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Research Article

Effect of a Clinical Nursing Practice Guideline of Enteral Nutrition Care on the Duration of Mechanical Ventilator for Critically Ill Patients

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ABSTRACT

Purpose: Early enteral nutrition (EN) can improve clinical outcomes in critically ill patients. This study aimed to evaluate the effects of this clinical nursing practice guideline (CNPG) of EN care on the duration of mechanical ventilator in critically ill patients to investigate whether it was able to improve clinical outcomes.

Methods: This study compares a pretest-posttest design for the two groups, which was done before and after to determine the effects of a CNPG of EN care on the duration of a mechanical ventilator in critically ill patients. This study was performed on 44 critically ill patients admitted to the intensive care unit (ICU). The patients were divided into two groups according to EN. For the intervention group, CNPG started within the first 48 hours of admission to the ICU, and for the control group, they received standard nursing care.

Results: After the implementation, it showed significant associations between the duration of mechanical ventilator in ICU. The intervention group who received the CNPG had significantly shorter starting time of EN and a reduced duration of mechanical ventilator than those in the control group ($p < .001$).

Conclusion: A CNPG for EN care reduced the duration of mechanical ventilator. This could possibly improve the delivery of target calories when compared with current standard practice and improve the outcome of critically ill patients.

Introduction

Critically ill patients are patients who have severe illnesses with life threatening conditions that have serious consequences, including malnutrition [1]. They are typically associated with increased hypermetabolic [2] and the presence of lean body mass reduction that leads to malnutrition [3]. Patients' respiratory and cardiovascular systems are abnormal, leading to major organ failure in which they cannot function properly; respiratory insufficiency; impairment of healing; and increase in infections [2]. In addition, consequences associated with malnutrition in critically ill patients may include a prolonged duration of mechanical ventilation, increase in cost, duration of hospitalization, and higher mortality rates [4].

Malnutrition in critically ill patients is a global public health problem with a prevalence of 40% to 60% [3,5]. 50% of patients have malnutrition before hospitalization and from the pathology of a critical illness [4], while 70% of patients have malnutrition during hospitalization [6,7]. Critically ill patients cannot resume an oral diet, or most commonly, there is an interruption to the delivery of feeding, which is a problem related to bedside procedure, gastrointestinal function as high gastric residual volume, the presence of diarrhea, and aspirated [2]. The management of nutrition is delayed in 60% of critically ill patients and causes an inadequate daily calorie target in 42% of these patients [7]. These conditions affect body muscle, particularly the diaphragm, which is used for respiration and may become weak and atrophic [8]. However, malnutrition could decrease patients' ability for weaning mechanical ventilation, increase the duration of mechanical ventilation [4], pressure sores [8], infections [6], and mortality rate [3,4]. Nutritional support is an

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important role in critically ill patients, The American Society of Parenteral and Enteral Nutrition (ASPEN) recommended that nutrition support therapy from early EN should start within 24-48 hours after ICU admission, or when there is stable hemodynamic condition after resuscitation [8], the functional integrity of the gut by maintaining the structural integrity and may help to maintain the systemic immune functions. Moreover, critically ill patients that received target calorie requirement during the first 7 days of hospitalization [7,8] and their respiratory muscle function improved, which would increase the ability to wean mechanical ventilation [5,6].

Previous studies have been shown in only a few studies, standardized enteral feeding guideline. Lack of such guideline leads to delayed enteral feeding for critical patients more than 24 hours after being admitted to the critical care unit [9], resulting in inadequate energy intake and complications, such as nausea, flatulence, dyspepsia, gastrointestinal hemorrhage, diarrhea, and hyperglycemia [10,11]. Nurse is the closest care provider and has a crucial role in nutritional care, such as nutrition assessment, assessment of energy and nutritional requirements, prefeeding readiness assessment, and the execution of enteral feeding [8]. The guideline that has been developed systematically based on reliable empirical evidence would assist practitioners to make decision on treatment. Implementation of clinical practices would lead to changes in overall practice, reduction in cost, and improvement in treatment quality [12]. These guidelines aim to standardize and automate the provision of EN, enabling bedside nurses to initiate, monitor, and alter the administration of feeding without direct orders from the attending physician. The guidelines create variances in nursing practice and have not been updated with evidence-based clinical practice guidelines from the actual problems. A clinical nursing practice guideline (CNPG) developed from evidence-based practice is suitable for the problem, is beneficial to the patient, and helps improve enteral feeding service quality. With such practice, complications from enteral feeding can be avoided and managed. Development of a comprehensive, standardized practice also provides clear roles for the interdisciplinary team [13].

