ORIGINAL ARTICLE

Development and Validation of an Enteral Nutrition Eduactional Program for Nurses

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ABSTRACT

Introduction: Nurses have a significant role in providing enteral nutrition (EN) for patients in wards. However, insufficient knowledge of EN among nurses is one of the contributing factors to inadequate EN provision. This highlights the need to address knowledge gaps in this aspect of healthcare delivery. This study aims to develop and validate an enteral nutrition educational program (ENEP) for nurses. **Materials and Methods:** This study was divided into three parts and followed the Analysis, Design, Development, Implementation, and Evaluation (ADDIE) model for the module development. In Part 1, a need analysis and literature review was conducted to identify the program structure and content. Part 2 involves designing, developing, and validating ENEP, while in Part 3, the program was tested for feasibility. **Results:** Six modules were developed, consisting of three theoretical modules (Introduction to Enteral Nutrition, Provision of Enteral Nutrition, and Nursing Practice in Enteral Nutrition) and three practical modules (Insertion of Nasogastric Feeding Tube, Preparation and Storage of Enteral Formula, and Enteral Feeding Administration). Each module was validated with an item content validity index score higher than 0.83 for every domain tested. It is also considered to have good face validity, with criteria scoring above 75%. The pilot test in Part 3 showed a significant increase in knowledge score on EN (p-value <0.01) when comparing pre-and post-test module evaluations. **Conclusion:** Integrating this module into nursing workplace training can equip nurses with the necessary expertise to provide better patient care and improve the quality of healthcare services provided to patients.
Malaysian Journal of Medicine and Health Sciences (2025) 21(SUPP5): 199–207. doi:10.47836/mjmhs.21.s5.26

Keywords: Enteral nutrition, Enteral nutrition training, Training for nurses

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INTRODUCTION

Providing adequate nutrition is crucial for hospitalised patients and is considered one of the main factors contributing to a patient's recovery. Maintaining good nutritional status of in-patients are proven to optimise the overall quality of patient care, improve clinical outcomes, and reduce healthcare costs. However, a systematic review of hospital malnutrition in eleven Northeast and Southeast Asian countries found that over 40% of hospitalised patients are malnourished (1). Locally, multiple studies have been conducted in Malaysia to assess the prevalence of malnutrition among hospitalised patients also yielded concerning results, indicating a pressing need for focused interventions and nutritional support strategies (2,3).

Enteral nutrition (EN) plays a vital role in the clinical management of hospitalised patients who cannot meet their nutritional needs orally. Despite the availability of nutrition guidelines and evidence-based recommendations, the adequacy of enteral feeding remains a significant issue for tube-fed patients. Multiple studies have shown that feeding inadequacy is a significant challenge that needs attention (4–6). Failure to deliver adequate EN to hospitalised patients can lead to malnutrition, weakening patients and hindering recovery. This can result in impaired immune function, muscle wasting, and organ dysfunction, increasing morbidity and mortality rates. Ensuring patients receive the necessary nutrition is critically important for their health and healing (7,8).

Numerous barriers could impede the effective administration of enteral feeding. A study in China identified five major barriers in enteral feeding: frequency of EN-related training, presence of full-time ICU nutritionist, hospital level, availability of specific protocols, and nurses' positions (9). Another study in

North America identified barriers such as other aspects of patient care taking priority, insufficient feeding pumps, availability of enteral formulas, difficulties in obtaining small bowel access, and lack of dietitian coverage during weekends and holidays (10).

Effective EN delivery requires a collaborative team of healthcare providers (HCPs), including clinicians, dietitians, pharmacists, and nurses (11,12). Each team member plays a vital role in ensuring the safety and effectiveness of the EN therapy. Nurses, in particular, are key players at the forefront of managing EN, from initiating feeding protocols to monitoring patient outcomes. However, current research indicates a significant gap in nurses' knowledge regarding EN practices, which can be bridged through structured education and training interventions (13–15).

