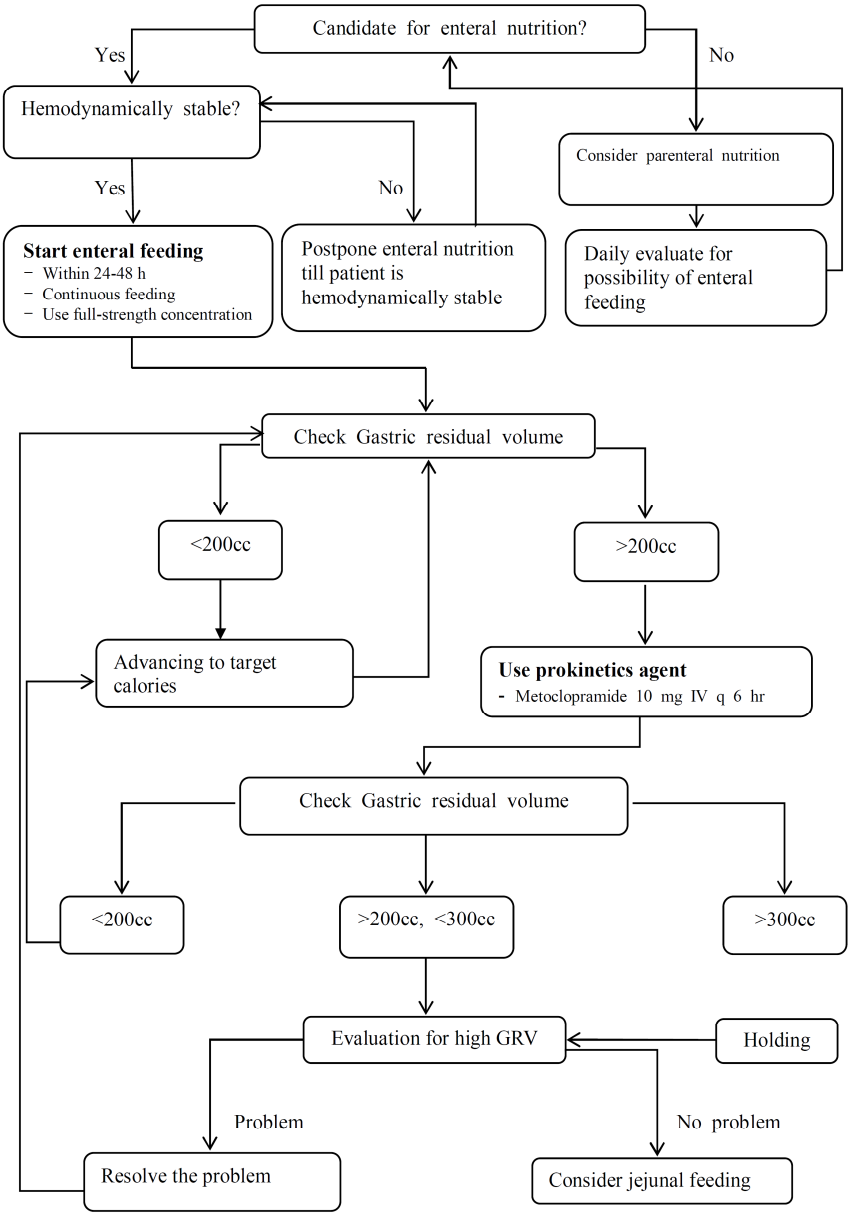

Figure 1. Enteral nutrition protocol

Table 1. Proposed schema for defining adult protein-energy malnutrition based on the malnutrition codes of the ICD-9-CM