The researcher, therefore, has an awareness and interest in using empirical evidence to develop a CNPG for enteral feeding in critically ill patients, applying the Australian National Health and Medical Research Council (NHMRC) [13], NHMRC supports the development and approval of high quality guidelines for critical practice. This systematic and standardized development of nursing practice development would allow feeding for critical patients within suitable time as well as obtain participation of practitioners, which foster a sense of responsibility and willingness to follow the guideline [4]. A guide to the development by NHRMC, implementation, and evaluation of CNPG may lead to adaptation of strategies suitable for local conditions and developed in concert with local clinicians in Thailand. In addition, there should be CNPG for EN specific to critically ill patients. This could provide patients with energy and protein requirements and nutrients, prevent feeding complications, reduce variety in practice, and develop more effective services [9]. This study was to evaluate the effects of this CNPG of EN care on the duration of mechanical ventilation in critically ill patients. The result of this study showed a reduced duration of mechanical ventilation. A clinical practice guideline may have resulted in an improvement in the delivery of EN to critically ill patients.

Nurses are the primary care provider for critically ill patients. For nutritional support, a nurse has an important role in identifying nutritional risk screening, assessing the adequacy calories target, starting and managing enteral feeding or parenteral nutritional, and monitoring patients for potential complication. Thus, a CNPG of EN care in critically ill patients is an integral part of evidence-based research and practice combined with clinical expertise of practitioners to make decisions for effective nursing care and the best performance with the patient that is suitable for the context. This study applies the scope used in the development of nursing practices by the Australian NHMRC [13]. The recommendations included are based on the ASPEN [4]. This guideline for clinical practice development comprises of seven steps: (1) determining the need for and the scope of the guidelines, (2) convening a multidisciplinary panel to oversee the development of the guidelines, (3) defining the purpose of and target audience for the guidelines, (4) reviewing the scientific evidence and categorized levels of research, (5) proposing the validated evidence to the guideline development team, (6) formulating a dissemination and implementation strategy, and (7) implementing a CNPG and revising it. Furthermore, the researcher develops CNPG of EN care in critically ill patients with clinical expertise to make decisions in providing nursing care to maximize benefits for patients.

From a published literature review on nutritional promotion and EN care in critically ill patients during 2008-2016, the process of EN care in critically ill patients consisted of the time to start feeding, which should be within 24-48 hours [4]. Other assessment included the readiness for EN, gastric residual volume, an assessment of calories target requirements, and the monitoring of feeding complications [9]. There were 16 from 30 research articles which matched the research objectives. The researchers categorized levels of research credibility according to the criteria of the Royal College of Physicians of Thailand [14]. There were 11 quasi-experimental papers of research (level A) and five operational papers (level B). It could be summarized that the guidelines helped the patients receive EN within 24 hours. Starting EN as soon as possible without contraindication after resuscitation or with stable circulation [15] helped provide targeted calories to the patients [4,7]. It was also beneficial for the restoration of organs to function normally in critically ill patients who had EN within 6 hours after admission by improving intestinal absorption and preventing intestinal atrophy [6]. The patients received target calorie requirement during the first 7 days of hospitalization [7,8], and their respiratory muscle function improved, which would increase the ability to wean mechanical ventilation [5,6]. The content of the synthesis practice from systematic literature review based on empirical evidence, the best researches on the content of five activity categories: (1) Assessment for readiness of the critically ill patients before EN, (2) assessment of targeted calories requirement, (3) EN procedure, (4) prevention of EN complication, and (5) outcome evaluation after EN. In this regard, a CNPG for EN care by using demonstration methods together with the promotion of practice guidelines. There is a common goal of the interdisciplinary team, share information, and opinions in nursing together to follow the guidelines developed. The suggested summarizing content is shown in Table 1.