A study conducted in Australia examined the knowledge and information sources regarding EN among nurses and found that they primarily learn about EN through hospital policies and dietitian guidance. However, only a few nurses strictly follow the established protocols and many lack access to dietitians outside typical work hours. Other knowledge sources include postgraduate studies, in-service training, and journal articles. Notably, 75.8% of the nurses expressed a desire for more education on EN, with in-service education and hospital dietitians being their preferred sources of information (16).

Addressing this educational deficit is critical to improving the quality of EN care. The American Society of Parenteral and Enteral Nutrition (ASPEN) recommends that organisations develop guidelines for safe EN practices, provide education and training to staff involved, and implement quality control measures to ensure the safety of EN delivery (17). To address this gap, this study aimed to develop, validate, and evaluate a structured EN training module for nurses using the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model.

MATERIALS AND METHODS

Study Design

The study employed an exploratory sequential mixed-method design, starting with a qualitative phase followed by a quantitative phase. The Enteral Nutrition Educational Program (ENEP) module for nurses was developed and validated using the ADDIE instructional systems design model, which includes the phases of analysis, design, development, implementation, and evaluation. These phases were divided into three parts. In Part 1, a qualitative study was carried out to explore the experience of HCPs in EN practice in hospital settings, the challenges faced, and ways to improve the current practice. Additionally, a literature review was conducted to identify the program structure and content. Part 2 involves designing, developing, and validating ENEP, while in Part 3, the module was pilot-tested. The study was conducted in a university hospital on the east coast of Peninsular Malaysia, Sultan Ahmad Shah Medical Centre @ IIUM (SASMEC @ IIUM).

The development and validation process was guided using an Analysis, Design, Development, Implementation, and Analysis (ADDIE) model.

Research Ethics

This research was approved by the International Islamic University Malaysia (IIUM) Research Ethics Committee with reference number IREC 2022-127 and Universiti Teknologi Mara (UiTM) Research Ethics Committee with reference number REC/07/2022 (PG/MR/152).

Part 1: Analysis

The ADDIE model for developing a learning program begins with analysis. In this stage, two types of analyses were conducted. The first one involved assessing the need for the program by conducting a qualitative study to explore the experiences of HCPs in EN practice. In-depth interviews were held to explore their experiences with EN in hospitals, understand the obstacles they face, identify needs for practice improvement, and determine the content for the ENEP module.

The second analysis involved a literature review of previous educational programs and training related to EN and evidence-based practice guidelines and recommendations to pinpoint key topics for nurses. Two electronic databases, Scopus and PubMed, were used to locate relevant papers, along with manual searches of bibliographies. The search was performed using the following keywords: (“enteral nutrition” OR “enteral feeding”) AND (“training” OR “education” OR “program”) AND (“nurses”) AND NOT (“pediatric” OR “parenteral”). The materials identified were then screened and evaluated to assess their relevance to the study.

Part 2: Development and Validation of the ENEP Module

The goal of the ENEP module is to provide the nurses with the necessary skills and knowledge to manage the EN process effectively and safely for patients. Based on the analysis done in Part 1, the module was designed and developed. In the designing stage, the aim, disciplines involved, topics, duration, and methods of training delivery of each module and learning outcomes were designed. Careful consideration was given to ensure that the arrangement of the module, its content, and learning activities is in a logical sequence.

During the development phase, the training content, activities, and materials were developed following the proposed program structure. A module booklet and PowerPoint slides covering both the theoretical and practical aspects of the educational program content were created.

