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ORIGINAL RESEARCH

Predictors of nutrition care process and terminology use, applicability and importance within Asia-Pacific dietitians

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Abstract

Aim: Many dietitians are yet to incorporate the Nutrition Care Process and Terminology (NCPT) into practice. The present study investigated factors predicting (i) NCPT use, (ii) perceived importance of NCPT implementation and (iii) perceived NCPT applicability to personal dietetic practice among dietitians in the Asia-Pacific region.

Methods: Dietetic association members from Australia, New Zealand and Singapore were invited to participate in an online survey assessing NCPT implementation, knowledge, and self-rated familiarity, attitudes, benefits, concerns, barriers, and enablers. Forward stepwise logistic regression used all factors to identify predictive dietetic characteristics for current NCPT use, importance or applicability to practice.

Results: A total of 377 dietitians (5%–55% of national dietetic memberships surveyed) completed at least one survey question. In logistic regression models, independent positive predictors of current NCPT users were knowledge ($P = 0.003$), confidence to implement ($P = 0.036$), confidence to write nutrition diagnoses ($P = 0.002$) and experiencing managerial support ($P = 0.004$). Not seeing a reason to change was a significant negative predictor of NCPT use ($P = 0.003$). An independent positive predictor of dietitians viewing NCPT implementation as important was feeling that it will improve patient care ($P < 0.001$), while negative predictors were seeing minimal benefit in changing ($P < 0.001$) and a preference to continue with current routine ($P = 0.015$). Independent positive predictors of dietitians viewing NCPT as applicable to their practice were NCPT knowledge ($P = 0.009$), seeing the value of NCPT ($P < 0.001$) and attendance at workshops or conferences ($P = 0.014$).

Conclusions: NCPT implementation may be enhanced thorough activities building confidence, gaining managerial corroboration and demonstration of NCPT benefits, including improved patient care.

Key words: attitudes, dietitian, implementation, knowledge, nutrition care process terminology, predictors.

Introduction

The early 2000s saw the development of the Nutrition Care Process (NCP) for dietitians. This standardised framework encompassed each of the four main nutrition care activities: (i) Assessment, (ii) Diagnosis, (iii) Intervention and (iv) Monitoring and Evaluation; operating within variable practice settings, economic environments, social systems and health-care systems.[1–3] The Diagnosis step is a defining part of the NCP framework, referring to identification of a specific nutritional problem rather than a medical problem. An accompanying standardised terminology was developed for use with the NCP, originally known as the International Dietetics and Nutrition Terminology (IDNT). The NCP and associated terminology is now referred to as NCPT. The NCPT has evolved to include over 1500 nutrition terminologies.[4]

A 2014 survey of Australian dietitians found that the most commonly reported anticipated benefits of using NCPT were having a common vocabulary to identify nutrition problems (75%), provision of a framework for dietetic care (71%), assisting with transfer of patient care (56%) and encouraging critical thinking (55%).[5] NCPT use has been demonstrated to improve recognition from other health professionals, enhance communication within interdisciplinary teams and increase productivity.[6,7] It has also been used to increase funding to dietetic departments because of improved identification of malnutrition diagnoses.[7]

Despite these advantages, worldwide implementation of NCPT among dietitians is yet to occur.[8] The majority of

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publications reporting on NCPT implementation have been conducted in USA, although some implementation has also been reported in the Asia-Pacific region, including Australia,[5,9] South Korea[10] and Malaysia.[11] In Australia, the Dietitians Association of Australia has endorsed voluntary use of the NCPT since 2009, however, approximately 30% of dietitians report that they yet to incorporate any aspect of NCPT into their medical record documentation.[5] In Asia, the Asian Federation of Dietetic Associations has not released a vision paper or statement regarding the NCPT implementation in Asian countries and the implementation rate is unknown, although qualitative research suggests it is low.[12] Knowledge of what factors are independent predictors of NCPT use and attitudes can assist in better targeting implementation programs, and potentially improve rates of NCPT use among dietitians outside USA. To date there have been no published studies which have investigated this concept.

The objective of the present study was to investigate predictors of NCPT use, along with attitudes towards the applicability and importance of NCPT implementation, via survey of dietitians working in the Asia-Pacific region.

Methods

Members of National dietetic associations from Australia, New Zealand and Singapore were invited to complete a survey online with the use of 'Survey Monkey' (www.surveymonkey.com, Palo Alto, CA). The only eligibility criterion was currently being a dietitian (as recognised by country of practice). The electronic survey link was disseminated by association newsletters twice, appearing 2 weeks apart. Survey completion was taken as consent. The survey questions were optional and all participants could leave the survey at any time. The online survey consisted of the previously validated attitudes, support and knowledge survey ('ASK NCP') developed by Porter *et al*.[13] This survey was used to ascertain dietitian's views and experiences regarding NCPT implementation. Survey questions combined open-ended, dichotomous and closed-ended questions employing a 5-point Likert scale ('1 'strongly agree' to 5 'strongly disagree'). For the predictive model analysis, 'agree' and 'strongly agree' were grouped as were 'disagree' and 'strongly disagree'.

