Original

Knowledge and practice patterns of nutrition-focused physical examination in dietitians in Malaysia after an in-person training workshop with 1-year online follow-up

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ABSTRACT *Background:* Nutrition-focused physical examination (NFPE) is a component of nutrition assessment performed by dietitians. Globally, research on NFPE practices of dietitians is limited. *Purpose:* This study explored changes in NFPE knowledge and practices over 12-months among clinical dietitians in Malaysia who completed a hybrid NFPE training program. *Methods:* This was secondary analysis of data from a 2019 prospective cohort pilot study. Participants attended a 2-day in-person workshop in Malaysia with quarterly online follow-up over 12 months. A 50-item multiple-choice knowledge test was completed by participants before and immediately, 6- and 12-months post-training. Data collection forms with self-reported frequencies of conduct of 43 NFPE practice tasks conducted during patient assessments were completed before and 6- and 12-months post-training. Statistical analyses included descriptive statistics, one-way repeated-measures ANOVA for knowledge assessment scores, and Chi-square tests for changes in frequencies of NFPE performance for the study population. *Results:* Of the 16 clinical dietitian participants, 81.3% (n = 13) completed the study. Participants had a mean of 9.3±6.4 years of clinical practice; 81.3% (n = 13) had no prior NFPE training. Mean NFPE knowledge scores increased significantly from before (33.8±3.9) to immediately post-training (44.0±3.2; $p < 0.001$) and were maintained for 12-months post-training (43.3±2.9; $p < 0.001$). Performance of all 43 NFPE practice tasks increased significantly from before to 12-months post-training ($p < 0.001$). *Conclusion:* Clinical dietitian participants demonstrated an improvement in their knowledge scores and frequency of use of NFPE from before to 12-months post-training. Future research should include a control group to examine the effectiveness of a hybrid NFPE training program.
Keywords: *Dietitians, Nutrition-focused physical examination, knowledge, practice, allied health*

INTRODUCTION

Physical examination of a patient involves a head-to-toe examination using visual observation, palpation, auscultation, and percussion (1). Nutrition-focused physical examination (NFPE), conducted by a dietitian, includes the examination of body composition (muscle and subcutaneous fat stores and fluid accumulation); inspection of the skin, hair, and nails; examination of posture and functional status, and the head, neck, select cranial nerves and oral cavity and dysphagia screening (2, 3). An NFPE allows the dietitian to identify factors impacting a person's ability to consume foods and fluids and signs and symptoms of nutrient deficiencies and malnutrition (1).

The Academy of Nutrition and Dietetics (Academy) Nutrition Care Process (NCP) for registered dietitians states that the NFPE should be included as part of a nutrition assessment (4). The NCP has been adopted by dietitians practicing in countries in the Asia-Pacific region, including Australia, New Zealand, and Singapore (5, 6). Dietitians in these countries have reported that the benefits to patient care support the use of the NCP in practice (6). Dietetics educators and clinical dietitians in Malaysia have also incorporated the NCP into their dietetics curricula (7) and clinical practice, respectively (8). However, before 2019, clinical dietitians in Malaysia do not use NFPE as part of the NCP. Instead, they commonly use the Subjective Global Assessment (SGA) to conduct nutrition assessments which includes a physical examination of subcutaneous fat tissue, muscle stores, and the presence of edema and/or ascites to identify malnutrition (9). Thus, clinical dietitians in Malaysia could have been practicing some components of NFPE.

Registered dietitians (RDs) in the U.S. have described inadequate training and lack of confidence as barriers to performing NFPE (3, 10-12). After receiving NFPE training, U.S RDs reported increased knowledge, confidence, and use of NFPE in clinical practice (3, 11). Two prior studies explored changes in the practice of dietitians following NFPE training in Africa and the Middle East (2, 13). Wright found that dietitians in Ghana demonstrated a significant increase in knowledge, application of the malnutrition diagnosis criteria, and confidence scores in diagnosing malnutrition after completing NFPE

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training (13). Similarly, Brody et al explored changes in the knowledge and practice of dietitians working in long-term care settings in Israel and found that participants demonstrated increased knowledge and performance of NFPE after completing NFPE training (2). However, there is a paucity of published research on the adequacy of training and other factors affecting the knowledge and practice of NFPE in Asia and other regions outside the United States.