The module that has been developed was then validated by expert panels in EN, consisting of doctors, nurses, dietitians, and academic professionals involved in clinical or teaching practices related to enteral nutrition. The purposive sampling was used to recruit expert panels who fulfilled the inclusion criteria of having more than 5 years experience in clinical or teaching practice involving EN. All experts were distributed a copy of the module and a content and face validity feedback form.
For this study, the Content Validity Index (CVI), a tool commonly employed in evaluating content validity during research activities, was used. The content validation form to calculate the CVI was prepared by adapting the criteria and principles outlined in Printed Education Materials (EVALPEM) developed by de Castro et al (18). The form consists of two sections: Section A is for socio-demographic data, while Section B is for the validity questionnaire. The experts reviewed each module according to their scientific accuracy and content that is distributed in six domains: (i) contents agree with the current knowledge, (ii) recommendations are necessary and are correctly approached, (iii) objectives are evident, (iv) recommendation about the enteral nutrition practice is satisfactory, (v) there is no unnecessary information, and (vi) important points are reviewed. Each item was rated based on a 4-Likert scale, where 1 represents total disagreement, 2 represents partial agreement, 3 represents agreement, and 4 represents total agreement. The content validity taken into consideration was item-level (I-CVI) and the average of I-CVI for all items on the scale (S-CVI/Ave). The criteria of content validation are I-CVI ≥0.83 and S-CVI/Ave ≥ 0.90 (19,20).

The module also underwent face validation with the same group of expert panels. Additionally, a small group of staff nurses was invited to assess the module's face validity and gather target user feedback (21). The inclusion criteria for the nurses to represent target users is having at least one year of experience working in a clinical setting. The face validity questionnaire, adapted from a study by Shahar et al. (2012), focused on participants' understanding of the module and their acceptance of its content, graphics, and design (22). The responses from reviewers were analysed descriptively, and the level of agreement for each module was calculated according to the evaluation criteria. Items with positive responses of 75% or higher were considered validated (22).

Part 3: Implementation and Evaluation
A group of staff nurses was invited to participate in the pilot test of the ENEP module. A quasi-experimental study design was used to assess the effect of the program on nurses' knowledge of EN. The participants were given pre- and post-tests using a questionnaire on EN knowledge among nurses. A convenience, non-probability sampling method was used to recruit the participants who fit the inclusion criteria of having been working as nurses in adults' wards and clinics at SASMEC @ IIUM, and nurses who are working in outpatient clinics and pediatric wards and those who were involved in face validity evaluation were excluded from this study.

The self-administered questionnaire on knowledge of EN among nurses was adopted from a study by Shahin et al. (23). This questionnaire is used as a pre and post-test to assess the participant's understanding of EN and to assess the effect of the program on the participants' knowledge of EN. The questionnaire is divided into 2 sections: (i) socio-demographic data and (ii) knowledge of EN. The knowledge on EN consists of 45 questions related to EN from different aspects that were taught in the program including the principle, indications, and contraindications of EN, insertion of the enteral feeding tube enteral feeding administration, formulas handling, medication administration, and care and complication of EN. After one month, the same questionnaire was used to determine the changes in knowledge and knowledge retention after the educational program.

RESULTS

Design and Development of ENEP Module

After analyzing the in-depth interviews and reviewing previous studies on EN training for healthcare providers, the structure of ENEP was designed. The program has two main objectives: (i) to understand the principles and implementation of EN practice and (ii) to apply evidence-based EN practice recommendations. The program includes three types of HCPs: clinicians, dietitians, and nurses, each presenting on a specific topic related to their field. Part 1 of the study highlighted the importance of both theoretical and practical knowledge in enteral nutrition. As a result, the ENEP includes both lectures and practical sessions. Lectures are held in a classroom setting, while practical sessions take place in a simulation ward, clinical lab, or skills centre. These sessions involve live demonstrations by instructors and hands-on practice for participants using mannequins.

There are six modules developed. The first three modules cover theoretical aspects of enteral nutrition: Module 1 Introduction to Enteral Nutrition, Module 2 Provision of Enteral Nutrition, and Module 3 Nursing Practice of Enteral Nutrition: Management of Feeding Equipment, Tube Care, and Patient Care & Education. The remaining three modules are practical and aim to develop key skills: Module 4 Insertion of the Nasogastric Feeding Tube, Module 5 Preparation and Storage of Enteral Formulas, and Module 6 Enteral Feeding Administration. The modules are distributed according to discipline: Module 1 for clinicians, Modules 2 and 5 for dietitians, and Modules 3, 4, and 6 for nurses.