Methods

Study design

This study used a quasi-experimental, pretest-posttest design with a comparison group, which was done before and after to determine the effects of a CNPG of EN care on the duration of a mechanical ventilator in critically ill patients.

Table 1 *Summary of Clinical Nursing Practice Guideline of Enteral Nutrition Care in Critically Ill Patients.*

Issue	Information available in clinical nursing practice guideline
Assessment for readiness before enteral nutrition and time to start enteral nutrition [3,6,15,19] (Grade B)	Before enteral nutrition, critically ill patients must be corrected for the shock of the blood circulatory system until the circulation is stable for at least 6 hours. With the doctor's order and no contraindication, the enteral nutrition is started. The assessment criteria consist of the followings a. Heart rate less than 120 bpm b. Average arterial pressure is 65 mmHg and over c. Inotropic drug of less than 5 microgram/kg/min is received d. No direct vasopressor drug e. Base excess is more than −2.5 mEq/liter or blood lactate is less than 2.5 mEq/liter In the case of patients with risks of abdominal compartment syndrome, they must be monitored for intraabdominal pressure to be less than 15 mmHg. The risks of abdominal compartment syndrome include abdominal organ injury, receiving more than 6 units of blood or blood components in the first 12 hours after injury, abdominal distension, and signs of increased intraabdominal pressure which are oliguria, hypotension, hypoxia, and increased intracranial pressure. The enteral nutrition is started when the patients pass all assessments for readiness, and the doctor is consulted if there is an abnormal condition.
Assessment of energy and protein requirement [3,6,15,16,19] (Grade B)	The daily calories target requirement is 25 kcal/kg/d as Harris–Benedict equation x 1.0-1.3 and 1.0-2.0 gm/kg/body weight (BW) and EN was recorded within 7 days. The current or ideal BW was used in the patients whose body mass index (BMI) = 18-30 kg/m^2. Ideal BW in males = 50.0 + 0.91 kg (height = 152.4 cm) and in females = 45.5 + 0.91 kg (height = 152.4 cm). For obese patients (BMI > 30), an adjusted body weight is used instead of their current weight. The adjusted BW = 0.5 (current weight + ideal weight)
Tube insertion techniques and placement confirmation [3,16] (Grade A)	Identifying the location of the feeding tube as the followings: a. Identifying the location of the feeding tube before feeding every 4 hours incontinuous feeding and before next feeding in intermittent feeding. b. Identifying the location of the feeding tube by; • Length of the feeding tube from the nose or mouth angle without folding in the mouth. • Characteristics of the aspirated gastric contents which should be clear or grassy-green and mixed with the remaining food. If the gastric contents could not be aspirated or no certain location of the feeding tube, it could be tested by pumping 10-20 ml of air into the feeding tube and listening to the air sound at epigastrium with stethoscope. This must be confirmed by two nurses. If the feeding tube is not in the right location, the doctor will be consulted to reinsert the feeding tube. Selecting enteral nutrition pattern and adjusting diet amount. Continuous feeding should be started in critically ill patients for 24 hours with the rate of 20 ml/hr. If the patients are well tolerated (gastric residues less than 200 ml in 4 hours and no enteral nutrition complication), the feeding amount of 20 ml/hr is added every 8 hour until the targeted calories is met. Selection of diet for critically ill patients: a. Standard concentration of enteral nutrition for critically