





Facilitators and barriers to providing culinary nutrition, culinary medicine and behaviour change support: An online cross-sectional survey of Australian health and education professionals

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Abstract

Background: An Australia wide cross-sectional online survey examined facilitators and barriers of health and education professionals to providing culinary nutrition (CN) and culinary medicine (CM) education and behaviour change support in usual practice, in addition to identifying continuing professional development (CPD) needs in this domain.

Methods: Survey items included socio-demographic characteristics, cooking and food skills confidence, nutrition knowledge (PKB-7), fruit and vegetable intake (FAVVA) and CPD needs. Data were summarised descriptively.

Results: Of 277 participants, 65% were likely/somewhat likely to participate in CN CPD. Mean (SD) cooking and food skill confidence scores were 73 (17.5) and 107.2 (24), out of 98 and 147, respectively. Mean PKB-7 score was 3.7 (1.4), out of 7. Mean FAVVA score was 98 (29), out of 190.

Conclusions: Gaps in knowledge and limited time were the greatest modifiable barriers to providing CM/CN education and behaviour change support in practice. Health and education professionals are interested in CPD conducted by dietitians and culinary professionals to enhance their knowledge of CM/CN and behaviour change support.

KEYWORDS

continuing professional development, culinary medicine, culinary nutrition, intervention

Key points

- Poor knowledge is a barrier to providing education about nutrition, cooking and food skills and to providing support to others to improve food behaviour.
- Participants want to understand differences between special diets and 'fad' diets.
- Health and education professionals are interested in continuing professional development to enhance their knowledge of culinary nutrition education and behaviour change support.

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INTRODUCTION

Diet plays an important role in prevention and treatment of non-communicable diseases.¹ However, fewer than 10% of Australian adults consume the daily recommended serves of vegetables and 35% of total daily energy intakes are derived from energy-dense, nutrient-poor foods.² The World Cancer Research Fund International's NOURISHING framework guides policy action for promotion of healthy eating to reduce the non-communicable disease burden. The framework identifies nutrition, food preparation and cooking skill programs as an area for action, with a focus on behaviour change communication, including providing opportunistic nutrition advice and counselling in health care settings and providing nutrition education and developing food skills.³

Dietitians provide personalised nutrition advice, often for complex medical conditions.⁴ However, other health professionals could support patient's food-related behaviour change within their usual scope of practice through provision of general evidence-based nutrition information and behaviour change support.^{5,6} Providing opportunistic patient support has been targeted in smoking cessation, alcohol reduction and increasing physical activity.⁷ Health professionals could support nutrition education to patients, including pregnant women,^{8,9} and in chronic conditions such as weight management,^{10,11} type 2 diabetes and cardiovascular disease.^{11,12} However, these opportunities are often missed.⁵ Barriers and enablers to providing opportunistic health behaviour change support align into four themes: (1) perception of health professionals' knowledge and skills; (2) perceptions about their role; (3) resources and support needs; and (4) health professional's practice.⁷ Time and a practitioners perception of scope of practice are both barriers to providing opportunistic health behaviour change support.^{7,10} Insufficient nutrition training of medical and other health professionals is a barrier, with the current level being insufficient to assist them in helping their patients make healthier food choices.¹³⁻¹⁵ More comprehensive nutrition training for healthcare providers could address this issue.^{13,15,16} Culinary interventions, including nutrition, cooking and food skill education, could be used to target diet-related risk behaviours.¹⁷ Some positive effects have been shown for fruit and vegetable intakes, knowledge, skills and cooking confidence.^{17,18}

Culinary medicine (CM) and culinary nutrition (CN) programs combine health and nutrition education with culinary arts, including food preparation and cooking, and utilise the relationship between nutrition-related health and culinary practices.^{19,20} CM considers social and cultural elements of food and eating, and the role of food in prevention and treatment of disease.²⁰ CM programs for health and medical practitioners teach nutrition by developing skills needed for both their own

healthy dietary behaviours and their patients and clients, including meal planning, food preparation and cooking skills.^{20,21} CN combines food science and nutrition with culinary arts to promote sustainable eating patterns to support health.¹⁹ CN programs can be delivered by community health workers, educators, dietitians, nutritionists, students of health disciplines or peer leaders and may include chefs.^{17,18}

Preliminary CM and CN program evaluations suggest that they are feasible, acceptable and may be effective in supporting nutrition and cooking education among trainee medical,²²⁻²⁵ nutrition and dietetic undergraduates,^{26,27} and health professionals.²⁸ CM education delivered to trainee health professionals within a teaching kitchen may be associated with better outcomes compared to traditional classroom-based learning, including improved dietary intakes for medical students and patient nutrition counselling competence.^{29,30} Education professionals who teach culinary arts and/or nutrition in adult and community settings are also well placed to provide CN related behaviour change support to their learners and students. We found no studies of facilitators and barriers to education professionals that provide this CN related behaviour change support. CM programs to date have rarely been conducted in Australia, none have been rigorously evaluated and few CM programs provide an adequate description of factors informing their development.³¹

Therefore, the present study surveyed health professionals and education professionals who work with patients or clients or teach adult cooking and/or nutrition in community settings, aiming to inform the development of a CM/CN continuing professional development (CPD) program. Specific aims, with respect to health and education professionals, were to assess: (1) cooking, food preparation and meal planning confidence, nutrition knowledge and dietary intake; (2) barriers and facilitators to provision of CM/CN education and behaviour change support in usual practice; and (3) personal preferences for CPD in this area.

