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Modified Delphi in adapting a tool to assess the level of knowledge and practice on adult enteral nutrition therapy among nurses

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ABSTRACT

Background: Enteral nutrition (EN) is the preferred method of nutritional administration for critically ill patients according to the world's standards. Nurses have a key role in delivering EN and assessing nurses' knowledge and practice on this, are crucial for maintaining quality nursing care. **Aims and Objectives:** This study was to utilize modified Delphi in adapting a tool to assess the level of knowledge and practice on adult EN therapy among nurses in Sri Lanka. **Materials and Methods:** A three-round modified Delphi technique (DT) was employed in adapting a research tool to assess nurses' knowledge and practice according to the nursing and EN guidelines in Sri Lanka. The questionnaire included 34 knowledge assessment items and 41 observational items to assess practice. Eight subject experts were purposively selected to rate each item on a 5-point Likert scale under three subheadings. Consensus defined at 80% agreement and mean ≥3. Mean value <3 was considered for suggested modifications. Experts participated in a final meeting in round 3 to finalize the tool. **Results:** Response rate was 100% throughout the process. During round 1, 13/34 knowledge items were modified, two were removed, and one item was added. In round 2, four items were modified, and one was removed. From the observational items, 40/41 achieved consensus, one was modified, and a new one was added in round one. One was modified in round 2. All achieved consensus by round three. The final tool contained 32 knowledge items and 42 observational items with test-retest reliability correlations ranging from 0.99 to 0.95. **Conclusion:** Modified DT was appropriate in achieving judgmental validity through experts' consensus in adapting a research tool to assess nurses' knowledge and practices on EN therapy for adult critically ill patients in Sri Lanka.

Key words: Critical care; Delphi technique; Enteral feeding; Knowledge; Nurses

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INTRODUCTION

Enteral nutrition (EN) is the preferred method of nutritional administration for critically ill patients according to the world's standards; as in Europe,[1] America[2], and even in Sri alanka.[3] This refers to delivery of dietary foods into the gastrointestinal (GI) tract either by orally or using a tube, when there is a functional and accessible GI tract.[4] When considering the delivery and management of EN therapy for critically ill, nurses have an important role as they spend more time at patients' bedside.[5] Nurses' responsibilities in EN and related care are important, where the nurses' knowledge and practice related to EN will directly affect the clinical outcome of these patients.[6,7]

In several studies which were aimed to assess nurses' practice, knowledge, and responsibility in relation to EN for the critically ill, it was observed that some critical care nurses had deficient knowledge and compliance with the

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enteral feeding instructions.[5,6,8-10] In two descriptive studies, the critical care nurses had recorded a lower score for taking responsibility regarding nutritional assessment, for having sufficient knowledge and for having support from documentation of EN.[6,10] Other had revealed that the majority of the nurses in their study had a satisfactory total knowledge score regarding feeding administering with an unsatisfactory level of practice before, during, and after NG feeding administering.[11] Two quasi-experimental studies had revealed that the critical care nurses had lack of knowledge and some unsafe practices regarding EN therapy, but an instructional program had showed a positive impact in improving nurses' knowledge and practice on this regard.[9,12] In Sri Lankan context, they had reported that the nurses' knowledge varies in managing patients with tube feeding in different aspects and most nurses had followed desired practice methods of tube feeding in certain areas only.[7,13]

At present, there are a lot of critically ill patients with EN in Sri Lanka, especially cancer patients who need EN care on daily basis and it was understood that lack of nursing responsibility for EN therapy will results insufficient nutritional outcomes of the critically ill patients.[10] Proper assessment methods or tools should be available with the researchers to identify the nurses' overall knowledge and practice gaps, defects on EN therapy and to design necessary strategies, they need for improving the quality of their patient care related to EN. In literature, there were some related studies which had used only a self-administered, structured questionnaire regarding knowledge and practices on EN care for critically ill patients[6,7,12-14] and some had used a self-administered knowledge assessment questionnaire to assess knowledge and an observational checklist for assessing their practice during work.[9-11,15] Basically, it was observed that most of these tools had only focused to assess certain areas of knowledge and practical aspects that the researchers had anticipated regarding EN therapy but not the overall knowledge and practical standards expected from a nurse through nursing education of the respective country or its EN guidelines.

Delphi technique (DT) has being recommended for use in the educational and health-care setting including nursing, as a reliable method of determining consensus for a defined clinical problem by gathering data from respondents within their domain of expertise.[16-18] According to the literature found, this is the 1st time use and reporting of a modified Delphi method for harnessing experts' opinion in adapting a tool to assess nurses' knowledge and practice level on adult EN therapy in Sri Lanka.