The primary aims of this secondary analysis were to examine the changes in NFPE knowledge and practices for clinical dietitian participants in Malaysia who attended an in-person NFPE workshop and completed 12-months of online follow-up training.

MATERIALS AND METHODS

Study Design

This study is a secondary analysis of data from one of two cohorts, comprising 16 clinical dietitian participants from the original prospective cohort pilot study by Tomesko et al (14). For inclusion in the pilot study, dietitian participants had at least 1 year of clinical work experience and could attend a 2-day in-person NFPE training workshop conducted at International Medical University (IMU) in Kuala Lumpur, Malaysia in January 2019, and participated in the 12-months of online follow-up.

Recruitment and Study Implementation

Sixteen clinical dietitian participants enrolled in the original study; 13 who completed all study components, including knowledge tests and NFPE data collection forms, were included in this secondary analysis. Participants were invited to participate in an information session about the study via an email invitation sent through the Malaysian Dietitian Association (MDA) listserv or were selected by Malaysia's Ministry of Health (MOH) Head of Professions. Participants who agreed to participate in the study signed consent forms after the information session.

Study participants enrolled in a Canvas Learning Management System (LMS) module entitled "Nuts and Bolts of NFPE" (15) that included the NFPE training module, training resources, and ZOOM links for online follow-up sessions. In January 2019, participants attended a 2-day in-person NFPE workshop conducted by 3 faculty from Rutgers University. Day 1 consisted of didactic lectures with hands-on demonstrations, role-modeling by the instructors, and mentored practice of NFPE techniques. Day 2 focused on the evaluation of skills acquisition. At the end of Day 2, clinical dietitian participants completed the first knowledge post-test and a skills competency assessment. Live online sessions were conducted quarterly for 12-months post-training via ZOOM (16), using case studies to reinforce NFPE skills. The skills competency assessment was repeated virtually at 6- and 12-months post-intervention to assess skill acquisition and retention. Study investigators, who are experts in NFPE, evaluated the competency assessments.

Data collection tool

Knowledge tests: Participants completed a knowledge pre-test with demographic questions administered by Qualtrics (17) and the knowledge test before and immediately, 6, and 12-months post-training. These tests consisted of 50 questions related to NFPE. Participants were awarded 1 point for each correct answer and no points for incorrect or missing answers, with a possible minimum score of 0 and a maximum score of 50 points. The knowledge pre- and post-tests had the same questions, but the order of the questions and their multiple-choice options were scrambled each time the test was administered.

NFPE data collection form: Study investigators instructed the participants to complete 25 data collection forms 2 weeks before the workshop. The form consisted of 43 NFPE practice tasks, comprised of a patient interview, examination of the skin, fluid, muscle, and fat stores; cranial nerve and intra-oral examination tasks, based on the *Stepwise Approach to the Conduct of the Nutrition Focused Physical Examination* developed by the Rutgers School of Health Professions' Department of Clinical and Preventive Nutrition Sciences (RU, SHP, DCPNS). This guide was used as a training tool during the workshop to teach participants how to conduct a physical examination.

Post-training, participants were asked to complete one form for each patient they conducted a nutrition assessment on and return up to 25 forms at 6- and 12-months. If participants completed the NFPE practice task, they indicated "performed exam" and if they did not complete the NFPE practice task, participants indicated they "did not perform exam" on the form.

The knowledge tests and NFPE data collection tool were subjected to face and content validity testing with 4 NFPE experts from RU, SHP, DCPNS, and 2 dietetics educators from IMU. The knowledge tests and NFPE data collection tools have also been used with other dietitians globally (2, 3). This study received expedited ethics approval by the Health Sciences IRB Newark at Rutgers University (protocol #2018000733), IMU Joint-Committee on Research and Ethics (IMU R 209/2018), and Malaysian Ministry of Health National Medical Research Registry (NMRR18-2857-44374 (IIR)).

Statistical Analyses

Descriptive statistics were used to describe the sample, responses to the knowledge tests, and self-reported NFPE practices at each time point of data collection. One-way repeated-measures ANOVA with Bonferroni's post-hoc analysis analyzed the change in NFPE knowledge scores over time. Chi-square or Fisher's exact test was used to analyze changes in practice task performance from before to 6- and 12-months post-training, and from 6- to 12-months post-training. Changes in NFPE practice task performance were based on the number of NFPE data collection forms returned at each time point of data collection and not by comparing individual clinical dietitian participants' responses. We did not conduct matched paired analysis because the same individual

did not return the same number of forms at each timeframe. For these analyses, the 'n' reported is the number of times a clinical dietitian participant reported that they performed or did not perform a task on the data collection form.