Malnutrition	Code	Definition
Kwashiorkor	ICD-9-CM code 260	• Weight loss ≤10% • Albumin level <25 g/L
Malnutrition of moderate degree Mixed marasmus-hypoalbuninemia	ICD-9-CM code 263.0	• Weight loss >15% • Albumin level ≤32 g/L
Nutritional marasmus	ICD-9-CM code 261	• Weight loss >20% and <80% ideal body weight or <70% ideal body weight alone • Albumin level ≥25 g/L
Malnutrition of mild degree Mixed marasmus-hypoalbuninemia	ICD-9-CM code 263.1	• Weight loss 10% to 15% • Albumin level ≤32 g/L
Other severe protein-energy malnutrition	ICD-9-CM code 262	• Weight loss >10% • Albumin level <25 g/L
Other protein-energy malnutrition Anticipate prolonged length of stay (actual or predicted)	ICD-9-CM code 263.8	1. Not depleted but stressed or septic • Weight loss <5% • Albumin level ≤32 g/L 2. Moderate weight loss with planned major surgery • Weight loss >10% • Albumin level >32 g/L 3. Moderate depletion with mild weight loss • Weight loss >5% • Albumin level ≤32 g/L 4. Inability to eat ≥7 days

If a patient could be classified with a major code (260, 261, or 262) and a minor code (263.0, 263.1, or 263.8), the major code was chosen. To convert g/L albumin to g/dL, multiply g/L by 0.1. To convert g/dL albumin to g/L, multiply g/dL by 10.

(DNR), pregnant or lactating women, those who were readmitted to the ICU, those who had been transferred from another ICU, and those whose length of stay (LOS) was <48 hr. Enteral nutrition was postponed if the patient was hemodynamically unstable.

Enteral feeding protocol

There was no standard protocol for enteral nutrition in our hospital until 2010. Until then, each physician and surgeon would administer enteral nutrition using his/her own clinical judgement. The multidisciplinary working group, which included NST physicians, dietitians, nurses, pharmacists, and intensive care specialists, developed an evidence-based protocol through extensive review of the literature and existing guidelines. We implemented the protocol for each patient that was admitted to the medical or surgical ICU after April 2011, after several rounds of staff education and iterative protocol revision.

The EN protocol encouraged early initiation of enteral feeding (24-48 hours after ICU admission) if there were no contraindications. These included hemodynamic instability and intravascular volume that was not fully resuscitated, because such cases may be predisposed to bowel ischemia.[5] Other contraindications included bowel obstruction, severe and protracted ileus, major upper gastrointestinal bleeding, intractable vomiting or diarrhea, gastrointestinal ischemia, and a high-output fistula.

If EN was indicated, enteral feeding formula was given at a volume of 20 cc/hr at first and increased by 10 cc/hr every 24 hours until the caloric target was achieved. Caloric target estimates for each patient were 20-25 kcal/kg during the acute phase and 25-30 kcal/kg during the stable phase. Adjusted body weight was utilized for this calculation. Patients received enteral feeding through a nasogastric drainage tube (Levin tube) prior to implementation of the protocol because of health insurance regulations, but a nasogastric feeding tube was utilized upon implementation of the protocol. Continuous feeding was recommended during the acute phase in the ICU. If gastric residual volumes were 200 mL or more, a reduction in feeding rate or the use of motility agents was recommended. If high gastric residual volume persisted, or if aspiration risk was high, nasojejunal feeding was recommended. Metoclopramide was used as the motility agent of choice in this study.

Data collection and statistical analysis

This was a before-and-after implementation study with prospectively collected data. Basic demographic data were collected, including age, sex, nutritional status, height, weight, reason for admission, department of admission, laboratory test results, and initial Sequential Organ Failure Assessment (SOFA) score. A nutritional diagnosis was performed using the patient's medical history, a physical examination, biochemical analysis, and functional testing. Protein-energy malnutrition was evaluated based on ICD-9-code[6] (Table 1). A dietitian diagnosed extent of malnutrition in each patient using information such as IBW, weight loss, albumin, and total lymphocyte count. The details of ICD-9-code we applied are explained in Table 1.