Aims and objectives

This study aims to adapt a tool to assess nurses' knowledge and practice level on adult EN therapy in Sri Lanka, using modified DT.

MATERIALS AND METHODS

Study design

A three-round modified DT[19] was utilized for adapting an existing research tool between February and May 2020. Delphi was initially developed by Dalkey and Helmer[20] with three main features as: Subject anonymity, iteration, and statistical group response. Subject anonymity can reduce the influence of dominant participants over the others' opinions, allowing them to vote independently.[17] Iterations refers to controlled feedback process, where a well-organized summary of the findings from previous round is given to the experts for the subsequent round, allowing them to have a better insight and more thoroughly clarify the information developed by previous iterations.[17,21] Iteration can extend up to many rounds as necessary for achieving consensus,[17] but three iterations have been often sufficient.[19] Experts' statistical response to the items in each Delphi rounds facilitates to see their views quantitatively in achieving consensus.[20] The modified Delphi differs from the original Delphi, as it contains a "final face-to-face meeting" which allows direct interaction with the experts for obtaining further clarification on subject matters.[19] Once, Hsu and Sandford had cited that "the use of a modified Delphi process is appropriate, if basic information concerning the target issue is available and usable;"[22] and since we were adapting an already existing research tool, "modified Delphi" was a most suitable technique we could apply for this research process.

Sampling method and sample size

As described by Delbecq et al., a homogeneous group of 15–30 experts from a same discipline and a heterogeneous group of 05–10 experts with expertise on the particular topic and coming from different social/professional strata had been considered as adequate for an Delphi expert panel.[23] Therefore, a heterogeneous group of eight subject experts was purposively selected to this study from different institutions in the capital city of Sri Lanka, based on their clinical, educational, and research experience and expertise in caring of critically ill patients with EN for more than 2 years. The panel included a professor in surgery engaged in critical care, a consultant community physician engaged in palliative care services, two physicians engaged in clinical nutrition, a chief nutritionist, a nursing instructor engaged in post-registration nursing education and two nurses in-charge (RNs) engaged in palliative care and critical care.

Ethical considerations

The ethical approval was obtained from the Ethics Review Committee at the Faculty of Medical Sciences of University of Sri Jayewardenepura, Sri Lanka (ERC Ref No: 45/19). Experts were initially contacted and explained the study purpose, the study process, and the estimated time of

commitment (2 weeks per round). All experts gave their voluntarily consent to participate in the Delphi panel and they were well assured regarding the confidentiality of the information provided. Each expert was given a serial letter (from "A" to "H") to preserve the subject anonymity. The concept of "Quasi-anonymity" was employed as described by Dalkey and Helmer,[20] where the experts were known about the participants in the expert panel, but their judgments over the questionnaire remained anonymous to each other, which was a motivated factor to increase their response rate for the consecutive rounds.[16]

Development of the Delphi instrument

The most common tool format used in Delphi studies is a review type questionnaire with a suitable Likert scale for the expert panelists to rate their responses over the respective items[17] which is prepared after an extensive literature review. The tool used by Shahin et al.,[9] was chosen for this study, as it was more comprehensive and had followed the EN guidelines described by the European Society for Clinical Nutrition and Metabolism[1] and American Society for Parenteral and Enteral Nutrition.[2] This tool had two main parts as; self-administered questionnaire to assess nurses' knowledge with a demographic data section and an observational checklist to assess nurses' practical skills in EN and medication administration. With the original authors' permission, the tool was adapted by the researchers as described below, in its original language (English) following the present nursing education and EN guidelines for adult critically ill patients in Sri Lanka.[3]

The first demographic section was not changed in the modified tool. The second section consisted of 45 questions under nine aspects related to knowledge on EN therapy. Among them, two were open-ended questions and eight were to mark as "True" or "False." In the rest of the questions, only the "True" answers had been considered as correct and taken for scoring and calculating knowledge level. However, as we think, knowing other answers, wrong is also one aspect of showing nurses' knowledge on EN. Therefore, considering only the "true" answer for scoring is not sufficient for an overall judgment of the nurses' knowledge. To overcome this shortcoming when preparing the new tool, those questions were converted into multiple-choice question (MCQ) and single best choice question (SBQ) types accordingly. In brief, previous 45 questions were reduced up to 34 questions, including four open ended, 11 SBQs, and 17 MCQs. The previous observational checklist consisted of three separate procedures with 69 observable items. In the new tool, it was reduced up to 41 items under four criteria as clinical data, meal preparation, enteral feeding, and medication administration.