RESULTS

Sample Description

Of the 16 clinical dietitian participants who consented to the study, 81% (n = 13) completed the study. Ninety-two percent (n = 12) were female. Participants had a mean age of 33.8±4.0 years and a mean of 9.1±4.9 years of clinical practice; 76.9% (n = 10) reported that they had never received NFPE training before this study.

Knowledge scores

Participant knowledge scores for those who completed knowledge tests at all 4 time points were 33.8±3.9 before training, 44.0±3.2 immediately post-training, 42.9±3.6 at 6 months post-training, and 43.3±2.9 at 12-months post-training out of a maximum possible score of 50 points. There was a statistically significant increase in total knowledge scores from 33.8 before training to 44.0 immediately post-training. This increase was sustained at 6- and 12-months post-training (p <0.001) (Figure 1).

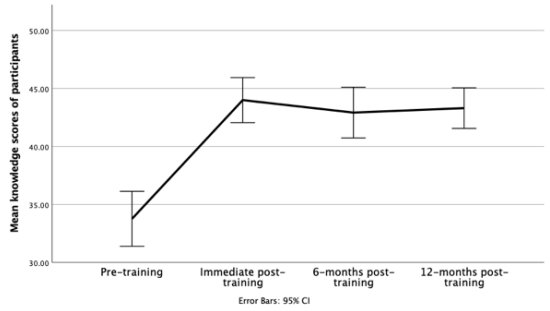

Figure 1: Graph of change in mean knowledge scores over time of clinical dietitian participants (N = 13)

More than 50% of participants selected incorrect answers for 14 of the 50 knowledge questions of the knowledge pre-test. At baseline, all participants selected the correct answers for questions related to applying NFPE and the SGA in clinical practice, the physical identification of landmarks for examining upper body muscle and subcutaneous fat stores, and intra-oral examination. All participants selected the correct responses for these questions at all 4 time points of knowledge assessment (Table 1).

Questions with the lowest proportion of correct responses before training were questions related to malnutrition diagnosis using the Academy/ASPEN consensus statement, extra-oral examination, and examination of muscle stores. The number of correct responses to these questions initially increased from before to immediately post-training but decreased at 6- and 12-months post-training. At the end of 12-months, questions related to malnutrition diagnosis, extra-oral examination, and examination of muscle and fat stores continued to have the lowest proportion of correct responses (Table 1).

NFPE practice tasks

The participants returned a mean of 18 forms each pre-training and a mean of 15 forms each at 6- and 12-months post-training. Self-reported conduct of NFPE practice tasks on the NFPE data collection forms was used as a surrogate measure for participants' conduct of each NFPE task. There were 43 NFPE tasks, grouped into 4 categories: "Patient Presentation and Interview" (9 tasks), "Skin, Fluid, Muscle and Fat Assessment Components" (19 tasks), "Cranial Nerve Examination" (7 tasks), and "Intra-Oral Examination" (8 tasks).

The self-reported conduct of all 9 "Patient Presentation and Interview tasks" by participants was completed less than 50% of the time before training. *Polypharmacy* questions were self-reported as conducted least often (17.1%, n = 42) in this category. In the "Skin, Fluid, Muscle and Fat Assessment Components" category, 16 of the 19 tasks were self-reported as performed 10% of the time or less at baseline (Table 2). At the end of 12-months, the self-reported conduct of all 19 NFPE practice tasks in the "Skin, Fluid, Muscle and Fat Assessment Components" increased significantly from being performed less than 10% before training to more than 70% of the time (p <0.001) (Table 2). The assessment of the *Cough reflex and Swallow* NFPE practice tasks increased from being performed 7.9% and 12.0% of the time before training, to 69.5% and 79.5% at 12-months post-training. Performance of all 7 "Cranial nerve examination tasks" increased from 0.0% before training, to between 46.3-50.2% at 12-months post-training (p <0.001) (Table 2). For the 8 "Intra-oral exam tasks," self-reported conduct increased significantly from being performed less than 10% of the time before training to 58.0% to 85.0% at 12-months post-training (p <0.001) (Table 2). At 12-months post-training, there were statistically significant increases in self-reported conduct of all 43 NFPE tasks from before to 12-months post-training (p <0.001) (Table 2).