METHODS

This cross-sectional online survey of Australian health and education professionals with the ability to potentially provide CM/CN education and behaviour change support to their patients, clients, adult learners or students, to improve dietary patterns, was undertaken in September 2019. The study reporting aligned with the STROBE checklist for cross-sectional studies.³²

Participants

Eligibility included living in Australia, aged ≥ 18 years, currently working in a health-related role (e.g., medical

physician, nurse, allied health) that included face-to-face contact either individually or with groups of patients or clients. Education professionals were eligible if they taught cooking and/or nutrition in either community education or adult education settings. There was no restriction regarding whom those programs targeted or the setting (e.g., out of school hours or vacation care, workplace). Exclusion criteria were education professionals teaching in early childhood education, or primary or secondary schools, exclusively. The sample size was selected to obtain meaningful representation of health professionals consistent with Australian workforce representation.³³ This is characterised by the highest number of health staff being from the professions of nursing, followed by allied health, medical and then dental health professions.

Survey

The online survey participants were recruited using Qualtrics Research Services (Qualtrics LLC). The service was responsible for the recruitment of all participants, distribution of surveys and data collection.³⁴ There were no differences in how health and education professionals were recruited. Survey commencement was taken as consent and all results were anonymous. The survey consisted of both closed quantitative data questions ($n = 150$) and one open-ended question. Completion time was approximately 20 min. The questionnaire was pre-tested with five practising health and education professionals for content validity and usability (i.e., readability, clarity, relevance and survey length) and revisions were made to wording in response to feedback provided. The University of Newcastle Human Research Ethics Committee approved the project (Approval number H-2019-0166).

Survey domains included cooking and food skills confidence³⁵; diet quality³⁶; nutrition knowledge³⁷; usual practice regarding provision of cooking, meal planning, nutrition and health behaviour change advice in the context of health or education practice, and barriers and facilitators to doing this^{10,15,38}; CPD activity preferences^{10,15,38}; and preferred delivery mode, format and content in regard to a CM/CN CPD course. Validated instruments were used to measure cooking and food skills confidence, diet quality, and nutrition knowledge.^{35–37} Questions to measure barriers and facilitators to provision of nutrition, cooking, meal planning and/or health behaviour change, as well as CPD preferences, were modified from existing surveys.^{10,15,38,39} Questions to measure preferred delivery mode, format and content for a CM/CN CPD course were developed specifically for the survey.

Cooking and food skills confidence

The health and education professionals' own food preparation and cooking skills, and food skills confidence was assessed using a survey based on the validated cooking and food skill confidence questionnaire of Lavelle et al.³⁵ This survey consists of 33 questions with response captured on an eight-point Likert scale, ranging from 7 'never/rarely' (0) to 'very good' (7).^{7,35} Two items ('prepare and cook raw meat/poultry' and 'prepare and cook raw fish') were omitted from the original cooking skills confidence measure of Lavelle et al.³⁵ and replaced with two vegetable specific cooking skill confidence items ('make a salad dressing' and 'make a salad from scratch'). Two items ('use vegetables as snacks' and 'have fresh vegetables available for salads or side dishes') were added to the food skill confidence measure. Overall cooking and food skills confidence scores were calculated for each of the three professional groups (health, adult education, community education professionals) based on questions on cooking and food skills developed by of Lavelle et al.³⁵ Food skills are reported with and without the additional items. The total score for the 14-item cooking confidence measure was 98, whereas the highest possible score for the original 19-item and modified 21-item meal planning and food skill confidence measure was 133 and 147, respectively.

Nutrition knowledge

Nutrition knowledge was assessed using the Practical Knowledge about Balanced meals (PKB-7), a seven-item tool used to assess understanding of what constitutes a balanced meal.³⁷ An incorrect response scored 0, and correct responses scored 1. The total PKB-7 score ranges from 0 (low knowledge) to 7 (high knowledge).

Diet quality

Diet quality was assessed using the Fruit And Vegetable VARIety Index (FAVVA)³⁶ as a brief measure of frequency and variety related to vegetable and fruit intake. FAVVA consists of 35 questions with higher scores shown previously to be associated with higher plasma carotenoid concentrations, a biomarker of carotenoid rich vegetable and fruit intake.³⁶ The maximum possible score is 190 points, indicating a high frequency and variety of vegetables and fruit. A score of 0 indicates no intake of any vegetable and fruit items included in the measure. Points are awarded based on frequency of intake of specific vegetables and fruit, with 0 points awarded for a response 'never consumed', up to 5 points for a response of '5 or more times per week'.³⁶ A comprehensive list of vegetable and fruit items are included in the tool with additional points available for

frequently consumed vegetables (peas, carrots, broccoli) and fruit (apples, oranges, bananas). These higher scoring options were 'once per day' (6 points) and '≥2 times per day' (7 points).