The objective of this study was to compare the nutritional practices and clinical outcomes between pre- and post-EN protocol implementation. We evaluated protocol compliance and adequate nutritional practice by assessing time to EN initiation, achievement of target calories intake, feeding method and route, frequency of interruption of EN delivery, and the use of pumps and prokinetics

Table 2. Basic characteristics between before and after implementation

		Before implementation	After implementation	*p* value
n		134	136	
Sex (men: women)		94:40	94:42	0.854
Age (years), mean±SD		65.0±15.4	62.4±14.7	0.151
Initial SOFA score, mean±SD		7.75 ±3.3	7.24 ±3.9	0.308
Department, n (%)	Gastro	4 (1.5)	1 (0.7)	0.543
	Cardiology	1 (0.7)	0 (0.0)	
	Pulmonology	94 (41.8)	46 (32.4)	
	Nephrology	9 (4.5)	6 (4.4)	
	Oncology	68 (26.1)	46 (33.8)	
	Infection	28 (9.0)	9 (6.6)	
	general surgery	21 (8.9)	22 (16.2)	
	Other	13 (5.8)	6 (4.4)	
Intensive care unit, n (%)	Medical	121 (90.3)	113 (83.1)	0.081
	surgical	13 (9.7)	23 (16.9)	
Cause of admission, n (%)	After scheduled surgery	5 (3.7)	12 (8.8)	0.471
	After unscheduled surgery	6 (4.5)	7 (5.1)	
	Cardiac problem	9 (6.7)	5 (3.7)	
	Pulmonary problem	81 (60.4)	75 (55.1)	
	Neurologic problem	5 (3.7)	5 (3.7)	
	Gastrointestinal problem	0 (0)	2 (1.5)	
	Severe sepsis/septic shock	22 (16.4)	22 (16.2)	
	Other	6 (4.5)	8 (5.9)	

Table 3. Comparative summary of overall nutritional status

		Before	After	*p* value
Nutrition status, %	Nourished	3.0	5.9	0.214
	Mild	48.5	57.4	
	Moderate	34.3	26.5	
	Severe	14.2	10.3	
Anthropometric, mean±SD	Height (cm)	165±8.5	163±8.2	0.151
	Ideal body weight (kg)	59.0±6.9	58.0±7.0	0.255
	Actual body weight (kg)	59.2±10.9	60.0±10.8	0.726
	BMI(kg/m^2)	22.0±17.2	22.4±16.4	0.532
	IBW percent (%)	101±3.6	103±3.6	0.201
Target calories (kcal), mean±SD		1,489±226	1,506±234	0.559

BMI: body mass index; IBW: ideal body wight.

during the study period. We also compared clinical outcomes and complications related to the protocol including 28-day and 60-day mortality, length of hospital and ICU stay, and the incidences of aspiration, diarrhea, constipation, and gastrointestinal bleeding.

Pulmonary aspiration was detected by monitoring its clinical manifestations (desaturation, tachycardia, and cyanosis) continuously and by inspecting tracheal secretions for any blue coloration during tracheal suctioning. Oxygen saturation was monitored using a pulse oximeter, and it was considered low (desaturated) if it was <90%.[6] Heart rate was assessed by continuous cardiac monitoring and was considered tachycardia if it was >100 beats/min.[7,8] Diarrhea was defined as 3 or more loose or watery stools per day or 1 or 2 loose stools in 24 h, accompanied by at least 1 of the following symptoms: nausea, vomiting, abdominal cramps, or fever of 38.9 degrees C or higher.[9] Constipation was defined as per the Rome III criteria. Gastrointestinal bleeding was diagnosed when a patient showed symptoms like melena or hematochezia.

All variables were compared in patients before and after implementation of the protocol. The categorical data were compared using a Chi-square test or Fisher's exact test. Continuous variables were compared with independent *t*-test or Mann Whitney test, using two-sided testing. $p<0.05$ was considered statistically significant. All data were analyzed with SPSS statistics 22 (IBM, Chicago, IL).

RESULTS

A total of 270 patients were enrolled in this study. Of them, 134 were treated before implementation of the protocol, and 136 were treated post-implementation. The baseline characteristics of the study subjects are summarized in Table 2. Basic characteristics including age, sex, department and cause of admission, and SOFA score were not significantly different between the two groups. The most common reasons for admission were pulmonary conditions; severe sepsis and/or septic shock were the second most common.