DISCUSSION

NFPE knowledge

Eighty-one percent of the dietitian participants completed all components of the study. This was a higher retention rate than Brody et al. (60%) at the end of their one-year study with dietitians in Israel (2). Of the 3 participants that withdrew from the study, 2 did so due to changes in job roles and one could not fulfill study requirements.

There was a significant increase in knowledge scores from before to immediately post-training (p <0.001), which was sustained at 12-months post-training. This finding is consistent with similar studies that explored changes in NFPE knowledge in dietitians after completing NFPE training (2, 11).

Participants answered questions about the SGA and the physical identification of landmarks for examining upper body muscle and subcutaneous fat stores correctly 92.3-100% of the time from before to 12-months post-training. In contrast, less than 60% of participants selected the correct answers before training for questions related to cranial nerve

examination, oral manifestations of nutrient deficiencies, and identification of intra- and extraoral cavity structures. Six months post-training, more than 70% of participants selected the correct responses for questions related to these same topics, and by 12-months post-training, only one question related to cranial nerve examination had less than 60% of participants select the correct answer. Similarly, Brody et al. found that the proportion of correct responses to questions related to cranial nerve examination, oral manifestations of nutrient deficiencies, and identification of intra- and extraoral cavity structures increased from baseline to 12-months post-training in long-term care dietitians in Israel (2).

NFPE performance

There was a significant increase in participants' self-reported conduct of all 43 NFPE practice tasks from before to 12-months post-training (Table 2), which is similar to previous research that explored changes in NFPE knowledge and practices post-training. Consistent with our findings, Brody et al reported significant increases in self-reported conduct of NFPE tasks from before to 6 months post-training in dietitians in Israel (2).

Although dysphagia screening includes an examination of 7 cranial nerves, participants reported performing assessment of the *Cough reflex* and *Swallow* more frequently post-training (69.5% and 79.5% of the time, respectively) than the 7 cranial nerve examination tasks (45.3% to 50.2%). This finding is consistent with prior research where dietitians in Israel who received NFPE training significantly increased their performance of cranial nerve examination practice tasks and swallow screening but performed swallow screening more often than cranial nerve examination tasks.

Participants in this study reported significantly increasing performance of intra-oral examination tasks from baseline to 12-months post-training ($p < 0.001$) (Table 2). Similarly, dietitians working in long-term care in Israel who had received NFPE training related to intra- and extra-oral examination also significantly increased their performance of intra-oral examination tasks before to 6 months post-training (2). Dietitians who performed intra-oral examinations reported that they were significantly more likely to refer the patient to a relevant healthcare professional if abnormalities were observed during intra-oral examinations ($p < 0.001$) (2).

Strengths and limitations

Although this pilot study had a small sample size, the retention rate was high, reflecting the feasibility of using a hybrid approach with in-person training and virtual ZOOM follow-up for teaching NFPE. The US investigators' experience in developing training programs and conducting NFPE training globally was also a strength (2, 3, 14). Their collaboration with the investigators in Malaysia ensured the teaching materials and content used were culturally appropriate and reflected the local practice in Malaysia (14). As a result of this study, Malaysia's MOH now requires dietitians to include NFPE as part of their professional requirements. However, this study also has some limitations. The generalizability of the study results are limited due to the small sample from one geographical location in Malaysia. Selection bias is possible as recruited participants had volunteered via MDA's listserv or were selected by the MOH's Head of Profession and may already have an interest in NFPE. Since this was a pilot study with no control group, it was not possible to determine the effect of training on NFPE knowledge and practice in the clinical dietitian participants.

As knowledge test questions were identical at all time points, participants may have become familiar with the questions and reported answers from memory. To minimize this, questions and multiple-choice options were scrambled each time the knowledge test was administered. It is also possible that the ZOOM sessions and the continued documentation of NFPE practice tasks over the 1-year follow-up could have also reinforced knowledge retention and skill acquisition (14). The potential for recall bias cannot be ruled out since the conduct of NFPE practice tasks was self-reported (18). As participants were aware that the study was examining changes in NFPE practice after training, they could have reported the conduct of more NFPE tasks. Although the clinical dietitian participants' actual performance of NFPE practice tasks was not observed, the hands-on demonstration and practice of NFPE skills during the workshop and virtual follow-up sessions provided participants with the opportunity to practice and apply the skills taught.