Barriers and facilitators to provision of advice in practice

Barriers and facilitators to provision of nutrition advice in practice were derived from previous surveys.^{10,15,38} These barriers and facilitators related to whether participants provided food preparation and cooking; food skills; and nutrition related health behaviour change advice to patients, clients, adult learners or students, and whether they perceived this to be within, or should be within their scope of practice. Because the barriers for health and education professional groups differ as a result of their context of work, the response options were presented slightly differently. Participants were able to select as many barriers as applied to their situations. Participants were asked to rate their knowledge and skills in providing education to their patients, clients and students about food preparation, cooking, food skills and meal planning, and nutrition-related health behaviour change. Two questions related to barriers and facilitators to their own healthy eating practices were also included, as modified from a survey by Ashton et al.³⁹

CPD activities and course preferences

Questions examining CPD activities and sources were obtained from three previous surveys^{10,15,38} and adapted for the aims and population of the present study. Participants were asked about their interest in and preferences regarding CM/CN CPD education course content, delivery mode, session length and duration.

Statistical analysis

Qualtrics data cleaning involved removing straight-liners, speed completers and gibberish responses. Further data cleaning was conducted by the research team. This included removing responses where survey completion was less than half the median time because this was not considered sufficiently long to provide quality responses. To further ensure only quality responses were included in analysis a reverse coded 'attention check' question was included, and text responses were reviewed for inappropriate text.

STATA Statistical/Data Analysis 15.1 (StataCorp) was used to analyse data quantitatively.

Mean score (*M*) and standard deviations (*SD*) are reported for whole group and subgroup analysis performed

on cooking and food skill confidence scores. Subgroup analysis for cooking and food skills confidence was performed on participants reporting they were likely or somewhat likely to participate in a CM/CN course even if it was not accredited CPD, as well as for participants who perceive that provision of food preparation and cooking is or should be within their scope of practice. Subgroup analysis based on profession was performed for overall cooking and food skill confidence scores, nutrition knowledge and diet quality scores. Participants were categorised as a health professional, community cooking and/or nutrition education professional (i.e., not in a school) and adult cooking and/or nutrition education professional (i.e., not school-aged). Community cooking and/or nutrition education and adult cooking and/or nutrition education professional groups were collapsed into one group and reported as education professionals because there were no significant difference between these groups. Further between group analysis were conducted using a *t* test and a non-parametric Wilcoxon rank sum test, where appropriate. Cronbach's alpha was used to test the internal consistency and reliability of the adapted cooking and food skill confidence questionnaire. $p < 0.05$ was considered statistically significant.

Frequency and corresponding percentages are reported for subgroup analysis performed on barriers and facilitators to provision of nutrition advice in practice, and CPD activities and preferences. For barriers and facilitators subgroup analysis was performed for health or education professional. For CPD activities and course preferences, subgroup analysis was performed on participants reporting that they were likely or somewhat likely to participate in the course even if it was not accredited CPD.

RESULTS

In total, 375 participants completed the survey. Of the 98 removed, 12 occurred during the Qualtrics data cleaning process, five did not meet inclusion criteria, 42 failed the reverse coded 'attention check' question, 25 completed the survey in less than half the median time and 14 had inappropriate responses to text questions. The final sample of 277 participants eligible for inclusion in the analysis comprised 224 (81%) health professionals, 29 (10%) adult education professionals and 24 (9%) professionals from community education. The overall sample had a mean (*SD*) age of 33 (11.1) years, a mean (*SD*) body mass index of 25.5 (5.6) kg m⁻², a predominance of females ($n = 183$, 66%), almost half had a bachelor's degree ($n = 134$; 48%) and the majority were in full time employment ($n = 175$; 63%). Most participants were the primary person in their household responsible for meal provision with 74% ($n = 205$) responding 'most of the time'. Thirty percent ($n = 66$) of health professionals had practised in their health discipline for less than 3 years

TABLE 1 Characteristics of participants of health, adult and community education professionals

Characteristic (<i>n</i> = 277)	<i>n</i>	%	Mean	SD
Adult education	29	10	–	–
Community education	24	8.7	–	–
Health professional	224	81	–	–
Age	277	–	33.1	11.1
Body mass index	277	–	25.5	5.6
Female	183	66.1	–	–
<i>Meal provision (n = 277)</i>				
Most of the time	205	74	–	–
Sometimes	41	14.8	–	–
About half of the time	21	7.6	–	–
Rarely	8	2.9	–	–
Never	2	0.7	–	–
<i>Highest education (health) (n = 224)</i>				
Postgraduate	63	28.1	–	–
Bachelor degree	111	49.6	–	–
Trade certificate/diploma	43	19.2	–	–
Year 12	5	2.2	–	–
Year 11	1	0.5	–	–
Year 10	1	0.5	–	–
<i>Years practising (health) (n = 224)</i>				
< 3 years	66	29.5	–	–
3–5 years	55	24.6	–	–
5–10 years	49	21.8	–	–
> 10 years	54	24.1	–	–
<i>Health disciplines (n = 224)</i>				
Nursing	83	37.1	–	–
Medical	16	7.6	–	–
Allied health assistants	26	11.6	–	–
Physiotherapy	14	6.2	–	–
Occupational therapy	9	4.0	–	–
Dietetics	3	1.3	–	–
Speech pathology	2	0.9	–	–
Podiatry	1	0.5	–	–
Psychology	9	4.0	–	–
Social work	12	5.4	–	–
Exercise physiology	3	1.3	–	–
Pharmacy	10	4.5	–	–
Medical imaging	8	3.6	–	–