Each theoretical module lasts about an hour, followed by a 10-minute session for questions, discussions, and feedback. Practical modules involve participants rotating

through stations in groups of three, spending about 45 minutes at each station, with each station managed by two instructors. The entire program, including briefings, assessments, breaks, and feedback sessions, spans 9 hours, equivalent to a full day.

Once the program structure was finalized, a module booklet was created. Each module in the booklet starts with an introduction to the topic, followed by the learning outcomes and detailed content. The content is based on established guidelines, evidence-based recommendations, and relevant academic publications on EN. At the end of each module, a summary is provided for clarity. The practical modules include step-by-step pictures to guide participants through each procedure. Additionally, the appendices offer practical tools that can be easily integrated into daily practice, such as a nutrition risk screening form, an EN monitoring form, a nasogastric tube insertion form, and a feeding administration checklist.

Validation of ENEP Module

Seven experts, including three dietitians, a clinician, two head nurses, and an academician reviewed the content of the ENEP module. The average experience of reviewers was nine years in clinical or teaching practice associated with EN, with varying educational backgrounds: one PhD, one Master's, four Bachelor's, and one Diploma. Their ages ranged from 32 to 39 years, with a mean age of 35.0 ±2.38. They also did a face validity evaluation of the module. Meanwhile, five nurses were enlisted for face validation to ensure the module represents the target audience. Two of them worked in the surgical ward, while the other three worked in the ICU, internal medicine, and orthopaedic ward, respectively. Their ages ranged from 25 to 33 years old, with a mean age of 27.4 ±3.29. **Table I** provides the characteristics of the reviewers who participated in the content and face validation of the module.

Table I: Characteristics of Participants for Content and Face Validation

Characteristics	Expert reviewers (n=7)	Target users (n=5)	Total population, n (%)
Age (years)			
20-30	-	4	4 (33.3)
31-40	7	1	8 (66.7)
Educational level			
Diploma	1	5	6 (50.0)
Degree	4	-	4 (33.3)
Masters	1	-	1 (8.3)
PhD	1	-	1 (8.3)
Occupation			
Nurse	2	5	7 (58.3)
Doctor	1	-	1 (8.3)
Dietitian	3	-	3 (25)
Academician	1	-	1 (8.3)

According to the study findings, all test score components showed a significant improvement, except for knowledge related to formula handling. However, it is important to note that although there was no statistically significant increase in the mean score for this aspect, there was still some improvement.

The result of content validation is presented in **Table II**. After evaluating all the modules, each achieved an I-CVI score above the benchmark of 0.83 for every domain tested, indicating strong agreement among the experts. Most modules scored 1, reflecting those experts found them highly relevant and appropriate. The S-CVI score for each module was calculated using both S-CVI/AVE and S-CVI/UA methods to assess the overall validity. All modules had an S-CVI/AVE score of 0.90 or higher, surpassing the minimum required level.

Regarding the expert agreement, only Module 2 did not reach the excellent content validity threshold of ≥ 0.80, while the other modules scored above 0.83. The I-CVI and S-CVI/Ave values were within acceptable ranges, validating the content of the EN module booklet for nurses.

While the CVI scores for all modules are considered acceptable, modules that did not achieve universal agreement were further reviewed by analysing the reviewers' comments, particularly for Modules 1, 2, and 3. Notably, these modules are theoretical, which may naturally introduce some subjectivity or variability in interpretation. Recognising the importance of these areas, detailed feedback from the experts was carefully considered to understand their concerns better. Following a thorough review of the content and expert comments with the research teams, unnecessary information was removed, and certain elements were modified based on their recommendations. Additionally, general feedback regarding typographical and grammatical errors, font size, images, and colour was also addressed, and necessary amendments were made.

Face validity was evaluated using descriptive analysis to ensure the quality of the module booklet's content, layout, and design. The evaluation was carried out by the same group of EN experts who conducted the content validity assessment and targeted users (nurses). **Table III** demonstrates the result of face validation.

The module booklet received a 100% acceptance rate from reviewers regarding their understanding of the information presented, the suitability of the figures and illustrations used, and the readability of the font size. Only one reviewer rated the colour combination less attractive, while the remaining considered the colours in the booklet attractive.