The findings from this study demonstrate that clinical dietitians in Malaysia who completed an in-person NFPE training with 12-months of online follow-up sessions increased their NFPE knowledge scores from before training to immediately post-training, and sustained it for up to 12-months post-training. Self-reported conduct of NFPE tasks in clinical practice likewise increased significantly from before to 12-months post-training. Future research may include expanding this training program's reach to dietitians in other countries throughout Southeast Asia. Including a control group in future studies will help determine if increases in NFPE knowledge and dietitians' practice can be attributed to the training.

Table 1: Distribution of correct and incorrect responses for knowledge tests before and immediately, 6- and 12-months post-training (N=13)

	Question	Before training				Immediately post-training				6m post-training				12-m post-training			
		Correct		Incorrect		Correct		Incorrect		Correct		Incorrect		Correct		Incorrect	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1.	NFPE scope of practice	13	100.0	0	0.0	13	100.0	0	0.0	13	100.0	0	0.0	13	100.0	0	0.0
2.	Academy and A.S.P.E.N.[a] consensus statement malnutrition diagnostic criteria	1	7.7	12	92.3	8	61.5	5	38.5	3	23.1	10	76.9	1	7.7	12	923
3.	Identifying abnormalities during intra-oral exam	6	46.2	7	53.8	10	76.9	3	23.1	13	100.0	0	0.0	12	92.3	1	7.7
4.	Using the SGA in nutrition assessment	13	100.0	0	0.0	12	92.3	1	7.7	12	92.3	1	7.7	12	92.3	1	7.7
5.	Identifying validated nutrition screening tools	9	69.2	4	30.8	11	84.6	2	15.4	10	76.9	3	23.1	13	100.0	0	0.0
6.	Recognition of causes that result in failure of the soft palate to rise	8	61.5	5	38.5	11	84.6	2	15.4	11	84.6	2	15.4	11	84.6	2	15.4
7.	Identifying normal appearance of the gingiva	12	92.3	1	7.7	12	92.3	1	7.7	13	100.0	0	0.0	11	84.6	2	15.4
8.	Identifying functions of the Wharton's and Stenson's ducts	9	69.2	4	30.8	13	100.0	0	0.0	13	100.0	0	0.0	13	100.0	0	0.0
9.	Identifying correct fat and muscle assessment techniques in NFPE	9	69.2	4	30.8	12	92.3	1	7.7	10	76.9	3	23.1	11	84.6	2	15.4
10.	Identification of occlusion	5	38.5	8	61.5	10	76.9	3	23.1	13	100.0	0	0.0	13	100.0	0	0.0
11.	Definition of edentulism	4	30.8	9	69.2	12	92.3	1	7.7	13	100.0	0	0.0	13	100.0	0	0.0
12.	Identification of factors that hide orbital fat pad wasting	7	53.8	6	46.2	6	46.2	7	53.8	2	15.4	11	84.6	8	61.5	5	38.5
13.	Identification of clavicle for muscle assessment	12	92.3	1	7.7	13	100.0	0	0.0	12	92.3	1	7.7	13	100.0	0	0.0
14.	Identification of acromion for muscle assessment	13	100.0	0	0.0	13	100.0	0	0.0	12	92.3	1	7.7	13	100.0	0	0.0