TABLE 1 (Continued)

Characteristic (<i>n</i> = 277)	<i>n</i>	%	Mean	SD
Dentistry and oral health	15	6.7	–	–
Other	13	5.8	–	–
<i>Years practising (education) (n = 53)</i>				
< 3 years	18	34	–	–
3–5 years	26	49.1	–	–
5–10 years	8	15.1	–	–
> 10 years	1	1.9	–	–
<i>Highest education (adult education) (n = 29)</i>				
Postgraduate	13	44.8	–	–
Bachelor degree	13	44.8	–	–
Trade certificate/diploma	3	10.3	–	–
<i>Highest education community education (n = 24)</i>				
Postgraduate	4	16.7	–	–
Bachelor degree	10	41.67	–	–
Trade certificate/diploma	5	20.8	–	–
Year 12	3	12.5	–	–
Year 11	1	4.1	–	–
Year 10	1	4.1	–	–

and 22% (*n* = 49) had practised for 5–10 years with a mean (SD) time spent with patients/clients per session of 41 (34) min. This was in comparison to 49% (*n* = 26) of education professionals reporting 3–5 years practising and a mean (SD) time spent with students of 46 (43) min per session. Participant characteristics are summarised in Table 1.

Almost two-thirds of participants (*n* = 180; 65%) were likely or somewhat likely to participate in a CN CPD course and were prepared to even if it was not recognised as a CPD activity by their professional association (Table 2). An even greater number (*n* = 234; 84.5%) reported that, if the CPD course was recognised by their professional association, they were likely or somewhat likely to participate. When asked if health behaviour change counselling was within their scope of practice, over half of the participants (*n* = 161; 58.1%) reported that it was within their scope. Of the 116 participants who reported that it was not within their scope of practice, % (*n* = 71) also felt that it should not be within their scope of practice.

Cooking and food skills confidence

Food preparation and cooking skill confidence and meal planning and food skill confidence scores are

TABLE 2 Summary of perceived scope of practice

Scope of practice	Yes, within scope of practice		Not within scope of practice, but should be ^a		Not within scope of practice, and should not be ^a	
	Frequency (n)	Percent	Frequency (n)	Percent	Frequency (n)	Percent
Nutrition education	160	57.8	47	17	70	25.3
Food preparation and cooking skills education	122	44	59	21.3	96	34.7
Food skills and meal planning education	126	45.5	53	19.1	98	35.4
Health behaviour change counselling	161	58.1	45	16.2	71	25.6
Total (n = 277)	–	–	–	–	–	–

^aParticipants indicating 'no, not within scope of practice' were asked if it should be.

summarised in Table 3. Highest reported cooking confidence scores for all participants were for chopping/mixing/stirring food (mean [SD] = 5.6 [1.6], range 0–7), peeling and chopping vegetables (mean [SD] = 5.5 [1.7], range 0–7), boiling/simmering food (mean [SD] = 5.5 [1.5], range 0–7) and making a salad from scratch (mean [SD] = 5.5 [1.7]). All groups reported low confidence scores for making sauces and gravy from scratch (mean [SD] = 4.7 [1.9]), baking cakes/bread/buns (mean [SD] = 4.8 [1.8], range 0–7) and stewing food (mean [SD] = 4.9 [2.0], range 0–7).

Highest reported food skill confidence scores by all participants were for reading the 'best before' date on food (mean [SD] = 5.6 [1.6]), shopping with specific meals in mind (mean [SD] = 5.7 [1.4]), keeping basic meal items in the cupboard (mean [SD] = 5.4 [1.6]) and reading storage and use-by information on packages (mean [SD] = 5.6 [1.6]). In all groups, the lowest confidence scores were reported for using vegetables as snacks (mean [SD] = 4.6 [1.9]), buying food in season (mean [SD] = 4.8 [1.8]) and buying cheaper cuts of meat to save money (mean [SD] = 4.8 [1.9]).

Total food and cooking skill confidence scores by professional group are presented in Table 4. There were non-statistically significant mean (SD) higher food preparation and cooking skill confidence scores 77.1 (15.9) and food skill confidence scores 101.6 (19.7) reported by community educators compared to other groups.