ill patients is 1 kcal/ml. b. Other choices of specialized diet depend on the doctor's consideration. Preparing enteral nutrition and diet sets for the patients [3,16] a. Preparing bottled liquid diet with sterile water and a sterile technique. b. The liquid diet prepared at the ICU is recommended to be fed within 24 hrs. c. The bottled liquid diet is prepared by the nutritional unit and should be stored in the refrigerator for not more than 24 hours and should be put at room temperature before feeding within 4 hours with the any leftover discarded. d. Washing hands before holding food supplies and when feeding the patients. e. Wearing clean gloves to wash feeding equipment. f. All equipment for enteral and medicine feeding should be washed and dried before the next feeding: • the feeding syringe should be washed with clean water, left to dry before the next use and changed to a new set every shift • the continuous feeding set (kangaroo pump set) should be washed with hot water after feeding for 4 hours, dried before the next use and changed to a new set every 7 day • the intermittent feeding set should be changed to a new set for each feeding • the medicine cup and diet preparing equipment should be washed with dish washing soap and clean water and dried before the next use.
Prevention of enteral nutrition complications [3,6,13,16,19] (Grade B)	Enteral nutrition should be temporarily stopped if there vital signs change to a state of shock which needs an increasing dose of cardiac drugs that cause blood vessel constriction. The enteral nutrition can be started with the same rate after the patients' circulatory systems become stable. Prevention of aspiration with the following procedures [16]: a. Positioning the patients' beds to a 30° elevated head tilt during enteral nutrition (if no contraindication) and spending the least time in a recumbent position or less than a 30° head tilt. b. If there is contraindication of the elevated head tilt position, such as a spinal cord injury, the patients' bed should be in a reverse Trendelenburg position. c. If the patient needs to lower the head tilt or recumbent position for a longer period of treatment, the enteral nutrition should be temporarily stopped until their conditions allow an elevated head tilt position. d. The gastric residual volume (GRV) should be evaluated every 4 hours in continuous enteral nutrition and before each feeding in intermittent feeding. e. When there is regurgitation, vomiting, or choking, the enteral nutrition must be temporarily stopped, and the cause should be investigated and solved before the next feeding. f. The patients' oral care with sputum suction should be provided every shift. The enteral nutrition should be temporarily stopped during sputum suction to prevent choking and movement of the feeding tube. The feeding can be restarted promptly after sputum suction. g. The endotracheal tube cuff pressure should be checked for a peripheral leak to obtain peak inflation pressure. The endotracheal tube cuff pressure should not be over 24-30 cm H_2O and should not be totally deflated to prevent choking food into the trachea during using a ventilator. Management of gastric residues by the followings [3,16]: a. If the GRV is 200-300 ml, the rate of feeding should remain the same, and all residues should be put back. If the patients have nausea, vomiting, choking, abdominal distension, and severe abdominal pain, the enteral nutrition should be temporarily stopped, and 500 ml of GRV can be put back. b. If the GRV is more than 500 ml, the enteral nutrition should be temporarily stopped and 500 ml of GRV put back and the rest discarded. The GRV is reevaluated every 2 hours.