The overall nutritional status of the two groups was similar (Table 3). Target caloric intake for individuals in

Table 4. Nutritional practices

	Before	After	*p* value
Combined PN support, no. (%) of patients	75 (56.0)	57 (41.9)	0.021
Mean time from ICU admission to EN (hours)	87.1	35.8	0.001
Received EN within 24 hours from ICU admission, (%)	41.0	59.6	0.002
Interruption of EN, no. (%) of patients	93 (69.4)	100 (73.5)	0.473
Mean EN support days (days)	14.8	15.4	0.724
Patients who reached caloric goal during ICU stay (%)	38.3	52.2	0.037
Weight change, mean (kg)	- 1.9	-1.5	0.568
Feeding route, no. (%) of patients			0.000
Feeding tube	1 (0.7)	126 (92.6)	
Levin tube	132 (98.5)	1 (0.7)	
Gastrostomy	1 (0.7)	4 (2.9)	
Jejunostomy	0 (0)	5 (3.7)	
Route, no. (%) of patients			
Nasogastric	131 (99.2)	127 (100)	
Nasojejunal	1 (0.7)	0 (0)	
Delivery method, no. (%) of patients			
Intermittent	121 (90.3)	1 (0.7)	<0.0001
Continuous	12 (9.7)	135 (99.3)	
Use of feeding pump, no. (%) of patients	14 (10.4)	134 (98.5)	<0.0001
Use of motility agents, no. (%) of patients	46 (34.3)	73 (53.7)	0.001

both groups was not significantly different. Comparison of anthropometries, such as height and weight, did not reveal significant differences. Only a small fraction of patients were well nourished: 3.0% in the cohort prior to implementing the protocol and 5.9% in the post-implementation group. Almost all patients in both groups were mildly to moderately malnourished at the time of admission.

Overall, enteral feeding protocol compliance was 72.1% after implementation (Table 4). The most common cause of protocol violation was noncompliance with the gastric residual volume (GRV) threshold. Other common causes of protocol violation were appropriate and timely increase in caloric content, use of prokinetics, and changing to jejunal feeding. Enteral feeding was initiated earlier (35.8 post- vs 87.1 hours pre-implementation, p=0.001) and more patients received EN within 24 hours (59.6% post- vs 41.0% pre-implementation. p=0.002) after implementation of the protocol (Figure 1). The interval between starting EN and reaching the caloric goal was not different between the two groups; however, more patients reached the caloric goal after implementation (52.2% post- vs. 38.3% pre-implementation, p=0.037). In the pre-implementation group, 56.0% of patients received both enteral and parenteral nutrition, but only 41.9% of patients received both enteral and parenteral nutrition in the post-implementation group (p=0.021). In the pre-implementation group a Levin tube was used for feeding almost all patients (there were two exceptions, one of whom received a feeding tube and the other a gastrostomy), but in the post-implementation group, every patient but one received a feeding tube. Feeding was intermittent before implementation of the protocol, but after implementation, patients received feeding more continuously. A pump was used for feeding post-implementation. The post-implementation group was given more motility agents (53.7% post- vs 34.3% pre-implementation, p=0.001). There were no differences in the number of patients whose feeding was interrupted more than once between the two groups (69.4% pre- vs 73.5% post-implementation, p=0.473).

Table 5. Clinical outcomes

	Before	After	*p* value
Hospital death	125 (46.3%)	37 (35.6%)	0.061
28-days death	74 (27.4%)	22 (21.2%)	0.215
60-days death	103 (38.1%)	31 (29.8%)	0.132
ICU death	113 (41.9%)	34 (32.7%)	0.104
ICU LOS (days)	19.4	20.1	0.661
Hospital LOS (days)	45.3	48.7	0.752
Aspiration	1 (0.7%)	2 (1.5%)	0.570
Diarrhea	70 (52.2%)	29 (21.3%)	<0.0001
Constipation	16 (11.9%)	39 (28.7%)	0.001
GI bleeding	16 (11.9%)	7 (5.1%)	0.046

Hospital death, 28-day death, 60-day death, ICU death, Aspiration, Diarrhea, Constipation, GI bleeding; chi-square test.
ICU LOS, Hospital LOS; Mann-Whitney test
LOS: length of stay; number of days in the ICU; number of days in the hospital.