Subsequently after making the research tool as above, the initial Delphi review form was prepared including all the items in the new tool where the experts were asked to rate each item on a 5-point Likert scale (1=not appropriate at all, 2=less appropriate, 3=neutral, 4=appropriate, and 5=Highly appropriate) under three subheadings as follows; appropriateness of content, appropriateness of the words used, and appropriateness to the culture. A separate column was also assigned for their new suggestions on item modifications as well.

Data collection and analysis

Data collection and analysis of Delphi round 1

The round 1 review forms were either circulated by emails or distributed personally to the experts with invitation letters. Reminders were done 2 weeks later and following every week. The review was completed within 3–4 weeks. Experts' ratings were summarized in an excel work sheet, as "Round 1 review summery," and a database was prepared through SPSS statistic version 21. Descriptive analysis was conducted (Tables 1 and 2). Consensus was defined at 80% experts' agreement for accepting or removing an item since the study had relatively a small expert panel.[19] If an item's mean value was ≥3, it was considered as experts' agreement on cultural appropriateness and satisfactory judgmental validity of the item. When the mean was <3, the modifications suggested by the experts were reviewed and incorporated, considering the Sri Lankan EN Guidelines and the current EN practices at hospitals. Simultaneously, common terms used by the population to describe technical terms were replaced by culturally appropriate words as suggested by the experts as well. The items, those did not meet consensus and were modified from the round 1, were taken up to the second round.

Data collection and analysis of Delphi round 2

The review summery form prepared in round 1 was used as the round 2 questionnaire according to the controlled feedback process. Items those should be reviewed in round 2 were highlighted for quick reference and the iteration carried out same as in round 1. A review summery form was prepared from round 2, highlighting all the items to be taken up to the round 3 discussion.

Data collection and analysis of Delphi round 3

At the beginning of the round 3, the second-round review summery was emailed to the experts. Even though the face-to-face meeting was arranged for the final round, due to corona pandemic situation, all the experts were contacted together through Zoom meeting.

RESULTS

The quantitative data summery of the three Delphi rounds are shown in Tables 1 and 2. Experts' response rate was 100% throughout the process.

Table 1: Level of consensus for panel participants associated with each knowledge assessment questions for the three rounds of consultation

Knowledge assessment questions	Round 1 (n=8)			Round 2 (n=8)			Round 3 (n=8)		
	(%) Agree	Mean	SD	(%) Agree	Mean	SD	(%) Agree	Mean	SD
Q1_ Define the enteral feeding?	12.5	2.58	0.39	100	4.88	0.35	100	4.88	0.35
Q2_ What precautions should be taken to insert a nasogastric tube?	25.0	2.62	0.60	50.0	2.92	0.43	100	4.71	0.49
Q3_What are the challenges/ barriers you face when feeding the patients on tube feeding?	87.5	3.21	0.50	0.0	2.25	0.29	N/A[#]	N/A[#]	N/A[#]
Q4_Enteral feeding tubes include;	100	4.58	0.46	100	4.62	0.52	100	4.62	0.52
Q5_The nasojejunal tube is a feeding tube that extends from;	100	4.54	0.53	100	4.54	0.53	100	4.54	0.53
Q6_The factors that affect the critical patients' nutritional needs are;	75.0	2.96	0.21	100	4.79	0.40	100	4.79	0.40
Q7_Indication to use nasogastric tube are;	100	4.71	0.42	100	4.58	0.46	100	4.58	0.46
Q8_The nasogastric tube feeding is;	100	4.54	0.50	100	4.50	0.53	100	4.54	0.50
Q9_Contraindication of nasogastric intubation are;	50.0	2.92	0.56	100	4.88	0.35	100	4.88	0.35
Q10_Contraindications of enteral feeding include;	100	4.50	0.56	100	4.88	0.35	100	4.88	0.35
Q11_The proper patient position during nasogastric intubation is;	100	4.25	0.68	100	4.75	0.46	100	4.75	0.46
Q12_An adult's nasogastric distance is measured from;	100	4.67	0.47	100	4.67	0.47	100	4.67	0.47
Q13_The maximum number of attempts allowed for a nurse to insert the nasogastric tube is;	100	4.38	0.60	100	4.46	0.59	100	4.46	0.59
Q14_Safe methods to confirm nasogastric tube placement is;	100	4.83	0.31	100	4.83	0.31	100	4.83	0.31
Q15_The enteral feeding is preferred to be given;	62.5	2.88	0.44	62.5	2.92	0.56	100	4.83	0.36
Q16_When we start enteral feeding for the first time;	50.0	2.83	0.64	100	4.71	0.45	100	4.71	0.45
Q17_The equipment required to start enteral feeding include;	62.5	2.96	0.52	100	4.71	0.45	100	4.71	0.45
Q18_ Once we give the feed, we check the residual volume;	12.5	2.54	0.40	100	4.92	0.24	100	4.92	0.24
Q19_ If the amount of residual volume is higher than 50 cc, we should;	25.0	2.58	0.46	100	4.75	0.46	100	4.75	0.46
Q20_In the intermittent feeding, what is the proper action if you found 150 ml residual volume:	12.5	1.96	0.88	N/A[+]	N/A[+]	N/A[+]	N/A[+]	N/A[+]	N/A[+]
Q21_During continuous enteral feeding, the residual volume in non-critical patients should be checked every;	87.5	4.25	1.39	100	4.88	0.35	100	4.88	0.35
Q22_The tube feed should be given;	100	4.46	0.73	100	4.62	0.74	100	4.62	0.74
Q23_ Opened formula and nutritional supplements that kept in fridge should be discarded after;	50.0	2.92	0.56	100	4.75	0.46	100	4.75	0.46
Q24_When we give the medications through the nasogastric tube, we should;	100	4.71	0.45	100	4.71	0.45	100	4.71	0.45
Q25_Regarding giving oily medications through a feeding tube;	37.5	2.75	0.39	100	4.75	0.46	100	4.75	0.46
Q26_During continuous enteral feeding, the feeding tube should be flushed every;	87.5	4.25	1.39	87.5	4.25	1.39	100	4.25	1.39