(*continued on next page*)

Table 1 (*continued*)

Issue	Information available in clinical nursing practice guideline
	c. If the GRV twice is more than 500 ml, the causes should be investigated and corrected. The probable causes are body condition, gastrointestinal tract abnormality, blood glucose, and sedatives. A prokinetic drug such as metoclopramide should be prescribed by the doctor. Additionally, if the gastric residues remain, the enteral nutrition should not be stopped for a longer period, but the feeding volume should be reduced instead. d. For patients with a severe head injury who cannot tolerate enteral nutrition within 48 hours after injury, the location of the feeding tube should be moved to the small intestine under the doctor's order for more food tolerance and safety from choking. e. An occlusion of the feeding tube can be prevented by washing the tube with 20 ml of drinking water every 4 hours in continuous feeding and washing after intermittent feeding, after checking gastric residues, before and after giving medicines via feeding tube and when stopping the enteral nutrition. Managing abdominal distension by evaluating the symptoms from inquiry and physical examination. Abdominal distension should be managed as follows: a. Less abdominal distension—keep the same feeding rate and monitor the symptoms with a record every 4 hours. If the symptoms remain the same, the feeding volume can be increased as normal practice. b. Moderate abdominal distension or the patients complains of more distension—the feeding rate and volume should be reduced to half. The causes should be investigated including the monitoring GRV and intraabdominal pressure. The doctors should be consulted to prescribe a prokinetic drug and to adjust the feeding rate and volume. The symptoms should be monitored and recorded every 4 hours. c. Severe abdominal distension or the patients complain of severe abdominal distension, become nervous, have a rapid pulse rate and rapid respiration—the enteral nutrition must be temporarily stopped, and the causes should be investigated. The doctor should be consulted to treat or order more investigations such as abdomen X-ray. The symptom should be followed and recorded every 4 hours. Managing diarrhea as the followings: a. Diarrhea 3-4 times or 400-600 ml/day—The feeding rate and volume should remain the same. If diarrhea persists for more than 48 hours, the doctor should be consulted to investigate the causes such as side-effects of a prokinetic drug and a drug that contains sorbitol, magnesium, or phosphorus. b. Diarrhea for more than 4 times/day or more than 600 ml/day—the feeding rate and volume should be reduced to half. The doctor should be consulted to investigate the causes from intestinal infection and treat the patients. c. If the patients have risks of wound or central venous line contamination from stool, the doctor should be consulted to treat and prevent infection.
Outcome evaluation after enteral nutrition as follows [13] (Grade B)	Record of feeding diet in every meal—type of diet, feeding rate, volume, and gastric residues. Evaluation of enteral nutrition complications every 4 hours—abdominal distension, vomiting, choking, diarrhea, and change in vital signs. The complications are recorded and corrected.

Setting and sample

The participants were 44 critical ill patients at the Tertiary Hospital in Thailand from October 2018 to February 2019 in the intensive care unit (ICU), who understood the purpose and procedures of this study and voluntarily consented to the research that participated in this study. The inclusion criteria of participants were (1) being conciseness; (2) aged 18 years or over; (3) vital signs stable; (4) Acute Physiology and Chronic Health Assessment II (APACHE II) $\geq$ 15; (5) received the EN; and (6) willing to participate. Patients were deemed ineligible if they had other metabolic diseases (e.g., uncontrolled diabetes mellitus, thyroid disease, cancer, liver disease, or end of life) or were in a critical condition needing complete bed rest. Patients who were determined EN or noninvasive ventilator support were excluded from this study.

To calculate the number of participants, the effected size of intervention applied to CNPG for EN care in hospitalized in a previous study [15] was used. In this study, the effected size of the experimental group was .50. In applying alpha = .05, power = .80 on G*Power 3.1 software, a total of 44 critically ill patients were initially included in the study (22 in the intervention group and 22 in the control group). The participants included in the study were matched according to their age, diagnosis, and disease severity (APACHE II) to provide homogeneity in groups.

In addition, all patients received first time invasive a mechanical ventilator in the ICU for more than 6 hours during the period and hemodynamic stable before or after implementation of the CNPG with the permission from attending physicians were included in the study. Patients were divided into two groups based on the physician's judgment for EN onset; the first group included patients who received CNPG for EN care within 24 hours after being admitted into ICU and the control group received standard nursing.

Ethical consideration

This study was approved by the Research Ethical Committee of the Public Health Office Research Ethics Committee (Approval no. KLS.REC096/2561) belonging to the researcher to protect the human rights of the research participants. Before starting data collection, the participants and guardians were given a full explanation of the purpose and procedure of the study to potential participants and that they could withdraw from the study at any time. All participants willing to participate voluntarily were asked to sign the informed consent. Guardians replied for patients for whom a response was too difficult because of cognitive functioning problems that developed during the study period.