Cronbach's alpha indicated high internal consistency and reliability for the adapted scale. Cronbach's alpha for the adapted 14-item cooking skill confidence scale was 0.92, this compared to Cronbach's alpha ranging from 0.79 to 0.93 in reliability testing conducted in Lavelle et al.³⁵ Cronbach's alpha for the adapted 21-item and unaltered 19-item food skill confidence scale was 0.94 and 0.93, respectively, compared to Cronbach's alpha ranging from 0.89 to 0.94 reliability testing as conducted by Lavelle et al.³⁵

Nutrition knowledge

The mean (SD) PKB-7 score across all groups was 3.7 (1.4) (range 0–7). Health professionals and community educators had the highest mean nutrition knowledge scores (mean [SD] = 3.8 [1.4], range 0–7) and (mean [SD] = 3.8 [1.3], range 0–7), respectively, whereas adult educators (mean [SD] = 3.0 [1.7], range 0–7) had the lowest. All groups had moderate levels of nutrition knowledge with no significant differences between health professionals and education professionals, nor community education versus adult education professionals.

Dietary quality

The mean (SD) FAVVA score across all participants was 98 (29.1) (range 0–190). Mean (SD) FAVVA scores for participants in the 'likely/somewhat likely' to participate in the course even if not considered accredited CPD (mean [SD] = 99.6 [32.9], range 0–190) were significantly higher than those not likely to participate in the course (mean [SD] = 95.2 [20.9], range 0–190). When scores were assessed by profession, educators had a significantly higher mean score (mean [SD] = 112.9 [24.3], range 0–190) compared to health professionals (mean [SD] = 94.6 [29.3], range 0–190).

Barriers and facilitators to provision of advice in practice

A majority of participants reported that they had received nutrition education ($n = 191$; 69%) and health behaviour change education ($n = 148$; 53%) as part of their entry level professional qualification. A majority of education professionals reported that they had received cooking/food preparation ($n = 41$; 77%) and meal planning/food skills education ($n = 42$; 79%) as part of their entry level professional qualification. A majority of

TABLE 3 Summary of individual cooking and food skill confidence scores³⁵ for all participants and across subgroups^a

Food preparation and cooking skill confidence (14 items)	Total survey participants (n = 277)		Willing to participate in non-accredited CPD course (n = 180)		Perceived to be within scope of practice (n = 122)	
	Mean	SD	Mean	SD	Mean	SD
Total score	73.0	17.5	73.0	17.1	74.9	16.8
Peeling and chopping vegetables	5.5	1.7	5.4	1.7	5.6	1.5
Chopping mixing and stirring food	5.6	1.6	5.5	1.8	5.7	1.5
Make sauces and gravy from scratch ^b	4.7	1.9	4.8	1.8	5.0	1.7
Use herbs and spices to flavour food	5.4	1.6	5.4	1.5	5.4	1.6
Make a salad dressing	5.0	1.9	5.0	1.8	5.2	1.7
Make a salad from scratch	5.5	1.7	5.5	1.6	5.6	1.7
Roasting food	5.2	1.6	5.2	1.6	5.4	1.6
Frying/stir frying food	5.4	1.7	5.3	1.7	5.5	1.5
Microwaving food	5.2	2.1	5.1	2.1	5.2	2.0
Baking cakes/bread/buns ^b	4.8	1.8	4.9	1.8	5.0	1.8
Blending food	5.2	1.8	5.2	1.7	5.3	1.7
Steaming food	5.2	1.9	5.2	1.8	5.3	1.7
Boiling or simmering food	5.5	1.5	5.5	1.6	5.6	1.5
Stewing food ^b	4.9	2.0	5.0	1.8	5.1	1.7
Meal planning and food skill confidence (21 items)	Total survey respondents (n = 277)		Willing to participate in non-accredited CPD course (n = 180)		Perceived to be within scope of practice (n = 126)	
	M	SD	M	SD	M	SD
Total score	107.2	24.0	107.4	23.0	112.3*	24.1
Planning meals in advance	4.9	1.7	4.9	1.7	5.4	1.5
Preparing meals in advance	5.0	1.7	5.0	1.7	5.4	1.4
Using vegetables as snacks ^b	4.6	1.9	4.8	1.8	5.1	1.8
Following recipes when cooking	5.2	1.6	5.3	1.5	5.2	1.7
Shopping with a grocery list	5.3	1.7	5.2	1.7	5.4	1.7
Shopping with specific meals in mind	5.4	1.6	5.3	1.7	5.7	1.4
Planning how much food to buy	5.2	1.5	5.0	1.6	5.3	1.5
Comparing prices before you buy	5.1	1.8	5.0	1.8	5.2	1.8
Knowing what budget you have to spend on food	5.1	1.7	5.1	1.7	5.2	1.7
Buying food in season to save money ^b	4.8	1.9	4.9	1.8	5.1	1.8
Buying cheaper cuts of meat to save money ^b	4.8	2.0	4.8	1.9	5.1	1.8
Cooking more or double recipes which can be used for another meal	5.2	1.8	5.1	1.8	5.5	1.7
Preparing or cooking a healthy meal with only a few ingredients on hand	5.1	1.6	5.2	1.5	5.3	1.5

TABLE 3 (Continued)