(Contd...)

Table 1: *(Continued)*

Knowledge assessment questions	Round 1 (n=8)			Round 2 (n=8)			Round 3 (n=8)		
	(%) Agree	Mean	SD	(%) Agree	Mean	SD	(%) Agree	Mean	SD
Q27_During intermittent feeding, the feeding tube should be flushed;	87.5	4.25	1.39	87.5	4.25	1.39	100	4.25	1.39
Q28_Which of the following would you use when flushing the enteral feeding tube?	100	4.58	0.50	100	4.75	0.46	100	4.75	0.46
Q29_When assessing the patient tolerance to the feed;	100	4.75	0.39	100	4.92	0.24	100	4.92	0.24
Q30_The enteral feeding equipment should be changed every;	25.0	2.63	0.90	N/A⁺	N/A⁺	N/A⁺	N/A⁺	N/A⁺	N/A⁺
Q31_The follow up of patients on enteral feeding include;	50.0	2.96	0.72	37.5	2.88	0.64	100	4.88	0.35
Q32_The nasogastric tube should be removed if you have	100	4.62	0.52	100	4.62	0.52	100	4.62	0.52
Q33_Which of the following is considered a complication of enteral feeding?	100	4.71	0.38	100	4.71	0.38	100	4.71	0.38
Q34_ If the patient can swallow up to some extent, how would you maintain the psychological status of the patient in a favorable level regarding tube feeding?	50.0	2.67	0.62	100	4.62	0.45	100	4.62	0.45
Q35_Have you gained any new knowledge regarding enteral tube feeding during your practice period?	N/A*	N/A*	N/A*	37.5	2.96	0.72	100	4.75	0.46

SD: Standard deviation. N/A* denotes that this criterion was added after the Round 1 panel consultation. N/A⁺ denotes that this criterion was removed after the Round 1 panel consultation. N/A# denotes that this criterion was removed after the Round 2 panel consultation

Delphi round 1 results

After the first round, 19/34 knowledge assessment items had met consensus obtaining ≥3 of mean value and over 80% experts' agreement. The question Q20 regarding "the nursing action if 150 ml residual volume found during intermittent feeding" was removed on 87.5% experts' agreement (mean=1.96; SD=±0.88;) and Q30, the question regarding the proper time for changing an enteral feeding equipment only achieved 75% expert agreement to remove (mean=2.63; SD=±0.88) but considering their strong feedback on its low clarity, it was decided to remove that item from the tool. Other 13 items which had <3 mean value were modified according to the experts' suggestions. One open-ended question was added as Q35 for assessing new knowledge gained by the nurses regarding EN for critically ill patients. From the initial 41 items reviewed in the observational check list, consensus was achieved for 40 items. One new item was added as P42 – "Giving little amount of feed to taste." One item was modified (P13; mean=2.92; SD=±0.39) which was regarding preparation of the meal/feed given through the tube.