Measurement

Questionnaires and measurements

The participants' completed a demographic and clinical data sheet, included age, gender, diagnosis, disease severity (APACHE II), start EN (hours), daily calories target, and the duration of mechanical ventilator (hours) interviews by the researchers.

Disease severity assessment form

The researchers used the APACHE II which was developed by Knaus et al. [16]. The APACHE II is a universal tool and widely used for assessment of disease severity and forecast the mortality risk of the patients. The scores of disease severity were assessed by abnormal clinical signs during illness. The 12 variables were body temperature, mean arterial pressure, heart rate, respiration rate, blood pH, serum HCO_3, hematocrit, white blood cell count, serum creatinine, serum BUN, serum sodium, and serum potassium. The highest abnormal scores within 24 hours of admission in ICU were

combined with Glasgow Coma Scores and were determined with chronic diseases, age, underlying diseases, white blood cell count, and type of surgery. The combined scores would determine the disease severity and forecast the risk of mortality in critically ill patients who were admitted in ICU; score ranged from 0-71 with the higher scores determined more severity and higher mortality. The APACHE II scores of 25 and over indicated more than 50% risk of mortality. In this study, this instrument was tested with 10 critical ill patents and The Cronbach α coefficients for the present study were .84 and for this study was .81.

The daily calories target requirement

The calories target was calculated based on 25 kcal per kg of body weight for patients in a catabolic phase and 30 kcal per kg of body weight for patients in an anabolic phase as per the Harris–Benedict equation x 1.0-1.3 and 1.0-2.0 gm/kg body weight [4], and EN was recorded within 7 days. For the intervention group, the assessment contained records of the daily calories target from the first hour that the patients had EN until they met the 7 days of daily calories target requirements. In this study, this instrument was tested with 10 critical ill patents, and the Cronbach α coefficients for the present study was .93, and for this study was .95.

The clinical nursing practice guideline of enteral nutrition care

The CNPGs for EN care. The researchers adapted a conceptual framework of clinical practice development from the NHMRC. The CNPG and the content of the synthesis practice from systematic literature review based on empirical evidence of which the best research on the content of five activity categories was (1) assessment for readiness of the critically ill patients before EN, (2) assessment of the daily calories target, (3) EN procedure, (4) prevention of EN complications, and (5) outcome evaluation after EN. In this regard, CNPG was used by demonstrating methods together with the promotion of practice guidelines. There is a common goal of the interdisciplinary team to share information and opinions in nursing together and to follow the guidelines developed. The control group used standard nursing who were informed about the project on the first day, and their information was recorded. The developed practice guidelines were examined by three experts for content validity; they were corrected as the experts' advice. The practice guidelines were tested with 10 critically ill patients to assess feasibility for implementation. The instruments were examined by three experts and were revised based on their suggestions. The test and retest reliability yielded .90 for the patients' version with 10 critically ill patients, and the Cronbach α coefficients for the present study was .89.

Data collection

The data collection period was from October 2018 to February, 2019, in an ICU at the Tertiary Hospital in Thailand were recruited by purposive sampling. The purpose of this study was explained to evaluate the effects of this CNPG of EN care on the duration of mechanical ventilator in critically ill patients to investigate whether it was able to improve clinical outcomes. The patients were divided into two groups according to EN. The data collection in the control group was conducted first to prevent contamination of the care. The researcher reviewed patients' medical records to identify those who met inclusion criteria for the control group. Demographic data and history of illness were recorded from the medical records, and the interview was conducted to respondents or guardians at the time of enrollment. Disease severity and the daily calories target requirement were assessed within 7 days. The control group received treatment and usual nursing care as following the standard of care for EN care. Patient outcome included daily calories target requirements, and the duration of mechanical ventilator (hours) was assessed by a researcher.