Comparison of all-cause hospital mortality and 28-day death rate, 60-day death rate, and ICU death rate revealed no statistically significant differences (Table 5). However, this analysis showed that overall mortality rates decreased after implementation.[2] The total length of ICU stay and hospital stay were not different between the two groups.

Comparison of aspiration rates revealed no difference between the pre- and post- implementation groups (0.7% pre- vs 1.5% post-implementation, p=0.57). The incidences of diarrhea[11-13] and gastrointestinal bleeding were significantly reduced after implementation. On the contrary, however, constipation levels increased following enteral feeding protocol implementation (11.9% pre- vs 28.7% post-implementation, p=0.001).

We obtained patient laboratory data including WBC, lymphocyte, protein, albumin, prealbumin, bilirubin, AST, ALT, BUN, Cr, TG, cholesterol, and BST counts and

Table 6. Laboratory test results

		Before implementation	After implementation	*p* value
WBC ($\times 10^3/\mu L$)	Admission	11.7	11.8	0.588
	Day 4	11.8	10.7	0.633
	Day 7	12.4	13.0	0.038
	Discharge	14.1	13.0	0.579
Lymphocyte ($\times 10^3/\mu L$)	Admission	12.4	14.3	0.077
	Day 4	10.5	13.3	0.090
	Day 7	9.13	9.32	0.176
	Discharge	11.1	12.1	0.204
Protein (g/dL)	Admission	5.38	5.09	0.412
	Day 4	8.45	4.83	0.169
	Day 7	5.13	4.82	0.613
	Discharge	5.16	4.98	0.356
Albumin (g/dL)	Admission	2.80	2.88	0.317
	Day 4	2.75	2.74	0.094
	Day 7	2.76	2.70	0.362
	Discharge	2.75	2.83	0.080
Prealbumin (mg/dL)	Admission	10.3	8.40	0.011
	Day 4	12.5	11.0	0.724
	Day 7	12.2	11.2	0.754
	Discharge	12.7	12.2	0.243
Bilirubin (mg/dL)	Admission	2.57	2.43	0.897
	Day 4	2.10	2.85	0.069
	Day 7	2.55	3.32	0.341
	Discharge	3.33	3.76	0.414
ALT (U/L)	Admission	74.9	112	0.054
	Day 4	56.6	71.8	0.063
	Day 7	59.9	58.9	0.323
	Discharge	109	119	0.922
AST (U/L)	Admission	108	147	0.137
	Day 4	55.5	53.2	0.672
	Day 7	68.4	56.7	0.280
	Discharge	229	204	0.782
BUN (mg/dL)	Admission	30.1	28.9	0.486
	Day 4	34.4	29.6	0.021
	Day 7	38.3	32.3	0.026
	Discharge	40.4	35.9	0.340
Cr (mg/dL)	Admission	1.42	1.20	0.006
	Day 4	1.30	1.01	0.000
	Day 7	1.56	1.12	0.012
	Discharge	1.32	1.13	0.081
Cholesterol (mg/dL)	Admission	102	116	0.224
	Day 4	103	96.3	0.140
	Day 7	108	99.2	0.295
	Discharge	134	131	0.350
Mean BST (mg/dL)	Admission	191	187	0.138
	Day 4	196	194	0.042
	Day 7	194	198	0.144
	Discharge	181	193	0.550

compared these values between the groups (Table 6). Total bilirubin and ALT were statistically different between the two groups. Bilirubin levels were not different at baseline (p=0.44), but the post-implementation group showed higher values on the 4th and 7th ICU day and at discharge (p=0.38, 0.01, 0.23). ALT levels were higher at baseline and at discharge in the post-implementation group, but the difference was not statistically significant (p=0.17, 0.26). Albumin levels were significantly higher at discharge in the post-implementation group (p=0.04).