When further evaluation was made on the aspects that facilitate comprehension, all the reviewers unanimously agreed that four criteria contributed to better understanding of the module. These include an appropriate colour combination that is suitable for adults, the use of necessary illustrations/tables to aid in understanding the content, the illustrations/tables that serve as motivators to the reader in understanding the material, and the usage of terminologies that are easy

Table II: Content Validity Index by the Experts

Domain		Module 1	Module 2	Module 3	Module 4	Module 5	Module 6
	Number of experts	I-CVI	I-CVI	I-CVI	I-CVI	I-CVI	I-CVI
Contents are in agreement with the current knowledge	7	1	1	1	1	1	1
Recommendations are necessary and are correctly approached	7	1	0.86	0.86	1	1	1
Objectives are evident	7	1	0.86	1	1	1	1
Recommendations about the enteral nutrition practice are satisfactory	7	1	1	1	1	1	1
There is no unnecessary information	7	0.86	1	1	1	1	1
Important points are reviewed	7	1	1	1	1	1	1
	S-CVI/AVE	0.98	0.95	0.98	1	1	1
	S-CVI/UA	0.83	0.67	0.83	1	1	1

Table III: Face Validity of the EN Module Booklet

Parameters	Expert reviewers (n=7)	Nurses (n=5)	Total (%)
Understanding the information	3	3	6 (50)
Understood very much	4	2	6 (50)
Understand	0	0	0 (0)
Do not understand			
Suitability of figures/ illustration	7	5	12
Yes	0	0	(100)
No			0 (0)
Colour combination			
Attractive	6	5	11 (92)
Less/not attractive	1	0	1 (8)
Font size			
Easy to read	7	5	12
Difficult to read	0	0	(100)
			0 (0)

to comprehend. Although not unanimously agreed upon, the other criteria still received a reasonable acceptance rate of 92%. These criteria include clear and easy-to-understand language and sentence structures, appropriate font size for adult readers, and clear illustrations and tables.

Finally, both expert reviewers and target user groups agreed that the booklet is suitable for use as a guideline for EN provision and can be recommended. All the criteria scored well above the minimum acceptance rate of 75%, indicating that the EN module booklet demonstrates good face validity. The high percentage of face validity evaluation indicates that the participants fully understood the information presented in the booklet.

Implementation of ENEP Module

The ENEP for nurses underwent a pilot test with the participation of 32 staff nurses from SASMEC @ IIUM. The matron in charge of training sent email invitations to selected ward nurses who met the inclusion criteria. Only the first 32 eligible respondents were chosen to participate due to limited seats. Before the program commenced, all participants were provided with a briefing on the study objectives, the tentative schedule of the program, and pre and post-evaluation. Consent was obtained from all participants before the program began. **Table IV** summarises the characteristics of the study participants.

The average age of the participants is 28.8 ± 4.27 years. Among them, 93.70% (n=30) were female, and 6.30% (n=2) were male. All held a diploma as their highest level of education, and only one had completed a post-basic course in critical care. Regarding their work environments, 9 participants work in the internal medicine ward, 7 in the surgical ward, 5 in both the CCU and orthopaedics wards and 6 in the ICU. The years of practice as a nurse ranged from 2 to 19 years, with a mean working experience of 6.4 ± 3.95 years.

Table IV: Demographic Data of Participants for ENEP Pilot Test

Variables	Category	n (%) or mean (SD)
Age (years)	-	28.84 (4.27)
Gender	Male	2 (6.30)
	Female	30 (93.70)
Working experience as a nurse (years)	1-5 years	14 (43.75)
	6-10 years	13 (40.63)
	>10 years	5 (15.63)
Ward	Internal medicine	9 (28.13)
	Intensive care unit	6 (18.75)
	Cardiac care unit	5 (15.63)
	Surgical	7 (21.88)
	Orthopaedics	5 (15.63)

A pre- and post-test using a questionnaire on nurses' knowledge of EN was conducted to evaluate their baseline knowledge and the knowledge gained after the program. A score of 60 out of 92 marks (65%) was set as the benchmark for adequate knowledge. Initially, the participants (n=32) demonstrated a moderate understanding of EN, with an average score of 59.43 ± 9.79 (64.61 ± 10.65%), slightly below the required cutoff of 60 marks (65%). However, following the educational program, their average score significantly increased to 69.03 ± 7.87 (75.03 ± 8.56%). This improvement was statistically significant, with a p-value of less than 0.01. The detailed scores and mean changes for each knowledge component are provided in **Table V**.