Once data collection in the control group was finished, the intervention group was recruited, and those phases of the study began. The intervention group's baseline data were collected through the medical records within 24 hours of hospitalization. A CNPG started within the first 48 hours of admission to the ICU, and the time to first enteral feeding prescription was recorded. We included patients' age ≥ 18 years or over on mechanical ventilator ≥6 hours, and they received EN. To calculate the daily calories target requirement using the Harris–Benedict equation x 1.0-1.3 and 1.0-2.0 gm/kg body weight, and EN was recorded within 7 days. The participants in the intervention and control groups were monitored for the duration of the mechanical ventilator from the first day of invasive mechanical ventilator and after hemodynamic stable within 6 hours.

Data analysis

The data were analyzed using SPSS, version 22.0, statistical program (IBM Corp., Armonk, NY, USA). Descriptive statistics, such as number, percentage, mean, and standard deviation, were used to analyze the participants' demographics. Chi-square test and t test were used to compare baseline variables between the intervention and control groups. The significance test was used to examine differences in quantitative variables between the groups. Continuous variables were compared using the independent sample t test. An independent sample t test was used to compare the differences between pretest and posttest scores of the participants' in the intervention and control groups. A paired sample t test was used to compare the differences between pretest and posttest scores of the participants' at each group. For all analyses, $p < .05$ was accepted as the level of significance.

Results

Comparison of demographic characteristics between two groups

There was no statistically significant difference in demographic characteristics (age, diagnosis, and disease severity) between the intervention and control groups. The mean age of the participants was 47.11 years, ranging from 31-70 years, 39.4% were female, 54.5% were diagnosed with septicemia, and 60.7% were mild severity of APACHE II score. No statistically significant difference were found between the intervention and control groups regarding age, diagnosis, and disease severity (APACHE II). (Table 2).

Starting time of enteral nutrition and daily calorie target

The compared mean scores for the starting time of EN and daily calorie target requirement in the first 7 days before and after implementation were analyzed by t test. The EN start was within 8.78 hours (min-max = 5-42 hours, mean = 8.63, SD = 6.15), and the daily calorie target requirement in 7 days was 4590.91 kcal/kg/day (min-max = 1,400-19,600 kcal/kg/day, mean = 6,700, SD = 4575.50). The results showed that mean scores on starting time of EN and the daily calorie target requirement after using CNPG were different from the scores before using the practice guidelines with a statistical significance ($p < .001$). (Table 3).

Duration of mechanical ventilator

The comparison of the mean scores for the duration of mechanical ventilation before and after implementation were analyzed by t test. The duration of mechanical ventilation was

Table 2 *Demographic Characteristics of Critical Ill Patients (N = 44).*

Demographic characteristics	Intervention group (n = 22)	Control group (n = 22)	t or χ^2	*p*
Age (yrs) (M ± SD)	47.18 ± 10.32	47.05 ± 10.96	.04[a]	.966
APACHE II (M ± SD)	20.16 ± 3.96	21.09 ± 5.49	-.44[a]	.662
	n (%)	**n (%)**		
Sex			.54	.766
Men	10 (22.7)	8 (18.2)		
Women	12 (27.3)	14 (31.8)		
Diagnosis			.77	.540
Septic shock	18 (40.9)	18 (40.9)		
Pneumonia	2 (4.5)	1 (2.3)		
Heart disease	2 (4.5)	3 (6.8)		

Note. APACHE II = Acute Physiology and Chronic Health Assessment II; SD = standard deviation; yrs = years.
[a] Independent samples t test.

Table 3 *Comparison of Mean Scores for the Starting Time of EN, Energy Protein Requirements in the First 7 Days, and Duration of Mechanical Ventilation Between the Intervention and Control Groups (N = 44).*

Variables	Intervention group (n = 22)	Control group (n = 22)	t	*p*
	M ± SD	M ± SD		
Starting time of enteral nutrition (hours)	8.63 ± 6.15	24.00 ± 10.49	6.19	<.001
Daily calorie target requirement in the first 7 days (kcal/day)	6700.00 ± 4575.50	2481.82 ± 1216.80	−3.95	<.001
Duration of mechanical ventilation (hours)	33.90 ± 11.25	78.45 ± 41.50	4.86	<.001

Note. SD = standard deviation.