DISCUSSION

In the present study, we compared the improvement of enteral nutrition practices and clinical outcomes between pre- and post-enteral feeding protocol implementation groups. Overall protocol compliance was 72.1%. Initiation of enteral feeding was faster;[14] more patients were started on enteral feeding within 24 hours of admission to the ICU after implementation of the protocol. The time interval between starting feeding and reaching the caloric goal was not different between the two groups, but more patients reached the caloric goal after implementation of the protocol. More patients were given feeding tubes and feeding pumps, and the use of prokinetics[15] increased after implementation. The use of PN decreased because of improvements in EN practice. These finding suggest that implementation of a standardized enteral feeding protocol can lead to significantly improved enteral nutrition prac-

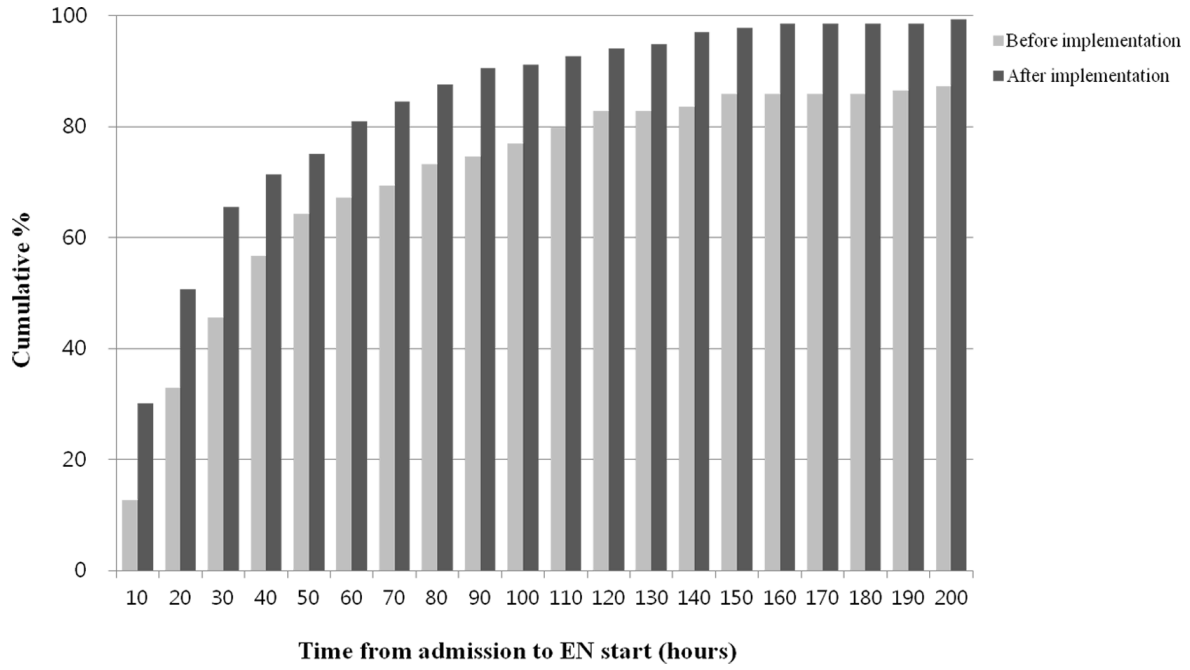

Figure 2. Mean time from admission to EN start (before, 87.1 vs. after, 35.8, p=0.001)

tices for patients admitted to the medical and/or surgical ICU.