Meal planning and food skill confidence (21 items)	Total survey respondents (<i>n</i> = 277)		Willing to participate in non-accredited CPD course (<i>n</i> = 180)		Perceived to be within scope of practice (<i>n</i> = 126)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Preparing or cooking a meal with limited time	5.1	1.7	5.2	1.6	5.3	1.7
Using leftovers to create another meal	5.0	1.8	5.1	1.7	5.3	1.7
Keeping basic items in your cupboard for putting meals together (e.g., herbs/spices)	5.4	1.7	5.4	1.6	5.6	1.7
Keeping fresh vegetables on hand to make salads and side dishes	5.0	1.7	5.0	1.7	5.4	1.6
Reading best before date on food	5.5	1.6	5.3	1.7	5.6	1.6
Reading the storage and use-by information on food packets	5.4	1.6	5.3	1.6	5.6	1.5
Reading the nutrition information on food labels	5.2	1.8	5.2	1.7	5.3	1.8
Balancing meals based on nutrition advice of what is healthy	5.0	1.7	5.1	1.5	5.2	1.6

Range: min = 0, max = 7

Abbreviation: CPD, continuing professional development.

^aFor all survey participants (column A), participants stating that they would participate in the course if it was not recognised as accredited professional development (column B), food preparation and cooking skills confidence scores if food preparation and cooking education is perceived to be within scope of practice (column C).

^bThree lowest reported confidence scored for food preparation and cooking skills.

**p* < 0.05.

TABLE 4 Total cooking skill, food skill confidence scores,³⁵ nutrition knowledge and FAVVA intake by professional group

	Health professional (<i>n</i> = 224)		Education professional (<i>n</i> = 53)		Total (<i>n</i> = 277)	
	Mean	<i>SD</i>	Mean	<i>SD</i>	Mean	<i>SD</i>
Total cooking skill confidence score (14 items)	72.6	17.9	74.7	15.3	73.0	17.5
Total food skill confidence score (19 items)	97.1	22.1	99.4	20.2	97.6	21.7
Nutrition knowledge (PKB-7 score, 7 items)	3.8	1.4	3.4	1.5	3.7	1.4
FAVVA score (190 items)*	94.6	29.3	112.9	24.3	98.1	29.3

Note: A higher score indicates higher confidence across all cooking and food skill items.

**p* < 0.001 between health professional and education professionals.

Abbreviation: FAVVA, fruit and vegetable intake; PKB-7, Practical Knowledge about Balanced meals (a seven-item tool).

health professionals reported that they had not attended nutrition education (*n* = 124; 55%), cooking/food preparation (*n* = 150; 67%), meal planning/food skills (*n* = 153; 68%) or health behaviour change education (*n* = 124; 55%) CPD. A majority of education professionals reported that they had attended nutrition education (*n* = 44; 83%), cooking/food preparation (*n* = 40; 75%), meal planning/food skills (*n* = 37; 69%) and health behaviour change education (*n* = 39; 74%) CPD.

A 'lack of knowledge' was the most frequently reported barrier to health professionals providing nutrition education (*n* = 70; 31%) and health behaviour change counselling (*n* = 52; 23%) to others (Table 5). The most frequently reported barrier for health professionals was a 'lack of time' for food preparation and cooking (*n* = 64; 29%) and meal planning/food skills (*n* = 54; 24%).

Education professionals most frequently reported 'no barriers' to providing nutrition education (*n* = 21; 40%) (Table 6). A lack of 'knowledge in the area' was the most frequently reported barrier to providing nutrition education (*n* = 14; 26%). Similarly, when asked about barriers to food preparation and cooking education, education professionals most frequently reported 'no barriers' (*n* = 16; 30%). Of the barriers identified by education professionals 'characteristics of the student group' (*n* = 14; 26%), was the most frequently reported barrier to food preparation and cooking education, meal planning (*n* = 15; 28%), and health behaviour change counselling (*n* = 15; 28%). Other more frequently reported barriers included 'knowledge in the area' of meal planning (*n* = 14; 26%) and for health behaviour change education (*n* = 14; 26%).

TABLE 5 Barriers reported by health professionals ($n = 224$) to providing nutrition education, food preparation and cooking education; meal planning and food skills education; and behaviour change counselling

Barriers	Nutrition		Food preparation and cooking		Meal planning and food skills		Health behaviour change	
	Frequency (n)	Percent	Frequency (n)	Percent	Frequency (n)	Percent	Frequency (n)	Percent
No barriers	35	16	35	15	40	18	49	22
No evidence for effectiveness	18	8	16	7	13	6	11	5
Lack of skills	38	17	49	22	32	14	37	17
Lack of knowledge	70	31 ^a	49	22	49	22	52	23 ^a
Referrer related	52	23	33	15	30	13	34	15
Characteristics of client group	47	21	48	22	42	19	32	14
Management related	25	11	33	15	30	13	37	17
Lack of resources	41	18	56	25	50	22	44	20
Lack of time	61	27	64	29 ^a	54	24 ^a	48	21
Lack of staff	36	16	39	17	30	13	33	15
Other	9	9	12	5	13	6	8	4

Note: Respondents could select all that apply.

^aMost frequently reported barriers.