Delphi round 2 results

In this round, 14 knowledge assessment items were reviewed, and nine items achieved consensus. The Q3, open-ended question regarding the challenges/barriers the nurse face when feeding the patients on tube feeding was removed, on all the experts' agreement (mean=2.25; SD=±0.29). Remaining four knowledge assessment items were modified following the experts' comments and taken up the round 3. From the two items reviewed in the observational checklist; consensus achieved for both. The P39 item which had already achieved consensus during the round 1 had to be modified according to the strong rationale made by the nursing experts, as "Removed gloves and wash hands thoroughly with soap and running water." This was taken up in to the third iteration.

Delphi round 3 results

After several successful Zoom discussions with the experts, consensus was achieved for the remaining five items. The final round results were summarized and distributed to all the experts for their final remarks. The finalized tool had the experts' unanimous agreement, and it was ready for pre-testing after this third round.

Pre-testing and reliability checking of the tool

The finalized draft tool was administered to 10 nurses in critical care setting and was individually observed while performing enteral feeding with medication administration. Later, a structured interview was done individually to

Table 2: Level of consensus for panel participants associated with each observational criterion for the three rounds of consultation. (According to the correct order of the procedure)

Observational criteria	Round 1 (n=8)			Round 2 (n=8)			Round 3 (n=8)		
	(%) Agree	Mean	SD	(%) Agree	Mean	SD	(%) Agree	Mean	SD
P1_Type of enteral feeding that the patient is on	100	4.63	0.45	100	4.63	0.45	100	4.63	0.45
P2_Method of feeding	100	4.42	0.66	100	4.42	0.66	100	4.42	0.66
P3_Type of the feed	100	4.50	0.76	100	4.75	0.46	100	4.75	0.46
P4_Prescribed time gap between two feeds	100	4.62	0.52	100	4.62	0.52	100	4.62	0.52
P5_Amount fed at one time	100	4.62	0.52	100	4.62	0.52	100	4.62	0.52
P6_Time taken to finish the feeding procedure	100	4.62	0.52	100	4.62	0.52	100	4.62	0.52
P7_Any complication/s of enteral tube feeding, observed in the patient	100	4.75	0.46	100	4.75	0.46	100	4.75	0.46
P8_Identified the patient	100	4.46	0.73	100	4.46	0.73	100	4.46	0.73
P9_Assessed the patient for any allergies/bowel sounds/ last meal/tolerance for previous feed and laboratory values	100	4.46	0.73	100	4.75	0.46	100	4.75	0.46
P10_Explained the procedure to the patient	100	4.71	0.45	100	4.71	0.45	100	4.71	0.45
P11_Washed hands	100	4.71	0.45	100	4.71	0.45	100	4.71	0.45
P12_Assembled necessary equipment	100	4.54	0.56	100	4.62	0.52	100	4.71	0.45
P13_Prepared the meal – Feed/formula	50.0	2.92	0.39	100	4.50	0.76	100	4.75	0.46
P14_Positioned patient in high fowler's or semi fowler's position	100	4.71	0.45	100	4.71	0.45	100	4.71	0.45
P15_Provided privacy	100	4.67	0.44	100	4.67	0.44	100	4.67	0.44
P16_Don gloves	100	4.62	0.52	100	4.62	0.52	100	4.62	0.52
P17_Confirmed the position of tube in stomach using routine methods	100	4.62	0.52	100	4.50	0.53	100	4.50	0.53
P18_Inserted 50 ml syringe into feeding tube and aspirate to check residual volume	100	4.50	0.76	100	4.50	0.76	100	4.50	0.76
P19_Returned residual and flush the feeding tube with 10 cc of water	100	4.58	0.50	100	4.58	0.50	100	4.58	0.50
P20_Clamped the feeding tube	100	4.62	0.52	100	4.62	0.52	100	4.62	0.52
P21_Connected 50cc syringe without plunger to the feeding tube	100	4.50	0.53	100	4.50	0.53	100	4.50	0.53
P22_Poured 30-40 cc of feed/ formula into syringe	100	4.54	0.50	100	4.88	0.35	100	4.88	0.35
P23_Raised the syringe up to 12–18 inches above the stomach	100	4.62	0.52	100	4.54	0.50	100	4.54	0.50
P24_Opened clamp on the feeding tubing and allow feed/formula to run in slowly through gravity	100	4.58	0.50	100	4.62	0.52	100	4.62	0.52
P25_Washed hands before taking medication	100	4.58	0.50	100	4.58	0.50	100	4.58	0.50
P26_Preparing medication	100	4.62	0.52	100	4.58	0.50	100	4.58	0.50
P27_Stopped any continuous tube feeding for 15 min if medication to be given on an empty stomach or stopped the feeding at the half of the total volume.	100	4.62	0.52	100	4.62	0.52	100	4.62	0.52

(Contd...)