Table V: Nurses' Knowledge of Enteral Nutrition Pre- and 1-month Post-test

Variables	Pre-test Mean score ± SD	Post-test Mean score ± SD	t-stat (df)	p-value
Total score	59.43 ± 9.79	69.03 ± 7.87	-8.52 (31)	<0.01*
Principle, indications, and contraindications of enteral nutrition	15.66 ± 3.92	20.63 ± 3.733	-7.15 (31)	<0.01*
Insertion of the nasogastric feeding tube	4.50 ± 1.46	5.63 ± 1.18	-4.45 (31)	<0.01*
Enteral feeding provision	7.66 ± 1.52	8.19 ± 1.15	-2.28 (31)	0.030*
Formulas handling	2.41 ± 0.56	2.44 ± 0.56	-0.23 (31)	0.823
Medication administration	4.22 ± 1.93	5.28 ± 1.63	-3.74 (31)	<0.01*
Care and complication of enteral nutrition	25.00 ± 4.68	26.88 ± 3.97	-3.34 (31)	0.02*

Note: * p<0.05

DISCUSSION

The ENEP module aims to help nurses understand the principles and implementation of EN practice and apply evidence-based EN practice recommendations. The program is designed to cover both theoretical and practical aspects of EN, starting from the fundamental principles in Module 1. Module 2 focuses on the theoretical part of the provision of EN, covering topics such as methods of enteral feeding, types of formulas, and management of complications. In Module 3, nursing practices related to EN are discussed, including management of feeding equipment, administration of medication, and patient and tube care. As for practical applications, ENEP focuses on three important skills for nurses, which are the insertion of nasogastric tubes, preparation of enteral formula, and administration of feedings via bolus and continuous method.

Specific references for each module were collected to create its content. For instance, while working on Module 1, the ASPEN Standards for Nutrition Support: Adult Hospitalised Patients, the ASPEN Safe Practices for Enteral Nutrition Therapy, and the ESPEN Guidelines on Definitions and Terminology of Clinical Nutrition were used as references (11,17,24). These articles helped to emphasize the importance of enteral nutrition and explain the nutrition care pathway in detail to the participants. The content of the rest of the modules was also outlined by referring to the established guidelines and related journals.

The program consists of one-hour theoretical modules followed by a 10-minute Q&A session. For practical modules, participants are split into three groups, rotating through stations with experienced instructors, spending 45 minutes at each. The full program, including assessments and breaks, spans approximately nine hours, covering a full day. Several factors influenced the structure of the program. The first is content relevance: the modules were designed based on thorough analysis to ensure they cover the essential aspects of EN that nurses need to master.

The second factor is convenience. The program was structured as a one-day course to fit into nurses' busy schedules and minimize disruption to their regular duties. Lastly, balance learning is emphasised. The modules include both theoretical and practical sessions, ensuring nurses gain a solid understanding and hands-on experience, enhancing knowledge retention and applicability to their daily work. The theoretical sessions provide a foundation for the nurses to understand the concepts, while the practical sessions enable them to apply the knowledge, and skills acquired immediately. An integrative review to identify effective training approaches for HCPs' continuing professional education (CPE) revealed that interactive strategies that engage learners, such as simulations and case studies, are more effective than only passive educational techniques like lectures and reading (25). As a result, the program was developed to incorporate both theoretical and practical modules, offering nurses a comprehensive and interactive learning experience.