These finding are consistent with prior studies on nutrition protocol in the ICU. Heyland et al (2010) conducted a multicenter observational study comparing sites that did and did not use a feeding protocol. Sites with a defined protocol used more enteral nutrition alone, started EN earlier, and used more motility agents in patients with high gastric residual volume.[16] Doig et al[17] conducted a randomized multicenter study of guideline implementation, and found that the ICUs in which guidelines were applied fed patients earlier and achieved caloric goals more often. However, there was no difference in in-hospital mortality and hospital and ICU length of stay.

Limited resources are available to deliver enteral nutrition in Korea because government insurance does not reimburse many aspects of the necessary practices. Such constraints result in inadequate enteral nutrition for critically ill patients. Protocol implementation could be helpful despite this economic consideration. We consider this to be the major policy implication and clinically applicable finding of our study.

More patients reached target caloric intake following implementation of the protocol in our study (Figure 2), but this goal was achieved later than it was in prior studies.[16,18] This may be related to the fact that we increased enteral feeding 10cc/hr every 24 hours whereas other protocols increase it every 8-12 hours. The protocol used in this study took a more conservative approach than that of other studies; this is a limitation that needs to be revised.

In the present study, mortality showed a decreasing trend in the post-implementation group, although the difference was not statistically significant. Prior studies have shown similar results.[19,20] A study by Arabi et al demonstrates that their feeding protocol was associated with improvements in overall caloric and protein intake and in meeting nutritional requirements, but there was no change in the duration of mechanical ventilation, ICU or hospital length of stay, or mortality after protocol implementation.[2,21] Additional studies have confirmed these findings.[16,17] However, other reports have found conflicting results. Barr et al reported that in the post-implementation group, the mean duration of mechanical ventilation was shorter and the risk of death was lower in patients who received enteral nutrition.[4] Martin et al showed that in the post-implementation group, patients received more days of enteral nutrition, had a shorter mean length of stay in the hospital, and showed a trend towards reduced mortality.[22] We expected that there could be differences between the two groups because the ratio of malnutrition was higher in this study, but trends towards clinical improvements were not statistically significant. Admittedly, the retrospective nature of our study leaves it with limited statistical power and, moreover, the study was not designed to assess mortality.

Among the complications of EN, GI bleeding and diarrhea were significantly reduced after implementation of the protocol. It appears that the feeding tube and continuous feeding may have played a key role. Feeding tubes are usually made of polyurethane or silicone, whereas a Levin tube is a rubber or plastic tube with a large-bore single lumen, typically used for decompression or lavage but not for feeding. It is possible that the Levin tube could be more irritating to the gastric or esophageal mucosa because of its stiffness.[23] In Korea, use of the feeding tube is limited because medical insurance often does not cover it, but the feeding tube, nonetheless, should be made available to all critically ill patients. Continuous feeding may reduce the incidence of diarrhea. Stevens et al found that diarrhea occurred in more patients and for a longer duration in those receiving intermittent enteral nutrition compared with those receiving continuous feeding.[24] In our study, diarrhea was decreased in the post-implementation group compared with the pre-

implementation cohort. This is likely related to the fact that continuous feeding was used in the protocol.

The present study has several limitations. Firstly, retrospective data were used and, as such, the data is limited by inherent biases. Although there was an inevitable selection bias as it was a before-and-after intervention study, the clinical characteristics were shown not to be different between the two groups. Secondly, there was a significant time difference between the two treatment groups, and advancements in medical knowledge, procedures, or drugs may have contributed to better outcomes for those in the later study period. The experience level of medical personnel also likely increased over time, but given that the study periods were separated by only 10 months this effect should be minimal. Thirdly, implementation of the protocol may have focused on the topic of nutrition, which may have favoured the intervention group.

In conclusion, we found that implementation of an enteral feeding protocol had beneficial effects on enteral nutrition, including beginning EN early, quickly achieving target caloric goals, using PN less frequently, and decreasing complications such as GI bleeding and diarrhea. Despite its limitations, the present study has significant practical and policy implications that strongly support the implementation of an enteral feeding protocol in countries with limited resources.

AUTHOR DISCLOSURES

All authors agree that the main author and the corresponding authors have all legal rights. Financial support: no external funding.

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