Table 2: *(Continued)*

Observational criteria	Round 1 (n=8)			Round 2 (n=8)			Round 3 (n=8)		
	(%) Agree	Mean	SD	(%) Agree	Mean	SD	(%) Agree	Mean	SD
P28_Poured each medication separately to the syringe and open to allow flowing through gravity	100	4.54	0.50	100	4.62	0.52	100	4.62	0.52
P29_Flushed tube with 10–30 ml water after each medication	100	4.62	0.52	100	4.54	0.50	100	4.54	0.50
P30_Restarted tube feeding at appropriate time	100	4.62	0.52	100	4.62	0.52	100	4.62	0.52
P31_Continued to add until the feed/formula is completed	100	4.58	0.50	100	4.62	0.52	100	4.62	0.52
P32_Flushed the feeding tube with 10–30 ml water	100	4.62	0.52	100	4.58	0.50	100	4.58	0.50
P33_Pinched or clamped the feeding tubing	100	4.67	0.47	100	4.62	0.52	100	4.62	0.52
P34_Disconnected syringe	100	4.62	0.52	100	4.67	0.47	100	4.67	0.47
P35_Made sure the feeding tube is secured	100	4.62	0.52	100	4.62	0.52	100	4.62	0.52
P36_Provided oral and nasal hygiene	100	4.62	0.52	100	4.62	0.52	100	4.62	0.52
P37_Positioned patient for comfort and kept the patient's head elevated for 20–30 min	100	4.62	0.52	100	4.62	0.52	100	4.62	0.52
P38_Disposed soiled materials in appropriate container	100	4.50	0.76	100	4.62	0.52	100	4.62	0.52
P39_Removed gloves and wash hands	100	4.54	0.67	100	4.50	0.76	100	4.50	0.76
P40_Documented all relevant information appropriately	100	4.75	0.46	100	4.54	0.67	100	4.54	0.67
P41_Reported any problem regarding feeding	100	4.75	0.46	100	4.75	0.46	100	4.75	0.46
P42_Gave little amount of feed to taste	N/A#	N/A#	N/A#	100	4.75	0.46	100	4.75	0.46

SD: Standard deviation. N/A# denotes that this criterion was added after the Round 1 panel consultation

identify any item which was difficult to answer and understand. Changes were done accordingly, such as in the observational check list, it was changed whether the nurse administered medication (i) before giving the feed, (ii) in-between feeding, or (iii) after giving the feed. The same procedure was repeated to the same group of nurses 1 week later and the test-retest reliability correlations (r) were measured which were ranging from 0.99 to 0.95.

DISCUSSION

The drafted questionnaire consisted of 32 knowledge assessment questions related to EN from nine different aspects covering definitions, indications, uses, contraindications for feeding tube insertion, enteral feeding process, formulas' handling, medications' administration, care of the tube feeding patient, and complications. The observational checklist had 42 practice items based on the above knowledge aspects, which would give the researcher a good insight to assess whether the nurses are practicing what they already knew regarding EN therapy.

Six of the eight participants of this study had many years of experience in critical care nutrition, and they were involved in the issues related to EN every day, unlike some expert panels involved in the review of questionnaires related to EN in certain other studies.[5,9,10,15] Their motivation to participate and their opinions and judgments can be seen as valid representation of the needs and requirements regarding standard data needed for this tool adaptation. The Delphi process was described in detail within this study, hoping to improve the quality and the credibility of the final tool,[19] and to keep the nurses who read this article well informative and transparent regarding the sequence of the technique applied until the end of the study.

Reducing the number of 45 questions in the knowledge assessment questionnaire up to 32 made it more feasible and time saving for the nurses to complete. Experts gave their agreement for 40 observational items without any modifications during the first round itself, mostly because they might be aware on the fact that those items had been prepared exclusively following Sri Lankan nursing procedure guidelines. An alignment between knowledge

assessment criteria and observational criteria has also shown a significant association in the study that the original tool was taken from.[9]

Several items in the knowledge assessment section had been modified 2 times when coming to the final round, allowing the experts to reconsider their judgments over certain facts those previously been unnoticed and collectively come to a most suitable decision during iterations. This shows one most important strength in the Delphi method.[17] Another strength is that all the experts have the same influence on the consensus process.[24]

Limitations of the study

One limitation of this study was losing the original subject anonymity concept. Despite that, following the quasi-anonymity concept and conducting the final meetings could facilitate to overcome this limitation in modified DT.[24] The approach used in this study was only considered the judgmental validity, which was only a one-third of the validation tests to be performed to a new research tool on the assessment of EN therapy. This was one limitation of this DT. Further, this study was implemented in English assuming that all the experts had a good literacy in English, though they were not native speakers of English. Therefore, some lingual misconceptions might have influenced the results of this study.