Question	Before training				Immediately post-training				6m post-training				12-m post-training			
	Correct		Incorrect		Correct		Incorrect		Correct		Incorrect		Correct		Incorrect	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
15. Identification of bicep for muscle assessment	13	100.0	0	0.0	13	100.0	0	0.0	13	100.0	0	0.0	13	100.0	0	0.0
16. Recognition of the appearance of a normal tongue	13	100.0	0	0.0	13	100.0	0	0.0	13	100.0	0	0.0	13	100.0	0	0.0
17. Identification of the impact of hyposalivation	13	100.0	0	0.0	13	100.0	0	0.0	13	100.0	0	0.0	12	92.3	1	7.7
18. Identification of the correct method for upper arm fat stores assessment	4	30.8	9	69.2	13	100.0	0	0.0	13	100.0	0	0.0	13	100.0	0	0.0
19. Identification of the causes of angular cheilitis	2	15.4	11	84.6	11	84.6	2	15.4	11	84.6	2	15.4	9	69.2	4	30.8
20. Proper documentation of the appearance of lesions on the palate	11	84.6	2	15.4	13	100.0	0	0.0	13	100.0	0	0.0	13	100.0	0	0.0
21. Identification of the function of anterior teeth	11	84.6	2	15.4	13	100.0	0	0.0	12	92.3	1	7.7	11	84.6	2	15.4
22. Identification of appearance of fat wasting in the thoracic/ lumbar region	12	92.3	1	7.7	11	84.6	2	15.4	13	100.0	0	0.0	13	100.0	0	0.0
23. Identification of the appearance of the temporalis muscle in a well-nourished individual [b]	13	100.0	0	0.0	13	100.0	0	0.0	11	84.6	1	7.7	11	84.6	2	15.4
24. Identification of the impact of a TMJ disorder	8	61.5	5	38.5	12	92.3	1	7.7	13	100.0	0	0.0	12	92.3	1	7.7
25. Facial examination	12	92.3	1	7.7	12	92.3	1	7.7	8	61.5	5	38.5	8	61.5	5	38.5
26. Extra-oral examination	4	30.8	9	69.2	12	92.3	1	7.7	13	100.0	0	0.0	12	92.3	1	7.7
27. The appearance of muscles in well-nourished individuals	11	84.6	2	15.4	12	92.3	1	7.7	10	76.9	3	23.1	9	69.2	4	30.8

Question	Before training				Immediately post-training				6m post-training				12-m post-training			
	Correct		Incorrect		Correct		Incorrect		Correct		Incorrect		Correct		Incorrect	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
28. Recognition of altered cranial nerve function	5	38.5	8	61.5	12	92.3	1	7.7	13	100.0	0	0.0	12	92.3	1	7.7
29. Identification of signs and symptoms of dysphagia	5	38.5	8	61.5	8	61.5	5	38.5	7	53.8	6	46.2	9	69.2	4	30.8
30. Muscle examination technique	6	46.2	7	53.8	13	100.0	0	0.0	11	84.6	2	15.4	12	92.3	1	7.7
31. Steps of dysphagia screening	8	61.5	5	38.5	13	100.0	0	0.0	13	100.0	0	0.0	13	100.0	0	0.0
32. Identification of the hard palate	10	76.9	3	23.1	12	92.3	1	7.7	12	92.3	1	7.7	12	92.3	1	7.7
33. Identification of the soft palate	7	53.8	6	46.2	12	92.3	1	7.7	11	84.6	2	15.4	11	84.6	2	15.4
34. Identification of the buccal mucosa	11	84.6	2	15.4	13	100.0	0	0.0	13	100.0	0	0.0	12	92.3	1	7.7
35. Identification of the oropharynx	11	84.6	2	15.4	13	100.0	0	0.0	12	92.3	1	7.7	12	92.3	1	7.7
36. Identification of the uvula	13	100.0	0	0.0	13	100.0	0	0.0	13	100.0	0	0.0	13	100.0	0	0.0
37. Identification of type of dentures	5	38.5	8	61.5	10	76.9	3	23.1	10	76.9	3	23.1	11	84.6	2	15.4
38. Identification of appearance of severe muscle wasting	13	100.0	0	0.0	12	92.3	1	7.7	13	100.0	0	0.0	12	92.3	1	7.7
39. The appearance of interosseous muscle	11	84.6	2	15.4	13	100.0	0	0.0	10	76.9	3	23.1	11	84.6	2	15.4
40. Proper muscle examination techniques	8	61.5	5	38.5	10	76.9	3	23.1	11	84.6	2	15.4	12	92.3	1	7.7
41. Steps in dysphagia risk screening	11	84.6	2	15.4	11	84.6	2	15.4	13	100.0	0	0.0	13	100	0	0.0