33.64 hours (min-max = 24-192 hours, mean = 56.18,SD = 37.55) after using CNPG, and the intervention group had a shorter of duration of mechanical ventilation than the control group, with a statistical significance ($p < .001$). Table 3.

Discussion

The results of this study showed that early EN in critically ill patients before and after implementation of CNPG was analyzed. The initial EN started within 48 hours after the patient was admitted and stabilized of hemodynamic. For all patients in this study, an invasive mechanical ventilator was initialed on the first day admission as well. To investigate the implementation of CNPG improvement of early EN, the target calorie daily requirements in day 7 and the reduced duration of the mechanical ventilator were compared. The implementation of EN guidelines led to the achievement of the initialed early EN reach within 8.67 hours, significantly after the implementation.

The study showed that the intervention group had a reduced time of duration of mechanical ventilator than the control group with a statistical significance ($p < .001$). It could be explained that after implementation, the intervention group received EN within 24 hours. They were evaluated for readiness and an adequate target calorie daily requirement after being admitted in the ICU as A.S.P.E.N recommended [4,9]. Dhaliwal et al. [17] studied factors that could affect EN. They found that having practice guidelines could help patients to receive EN in 24 hours, who benefited from organ restoration to its normal function [4]. EN care for critically ill patients within 6 hours after being admitted into ICU showed improved intestinal absorption and prevention of intestinal atrophy [17]. They also received an adequate target calorie requirement which promoted respiratory muscle function [3].

EN in patients admitted to ICU is often delayed because of reasons including procedures, gastrointestinal dysfunction, and nurses having a lack of knowledge. Nurses have an important role in the nursing care, nursing plan, preventing and managing complications, and coordinating the multidisciplinary team to have the patients receive nutrition as soon as possible if there is no contraindication. After implementing CNPG, the intervention group had different durations of time on the mechanical ventilation from the control group with a statistical significance ($p < .001$). There was a study which found that after using practice guidelines for EN within 24 hours and achieving the target calorie daily requirement in the first 7 days [18], the duration of mechanical ventilation use would decrease. The patients with a ventilator need a higher target calorie daily requirement than other patients [3,19]. This was consistent with the study of McClave et al. [4], which found that having critically ill patients in the medical ward receive EN within 48 hours, and an adequate target calorie daily requirement as soon as possible was related to the duration of mechanical ventilation use with a statistical significance [6]. However, there were other factors besides nutrition that affected the duration of a ventilator, such as age, disease severity, and underlying diseases [8].

In recently developed clinical practice guidelines for EN, it states that is a benefit for the potential risks and complications of that experiment [20], promotes early EN, and minimizing interruptions in feeding should be encouraged to be used. Nurses may be able to eliminate delay feeding and consultation with the multidisciplinary team, confirmation of timing to initial EN [8]. Also, ensuring a timely resumption of enteral feeding when interruptions are no longer necessary may be beneficial [2]. Furthermore, evidence suggested that a clinical practice guideline recommendation into nurse-initial to start enteral feeding is an effective strategy to improve the delivery of nutritional feeding. The clinical practice guideline for EN care is the potential role of critical care nurse in improving nutrition practice; critical nurses play an important role ensuring that patients meet nutritional target goals and an adequate prescription and delivery of nutrition therapy [2,3,5,8].

Study limitation

The approach of our study had a relatively small number of patients who enrolled in our study and applied in one ICU hospital.

Indeed, the participants of this study were recruited at a single hospital limits the full generalization of the research findings.

Conclusion

The findings of this study indicate that the integration of the CNPG of EN care could reduce the duration of mechanical ventilation in critically ill patients. It is recommended to start feeding as soon as possible within 24 hours so to receive the adequate target calorie daily requirement in the first 7 days. Therefore, this program can guide nurses to assist EN care in the ICU. Future studies should investigate other types of patients and factors such as length of hospital stay and infections.

Conflict of interest

The authors declared no conflicts of interest.

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