TABLE 6 Barriers reported by education professionals ($n = 53$) to providing nutrition education, food preparation and cooking education; meal planning and food skills education; and behaviour change counselling

Barriers	Nutrition		Food preparation and cooking		Meal planning and food skills		Health behaviour change	
	Frequency (n)	Percent	Frequency (n)	Percent	Frequency (n)	Percent	Frequency (n)	Percent
No barriers	21	40 ^a	16	30 ^a	12	23	7	13
No evidence for effectiveness	5	9	7	13	4	8	5	9
Skills in the area	10	19	8	15	6	11	13	25
Knowledge in the area	14	26	12	23	14	26	14	26
Parent's expectations	8	15	7	13	12	23	7	13
Characteristics of student group	9	17	14	26	15	28 ^a	15	28 ^a
Management related	8	15	12	23	6	11	7	13
Lack of time	8	15	8	15	6	11	9	16
Staffing	2	4	3	6	4	8	6	11
Other	0	0	0	0	1	2	1	2

Note: Respondents could select all that apply.

^aMost frequently reported barriers.

CPD activities and course preferences

The most requested nutrition topics by participants likely or somewhat likely to participate in a CN CPD course were 'goal setting for healthy eating' ($n = 93$; 53%), 'behaviour change/health coaching for healthy eating' ($n = 92$; 51%) and 'understanding special

versus 'fad' diets' ($n = 90$; 51%) (Table 7). The most requested content by these participants was 'simple vegetable recipes for meals, sides, snacks' ($n = 93$; 52%), 'cooking for different cultural groups' ($n = 87$; 49%) and 'using limited ingredients or utilising leftovers' ($n = 74$; 41%) (Table 7). Lastly, 'identifying healthy portion sizes' ($n = 103$; 58%), 'creating

TABLE 7 Summary of nutrition, cooking and food skill topics of interest for a CM/CN CPD course

	Frequency (n)	Percent
<i>Nutrition topics</i>		
Goal setting for healthy eating	93	52
Behaviour change/health coaching for healthy eating	92	52
Understanding special versus 'fad' diet	90	51
Diet across the lifespan	85	48
Understanding food access and socioeconomic barriers to healthy eating	74	42
Critiquing nutrition information and spotting pseudoscience	52	29
Tips for dispelling nutrition myths with patients	55	31
Other	1	1
<i>Cooking topics</i>		
Simple vegetable dishes for meals, sides and snacks	93	52
Cooking for different cultures	87	49
Cooking with leftovers or limited ingredients	74	41
How to prepare and cook vegetables	70	39
Cooking techniques (e.g., steaming)	61	34
Food preparation and cooking for chronic disease	58	32
Plant based cooking	63	35
Food preparation techniques (e.g., knife skills)	45	25
<i>Food skill topics</i>		
Healthy portion sizes	103	57
Created balanced meals	88	49
Understanding food labels	88	49
Meal planning	83	46
How to select and store vegetables	70	39
Food budgeting	73	41
Healthy meals with limited resources	64	36
Planning meals to minimise environmental impact	45	25

Note: Data from participants ($n = 180$) who reported they were somewhat likely or likely to participate in a CM/CN CPD course if it was NOT a recognised CPD activity by their professional association.

Abbreviations: CM, culinary medicine; CN, culinary nutrition; CPD, continuing professional development.

balanced meals' ($n = 88$; 49%) and 'understanding food labels' ($n = 88$; 49%) were the most common skills content requested related to meal planning and food skills (Table 7).

DISCUSSION

The present study investigated cooking and food skills, nutrition knowledge, and diet quality of health and education professionals. It also gauged their interest in participating in a course to enhance skills on these topics, at the same time as identifying barriers and facilitators to providing CM/CN behaviour change support as part of providing usual care to their patients, clients, adult learners and students. Overall, moderate cooking food preparation and meal planning confidence, and nutrition knowledge scores were identified. The findings highlight interest in a CM/CN CPD course, particularly if it was recognised as a CPD activity. However, these results indicate a reasonable level of interest exists, even if it was not a recognised CPD activity. A handful of key barriers were identified, with the most relevant modifiable barrier identified in all areas being a lack of knowledge. Although most participants felt that providing health behaviour change education was within their scope of practice, lack of knowledge was the most frequently reported barrier to providing nutrition education and behaviour change education to patients, clients, adult learners and students.

Food preparation and cooking, meal planning and food skills education were identified as outside of scope of practice, even though the majority of participants felt that providing health behaviour change education to their patients was within scope of practice. Practitioners are unlikely to provide education that is not considered to be part of their role.¹⁰ The perception that provision of behaviour change support through opportunistic healthcare is outside of scope of practice is frequently identified as a barrier among health professionals.⁷ Programs providing CM/CN health behaviour change education to health and education professionals should include education regarding what advice can be given that is within scope of practice, and when the practitioner should refer patients, clients, adult learners or students to a clinician specialised in nutrition, such as a registered or accredited practising dietitian.

Higher food skill confidence scores were reported for professionals providing cooking and/or nutrition education in a community setting; however, the result was not statistically significant. This was an anticipated result because the criteria for inclusion in this category was provision of cooking and/or nutrition education we would have expected higher food skill confidence scores from education professionals. An online cross-sectional survey of 910 Australian adults found food skills confidence to be a better predictor of diet quality than actual cooking skills.⁴⁰ It was highlighted that this may be a result of the broad range of skills required in the provision of healthy meals. This suggests that the use of food skill education within opportunistic healthcare, and CM/CN programs may have potential to improve diet quality. Thus, inclusion of food skill education and

evaluation in CM/CN programs may be an area of greater priority than cooking skills.