Question	Before training				Immediately post-training				6m post-training				12-m post-training			
	Correct		Incorrect		Correct		Incorrect		Correct		Incorrect		Correct		Incorrect	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
42. Identification of muscle appearance during the examination	3	23.1	10	76.9	6	46.2	7	53.8	7	53.8	6	46.2	4	30.8	9	69.2
43. Examination of cranial nerves	4	30.8	9	69.2	13	100.0	0	0.0	10	76.9	3	23.1	7	53.8	6	46.2
44. Identification of cranial nerves	1	7.7	12	92.3	11	84.6	2	15.4	11	84.6	2	15.4	13	100.0	0	0.0
45. Examination of muscle stores in malnutrition	10	76.9	3	23.1	12	92.3	1	7.7	12	92.3	1	7.7	12	92.3	1	7.7
46. Identification of the degree of muscle wasting	9	69.2	4	30.8	10	76.9	3	23.1	9	69.2	4	30.8	11	84.6	2	15.4
47. Steps of intra-oral examination	10	76.9	3	23.1	12	92.3	1	7.7	13	100.0	0	0.0	13	100.0	0	0.0
48. Identification of the degree of muscle wasting	12	92.3	1	7.7	10	76.9	3	23.1	11	84.6	2	15.4	13	100.0	0	0.0
49. Identification of the use of handgrip strength	10	76.9	3	23.1	9	69.2	4	30.8	8	61.5	5	38.5	10	76.9	3	23.1
50. Malnutrition diagnosis using the SGA	8	61.5	5	38.5	7	53.8	6	46.2	9	69.2	4	30.8	9	69.2	4	30.8

[a] Academy-Academy of Nutrition and Dietetics; A.S.P.E.N.-American Society of Enteral and Parenteral Nutrition; BMI-Body Mass Index; MNA-Mini Nutrition Assessment; MST-Malnutrition Screening Tool (MST); NFPE-Nutrition-focused Physical Examination; SGA-Subjective Global Assessment
[b] Missing response for Question 23 at 6 months post-training

Table 2: Change in performance of NFPE practice tasks by clinical dietitian participants over time (N = 13)

NFPE Clinical Practice Tasks	Before training					6months post-training[a]					12-months post-training[a]				
	Not performed		Performed		Total	Not performed		Performed		Total	Not performed		Performed		Total
	n[b]	%	n	%	n	n	%	n	%	n	n	%	n	%	n
Patient Presentation and Interview Tasks															
Physique and posture	149	60.1	**99**	**39.9**	248	12	6.3	**178**	**93.7**	190	9	4.5	**192**	**95.5**	201
Functional status	152	61.3	96	38.7	248	22	11.6	**168**	**88.4**	190	9	4.5	**192**	**95.5**	201
Cognition	140	57.4	**104**	**42.6**	244	14	7.4	**176**	**92.6**	190	5	2.5	**195**	**97.5**	200
Polypharmacy	203	82.9	42	17.1	245	66	34.6	125	65.4	191	79	39.7	120	60.3	199
Xerostomia	190	77.6	55	22.4	245	31	16.3	159	83.7	190	28	13.9	173	86.1	201
Altered taste	163	66.0	84	34.0	247	34	18.0	155	82.0	189	24	11.9	177	88.1	201
Oral pain	173	70.3	73	29.7	246	33	17.8	152	82.2	185	25	12.5	175	87.5	200
Changes in ability to bite, chew and swallow	136	56.2	**106**	**43.8**	242	29	15.5	158	84.5	187	22	11.1	176	88.9	198
Use of dentures to eat	148	61.4	93	38.6	241	34	19.3	142	80.7	176	22	12.4	156	87.6	178
Skin, Fluid, Muscle and Fat Assessment Components															
Dorsal hand region	219	92.0	**19**	**8.0**	238	37	20.6	**143**	**79.4**	180	26	13.1	**173**	**86.9**	199
Biceps, triceps	221	92.5	18	7.5	239	39	21.3	**144**	**78.7**	183	25	12.4	**176**	**87.6**	201
Acromion process and deltoid muscle region	220	92.1	19	7.9	239	47	25.4	**138**	**74.6**	185	29	14.4	**172**	**85.6**	201
Scapula	224	93.7	15	6.3	239	66	35.7	119	64.3	185	39	19.5	161	80.5	200
Clavicle	218	91.6	**20**	**8.4**	238	50	27.0	135	73.0	185	33	16.4	168	83.6	201
Ribs	222	93.3	16	6.7	238	67	36.6	116	63.4	183	41	20.4	160	79.6	201
Patellar region	221	92.9	17	7.1	238	58	31.4	127	68.6	185	39	19.5	161	80.5	200
Anterior thigh region	220	92.4	18	7.6	238	59	32.1	125	67.9	184	35	17.5	165	82.5	200
Posterior calf region	217	91.9	**19**	**8.1**	236	58	31.5	126	68.5	184	35	17.5	165	82.5	200
Fluid, skin hair and nails															
Edema or dehydration	201	84.8	**36**	**15.2**	237	35	19.1	**148**	**80.9**	183	19	9.6	**179**	**90.4**	198
Color and temperature	206	90.4	22	9.6	228	41	22.2	**144**	**77.8**	185	32	16.0	168	84.0	200
Texture, dryness and brittleness	206	91.2	20	8.8	226	44	23.2	146	76.8	190	26	13.1	173	86.9	199
Potential micronutrient deficiencies and toxicities	168	97.7	4	2.3	172	47	25.5	137	74.5	184	46	23.0	154	77.0	200
Orbital fat pads	212	88.7	**27**	**11.3**	239	21	11.0	**170**	**89.0**	191	2	1.0	**199**	**99.0**	201
Temporalis muscle	217	90.8	22	9.2	239	34	17.8	157	82.2	191	8	4.0	**193**	**96.0**	201
Temporomandibular joint (TMJ)	224	93.7	15	6.3	239	72	38.1	117	61.9	189	71	35.3	130	64.7	201
Muscles of mastication	224	93.7	15	6.3	239	69	36.3	121	63.7	190	69	34.5	131	65.5	200