CONCLUSION

The modified DT can be used as an appropriate and suitable mechanism to achieve judgmental validity through consensus when adapting an existing research tool in literature if the subject addressed falls into the same field. Following the reliability testing, this study could successfully adapt 32 knowledge assessment questions and 35 practical steps on EN therapy, covering all the necessary and important aspects of knowledge and practice that the nurses should possess when caring for critically ill patients on enteral feeding in Sri Lanka.

Recommendations

It is recommended to utilize only a validated version of this new tool in Sri Lankan context, in a cross-sectional or a case–control approach following an in-service education program on assessing and enhancing the nurses' knowledge and practices regarding EN therapy as well.

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REFERENCES

1. Singer P, Blaser AR, Berger MM, Alhazzani W, Calder PC, Casaer MP, et al. ESPEN guideline on clinical nutrition in the intensive care unit. Clin Nutr. 2019;38(1):48-79. https://doi.org/10.1016/j.clnu.2018.08.037
2. Boullata JI, Carrera AL, Harvey L, Escuro AA, Hudson L, Mays A, et al. ASPEN safe practices for enteral nutrition therapy. J Parenter Enter Nutr. 2017;41(1):15-103. https://doi.org/10.1177/0148607116673053
3. Kudavidanage DB, Jayasekera DC, Indraratna DK, Karunathillake DS, Kiriwattuduwa DS, Pilimathalawwe DC, et al. Guidelines-on-Nutritional-Support-in-ICU. Coll Anaesthesiol Sri Lanka. 2014;4-11: Available from: https://criticalcare.lk/wp-content/uploads/2019/04/Guidelines-on-Nutritional-Support-in-ICU.pdf[Last accessed on 2021 Aug 12].
4. Houston A and Fuldauer P. Enteral Feeding: Indications, Complications, and Nursing Care. American Nurse; 2017. Available from: https://www.myamericannurse.com/enteral-feeding-indications-complications-and-nursing-care [Last accessed on 2021 Jul 29].
5. Morphet J, Clarke AB and Bloomer MJ. Intensive care nurses' knowledge of enteral nutrition: A descriptive questionnaire. Intensive Crit Care Nurs. 2016;37:68-74. https://doi.org/10.1016/j.iccn.2016.07.001
6. Al Kalaldeh M, Watson R and Hayter M. Jordanian nurses' knowledge and responsibility for enteral nutrition in the critically ill: Enteral nutrition in intensive care. Nurs Crit Care. 2015;20(5):229-241. https://doi.org/10.1111/nicc.12065
7. Sajeewani PN, Indika PMK, Karunasena KP and Yapa HE. Knowledge and practices of intensive care nurses on enteral nutrition care. Open Univ Sri Lanka Annu Acad Sess. 2015;163-66. Available from: https://ours.ou.ac.lk/wp-content/uploads/2017/04/NS15-09-F.pdf[Last accessed on 2021 Aug 10].
8. Babapour SK, Esmaeili R, Esteki T, Naderiravesh N, Pourhoseingholi MA and Marzangu SM. Nurses' practice about performance of nasogastric tube feeding in intensive care unit. Int J Adv Biotechnol Res. 2016;7(5):1585-1594. Available from: https://www.researchgate.net/publication/311807411[Last accessed on 2021 Aug 10].
9. Shahin M, Mohamed WY and Sayed M. Nurses' knowledge and practices regarding enteral nutrition at the critical care department of Al-Manial University Hospital in Egypt: Impact of a designed instructional program. J Am Sci. 2012;8(11):397-405. Available from: https://www.academia.edu/38973980/Nurses_Knowledge_and_Practices_regarding_Enteral_Nutrition_at_the_Critical_Care_Department_of_Al_Manial_University_Hospital_in_Egypt_Impact_of_a_Designed_Instructional_Program [Last accessed on 2021 Aug 11].
10. Persenius WM, Larsson BW and Hall-Lord M. Enteral nutrition in intensive care. Intensive Crit Care Nurs. 2006;22(2):82-94. https://doi.org/10.1016/j.iccn.2005.09.001
11. Muneer NM, Al-Hawaly M, Ibrahim MH, Shereen AA and Qalawa DN. Assessment of nurses' knowledge and performance regarding feeding patients with nasogastric tube in Ismailia general hospital. Med J Cairo Univ 2016;84:7. Available

from: https://www.semanticscholar.org/paper/Assessment-of-Nurses%27-Knowledge-and-Performance-in-Ibrahim-Qalawa/baa52b619e4f0ca0947696be22c7def6c7dc7797