The newly developed ENEP module utilised hands-on workshops and clinical simulation learning for the practical modules. Low to moderate-fidelity manikins, equipped with an artificial mouth, oesophagus, stomach, pylorus, and duodenum, were employed for Modules 4 and 6. These modules involved the insertion of a nasogastric tube and the administration of feeding using bolus and continuous/intermittent feeding pump methods. This approach is in line with previous studies on EN training for nurses. For example, Rollins et al. utilised a simulation laboratory with manikins to provide partial training on the insertion of the small bowel feeding tubes (26).

After completing the development and design of the module, it was then sent to a group of expert panels of EN to be validated. This validation process encompassed both content and face validity, which are essential components in the creation of a comprehensive training module. Content validity is critical in ensuring that the assessment tasks, instruments, or procedures accurately represent the intended construct or domain being measured (27). This involves a rigorous assessment to confirm that the module content effectively aligns with the objectives and goals it aims to address. On the other hand, face validity, also known as response process validity, examines the extent to which test respondents perceive the content of the test items as relevant to the context in which the test is being administered (21).

This step ensures that the module's content is viewed as meaningful and applicable by those who will be engaging with it.

Despite previous studies conducted on EN education intervention training for nurses and other healthcare professionals, many of the developed programs or modules have not been validated. Only one study, conducted in a teaching hospital in the southeastern United States, validated the protocols they developed, but not the training module itself. In the study, the researcher developed a protocol for the assessment of gastric residual volume of patients on enteral feeding to eliminate unnecessary routine gastric residual volume monitoring. The new protocol that has been validated was then advocated to the nurses via mandatory in-service training (28). Another study only mentioned evaluating the EN educational program they developed without specifying the method used (29).

In the final phase of the study, the aim was to assess the effect of implementing the ENEP on the knowledge of EN among nurses. A key aspect of any clinical training or educational program is evaluating its impact to ensure its effect on the participant's knowledge, attitude, and/or practice. These outcomes can take the form of changes in knowledge, attitudes, psychomotor skills, clinical decision-making, communication skills, and effects on practice behaviours and clinical outcomes (25).

Previous studies on the impact of educational interventions related to EN among nurses have shown similar results. Madigan et al. found a significant improvement in knowledge among general practitioners and nurses after an educational program (30), while Mohamed Ludin et al. also reported positive changes in knowledge among community nurses following their intervention (31). Kim and Chang's study showed significant improvements in knowledge, perspective, and practice of EN among critical care nurses (29). Alhashemi et al. found that their intervention group had significant improvements in knowledge, attitude, and practice (KAP) of medication administration through enteral feeding tubes compared to a control group (32). Similarly, Abu Hdaib et al. reported significant KAP improvements after a three-month educational intervention (33). Other studies also reported positive outcomes following educational interventions. For instance, Mahmoud Al Kalaldeh and Mahmoud Shahin found significant clinical improvements, including reduced gastric residual volume, fewer cases of pulmonary aspiration and diarrhoea, and better calorie adequacy among ICU nurses in Jordan (34). Sheng et al. observed improved nurse compliance with best practices after evidence-based training on continuous nasal feeding in stroke patients (35).

Regardless of the evaluation method used, the findings indicate that the EN training program effectively enhances nurses' knowledge, attitudes, and practices regarding EN. These positive changes could result in improved clinical practice and patient outcomes.

CONCLUSION

The study's findings align with previous research, indicating that targeted educational interventions can significantly improve knowledge, attitudes, and practices related to EN among nurses. The positive outcomes observed in this study suggest that the ENEP can serve as a valuable model for continuing education in clinical nutrition and may contribute to improved patient outcomes through better-trained healthcare professionals. Future research could explore the long-term impact of such educational interventions and the development of similar programs for other areas of clinical practice.

ACKNOWLEDGEMENT

We thank all participants for their participation in this study, which was supported by UiTM and Kementerian Pengajian Tinggi Malaysia (600-RMC/GPK 5/3 (244/2020)) and Hadiah Latihan Persekutuan Bagi Staf Bukan Akademik IPTA (SLPP). The authors have no conflict of interest.

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