NFPE Clinical Practice Tasks	Before training					6months post-training[a]					12-months post-training[a]				
	Not performed		Performed		Total	Not performed		Performed		Total	Not performed		Performed		Total
	n[b]	%	n	%	n	n	%	n	%	n	n	%	n	%	n
Cough reflex	220	92.1	19	7.9	239	67	35.3	123	64.7	190	61	30.5	139	69.5	200
Swallow	198	88.0	**27**	**12.0**	225	49	25.8	141	74.2	190	41	20.5	159	79.5	200
Cranial nerve examination tasks															
Trigeminal Nerve V: motor	239	100.0	0	0.0	239	94	49.5	**96**	**50.5**	190	108	53.7	93	46.3	201
Trigeminal Nerve V: sensory	239	100.0	0	0.0	239	102	54.0	87	46.0	189	108	53.7	93	46.3	201
Facial Nerve VII: motor	239	100.0	0	0.0	239	94	49.7	95	50.3	189	100	49.8	**101**	**50.2**	201
Facial Nerve VII: sensory	239	100.0	0	0.0	239	90	48.1	**97**	**51.9**	187	102	50.7	**99**	**49.3**	201
Glossopharyngeal/ Vagus Nerve IX/X: motor	239	100.0	0	0.0	239	96	50.3	95	49.7	191	109	54.2	92	45.8	201
Hypoglossal Nerve XII: motor	239	100.0	0	0.0	239	92	48.2	**99**	**51.8**	191	107	53.5	**93**	**46.5**	200
Accessory Nerve XI: motor	236	100.0	0	0.0	236	98	51.3	93	48.7	191	108	53.7	93	46.3	201
Intra-oral exam tasks															
Dentition:															
Edentulism	218	91.6	**20**	**8.4**	238	48	25.8	138	74.2	186	36	18.1	163	81.9	199
Occlusion	223	93.7	15	6.3	238	48	25.7	139	74.3	187	37	18.6	162	81.4	199
Dentures	218	91.6	20	8.4	238	47	25.1	**140**	**74.9**	187	30	15.0	**170**	**85.0**	200
Soft tissue:															
Labial mucosa	238	100.0	0	0.0	238	92	49.2	**95**	**50.8**	187	84	42.0	116	58.0	200
Buccal mucosa	238	100.0	0	0.0	238	98	52.4	89	47.6	187	84	42.0	116	58.0	200
Floor of mouth	238	100.0	0	0.0	238	97	51.9	90	48.1	187	84	42.0	116	58.0	200
Hard and soft palates	238	100.0	0	0.0	238	96	51.5	**90**	**48.4**	186	83	41.5	**117**	**58.5**	200
Tongue	235	99.6	**1**	**0.4**	236	94	50.5	**92**	**49.5**	186	82	41.2	**117**	**58.8**	199

[a] Analyses were conducted using Chi-squared tests. All NFPE practice tasks had a significant change in performance over time, $p < 0.001$; Bold-faced' n' values and frequencies indicate the NFPE tasks with the highest frequencies of performance at each time point; [b] "n" refers to the number of forms submitted by participants at each time point. As clinical dietitian participants may not complete all NFPE tasks on the data collection form, the distribution (n) varies for each task

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CONFLICTS OF INTEREST (COI)

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