12. Bourgault AM, Ipe L, Weaver J, Swartz S and O'Dea PJ. Development of evidence-based guidelines and critical care nurses' knowledge of enteral feeding. Crit Care Nurse. 2007;27(4):17-29. Available from: http://ccn.aacnjournals.org/content/27/4/17 [Last accessed on 2018 Dec 14].
13. Karannagoda DI, Leelarathne KA, Wimalasooriya KB, Wijesekara GG and Madhavi AV. Nurses' Knowledge and Practices Regarding the Nutritional Management of Patients with Naso-gastric Tube Feeding. Open University of Sri Lanka Research Symposium; 2015. Available from: https://ours.ou.ac.lk/wp-content/uploads/2017/05/26.-NS15-102.pdf [Last accessed on 2021 Aug 03].
14. Ista P, Jassin S, Noël F and Preiser JC. Management and knowledge of enteral nutrition in intensive care units in a city in Belgium. Nutr Clin Pract. 2002;17(1):32-37.
https://doi.org/10.1177/011542650201700132
15. Das S, Patra D and Pradhan P. Critical care nurses' knowledge and skill regarding enteral nutrition in critically Ill patients at a glance. J Nurs Sci Pract. 2014;4:9. Available from: https://www.semanticscholar.org/paper/Critical-Care-Nurses%C3%A2%E2%82%AC%E2%84%A2-Knowledge-and-Skill-Enteral-Das-Patra/4c1c001dc9472391621ad956f8b1e2d0e448e36c[Last accessed on 2022 Jan 28].
16. Keeney S, McKenna H and Hasson F. The Delphi Technique in Nursing and Health Research. 1st ed. Hoboken, New Jersey: John Wiley and Sons; 2011. p. 208. Available from: https://books.google.lk/books?id=vd2sDwAAQBAJ&printsec=frontcover#v=onepage&q&f=false[Last accessed on 2021 Aug 07].
17. Nworie J. Using the Delphi technique in educational technology research. TechTrends. 2011;55(5):24-30.
https://doi.org/10.1007/s11528-011-0524-6
18. Keeney S, Hasson F and McKenna H. Consulting the oracle: Ten lessons from using the Delphi technique in nursing research. J Adv Nurs. 2006;53(2):205-212.
https://doi.org/10.1111/j.1365-2648.2006.03716.x
19. Eubank BH, Mohtadi NG, Lafave MR, Wiley JP, Bois AJ, Boorman RS, et al. Using the modified Delphi method to establish clinical consensus for the diagnosis and treatment of patients with rotator cuff pathology. BMC Med Res Methodol. 2016;16(1):56.
https://doi.org/10.1186/s12874-016-0165-8
20. Dalkey N and Helmer O. An Experimental application of the DELPHI method to the use of experts. Manag Sci. 1963;9(3):458-467.
https://doi.org/10.1287/mnsc.9.3.458
21. Dalkey NC. The Delphi Method: An Experimental Study of Group Opinion. Rand Corp Santa Monica Calif; 1969. Available from: https://apps.dtic.mil/sti/citations/AD0690498 [Last accessed on 2021 Aug 07].
22. Hsu CC and Sandford BA. The Delphi technique: Making sense of consensus. Pract Assess Res Eval 2007;12(10):8.
https://doi.org/10.7275/pdz9-th90
23. Delbecq AL, Gustafson DH and Van de Ven AH. Group Techniques for Program Planning: A Guide to Nominal Group and Delphi Processes. Glenview, Ill: Scott, Foresman; 1975. p. 174.
24. Rådestad M, Jirwe M, Castrén M, Svensson L, Gryth D and Rüter A. Essential key indicators for disaster medical response suggested to be included in a national uniform protocol for documentation of major incidents: A Delphi study. Scand J Trauma Resusc Emerg Med. 2013;21(1):68.
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PLW – Collected and analyzed data, interpreted results, and prepared the first draft of manuscript; **LMMKD and SEG –** Contributed for conceptualizing and developing the study, interpreting results, and revising the manuscript. All authors read and approved the final version of the manuscript.

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