Nutrition knowledge (PKB-7) scores across all professions was low, indicating that nutrition education for both health and education professionals is needed. This is despite the majority of participants reporting that they had received nutrition education as part of their entry-level professional qualification. Although CM/CN CPD activities are available internationally,²¹ it has been previously documented that nutrition education provided in undergraduate medical schools and health professional training programs, or as post-graduate CPD is currently insufficient to equip health professionals with the knowledge and skills needed to then effectively empower their patients and clients.^{14,15,41} In addition, dietitians may benefit from CPD targeting culinary components of CM/CN programs. The findings of the current survey further highlight the need for a more comprehensive and coordinated approach to nutrition education in medical schools, other health-related courses and in CPD programs.

Despite participants identifying food preparation and cooking, meal planning and food skills education as outside their scope of practice a majority still reported being likely to participate in a CM/CN CPD course. Potentially, participants may be more interested in these topics for personal benefits related to their own and/or their families' health. There is potential for CM/CN CPD to address both the barriers of knowledge and skill of the professional and the personal behaviour of the professional. Overall, participants were more likely to partake in a course if there were perceived benefits for their practice, such as accredited professional development. Although it was outside the scope of this survey to examine these motivating factors, future studies or course evaluations may want to consider this in their designs.

Key topics identified for a CPD course included goal setting and behaviour change for healthy eating; understanding special versus 'fad' diets; diet across the lifespan; simple vegetable recipes; cooking for different cultural groups; cooking with limited ingredients or utilising leftovers; portion sizes; balanced meals; and understanding food labels. Therefore, future studies or CPD courses with a focus on these topics and which emphasise health behaviour change education are indicated.

The present study has a several strengths and limitations. Validated measures were used to assess cooking and food skills confidence,³⁵ nutrition knowledge,³⁷ and vegetable and fruit intake and variety.³⁶ We used rigorous methods to ensure only high-quality data responses were included. Health professionals of all levels of experience, based on years practising, were evenly represented in the final sample supporting generalisability across health professionals in different career stages. Limitations included that, although

questions relating to barriers and facilitators to providing nutrition advice in practice were adapted from pre-tested questions, reliability testing was not conducted. Education professionals were included if they taught either nutrition or cooking, or both, in community or adult education settings. It is possible that our sample captured education professionals working in a broad range of settings, with a range qualifications and prior experience. A range of factors influence cooking, understanding these factors supports planning of cooking education programs tailored to the needs of their recipients.⁴² Further research with a larger sample and gathering information about the specific setting and form of cooking and/or nutrition education provided will support this. For practical reasons, it was only possible to include short nutrition knowledge and diet quality questionnaires. Although brief, the PKB-7 is a valid and reliable measure for assessing practical knowledge of nutrition recommendations, further exploration of nutrition knowledge in health and education professionals should be considered. This could potentially be the Revised General Nutrition Knowledge Questionnaire⁴³ which provides a more detailed exploration of the areas in which nutrition education within future CM/CN programs could be targeted. This could also be used to evaluate effectiveness of CM/CN intervention in specific areas of nutrition knowledge. Similarly, only a brief dietary intake assessment tool (i.e., FAVVA) was used. However, the FAVVA provides a measure of both amount consumed in addition to the variety consumed and higher vegetable and fruit intake and variety are associated with reduced chronic disease risk⁴⁴ and healthcare expenditure.⁴⁵ Interventions providing CM/CN education rarely provide education around vegetables and fruits in isolation. Evaluation of overall diet quality in studies evaluating courses to enhance CN skill of health and education professionals is warranted.

CONCLUSIONS

Professional development to support CM/CN education conducted by qualified nutrition and culinary professionals is needed. CM/CN interventions should focus on overcoming the barriers related to knowledge, and deliver CM/CN education to patients/clients in the context of usual care, as well as within scope of practice. The findings from the current survey highlight specific areas where education for a CM/CN CPD course can be targeted.

AUTHOR CONTRIBUTIONS

Clare E. Collins conceived the idea for the study and generated the research question. Roberta C. Asher, Tamara Bucher, Vanessa A. Shrewsbury, Clare E. Collins, Steven Roberts and Annette Meeder contributed to study design and survey development. Roberta C.

Asher managed data collection. Roberta C. Asher and Tamara Bucher contributed to data analysis and interpretation. Roberta C. Asher, Jaimee Herbert and Erin D. Clarke drafted the original manuscript. All authors critically reviewed and edited the manuscript. All authors have seen and approved the final version of the manuscript submitted for publication.

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CONFLICTS OF INTEREST

Two authors (Roberts S, and Meeder A) are affiliated with the funder Rijk Zwaan Australia Pty. Ltd., who contributed to study design and survey development. These two authors had no access to the research data, nor role in data analysis or interpretation. All other authors declare that they have no conflicts of interest.

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