Ethics approval was granted by the Metro-South Health Service District Human Research Ethics Committee. Free text answers to questions around barriers and enablers were incorporated into categories and grouped where appropriate. Three outcome variables were chosen *a priori*, based on perceived relevance for future NCPT implementation planning: (i) current NCPT use (answers grouped as yes *vs* no); (ii) whether implementing the NCPT within the dietitian's practice is important to them (not important or not sure *vs* important) and (iii) whether the dietitian considers NCPT to be applicable to their practice (not applicable or not sure *vs* applicable). Data analysis was completed using SPSS Statistics for Windows (Release 24.0, 2016; IBM Corp, Armonk, NY).

Factors included in the analysis as potential covariates included respondent characteristics, assessed knowledge of NCPT, values around NCPT, confidence around using NCPT, attitudes towards NCPT, educational enablers and barriers. These are detailed in Table 1. Type of work, defined as majority clinical (hospital based or private practice) or non-clinical, along with years as a dietitian, were also considered as potential confounding factors. A forward stepwise logistic regression was performed using all factors, with gender and country of practice retained in the models as a forced block because of anticipated cultural differences. Missing data were ignored for this analysis. This type of analysis was chosen as it is a simple data-driven approach for obtaining a parsimonious model, which is ideal from a practical standpoint. In this approach, variables are added to the model one at a time. For all outcomes and factors, negative responses (no, not important, not applicable, not confident, disagree, etc.) were selected as the reference level in the logistic regression model. A P-value of <0.05 was considered significant. The STROBE guidelines for reporting observational studies in epidemiology were followed when reporting this research (https://www.strobe-statement.org/).

Results

A total of 377 dietitians completed at least one aspect of the survey. Respondents indicated that they currently resided in Australia (n = 209), Singapore (n = 51), New Zealand (n = 41) or other countries (n = 4). According to National Dietetic Association figures from the International Confederation of Dietetic Associations, this represented between 5% and 55% of targeted dietetic memberships (Australia: 209/4476, 5%; New Zealand: 41/578, 7%; Singapore: 51/92, 55%),[14] for a total response rate of 6% to the question on country of residence. Respondent characteristics are shown in Table 1. Sixty-five percent of dietitians who answered the question on NCPT use reported using at least one part of the NCPT in their current practice. Most dietitians agreed that the NCP was applicable to their own practice (82%), and that implementing it in their practice was important (67%).

Independent positive predictors of being a current NCPT user were NCPT knowledge score ($P = 0.003$), confidence to implement ($P = 0.04$), confidence to write nutrition diagnoses ($P = 0.002$), and having management support ($P = 0.004$). Conversely, not seeing a reason to change was a negative predictor of NCPT use ($P = 0.003$) (Table 2). The model containing these factors had a correct classification percentage of 86.7%, and a Naglekerke R^2 value of 0.56.

An independent positive predictor of dietitians viewing NCPT implementation as important was feeling that it will improve patient care ($P < 0.001$), while negative predictors were seeing minimal benefit in changing ($P < 0.001$) and a preference to continue with current routine ($P = 0.015$) (Table 2). The model containing these factors had a correct

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Table 1 Characteristics of the dietitians participating in the study (n = 377), along with factors included in final predictive model analyses

Characteristic/response	*n (valid %)*
Gender (female)	284 (94.7)
Country of residence	
Australia	209 (69.4)
Singapore	51 (16.9)
New Zealand	41 (13.6)
Other—Philippines, India, USA	4 (0.8)
Years since qualified as a dietitian	median 8.00 (SEM: 0.56)
Main area of work is in clinical setting[a]	231 (85.6)
Outcomes of interest	
NCP is applicable to my area of practice	282 (81.7)
Implementing the NCP within my own practice is important to me	213 (67.6)
I am a current user of NCP	222 (65.1)
Knowledge of NCPT (score 0–8)	median 6.0 (IQR: 5.0–7.0)
Values (agree) versus neutral or disagree	
Familiar with NCP and NCPT	307 (81.4)
I see the value of IDNT within my clinical practice	248 (72.1)
I feel isolated from knowledgeable colleagues with whom to discuss the NCP/IDNT	92 (26.9)
I see minimal benefit in changing my documentation to incorporate NCP	66 (19.2)
I see minimal benefit in incorporating IDNT in my clinical documentation	65 (18.9)
I do not feel the need to change my clinical practice	57 (16.8)
Confidence (very confident) versus somewhat or unsure/unconfident	
I feel incorporating the NCP/IDNT will improve patient care	188 (55.0)
How confident do you feel to implement the NCP into your own practice	85 (27.8)
How confident do you feel in identifying nutrition diagnoses	80 (26.2)
How confident do you feel in writing the PES statements	66 (21.6)
Attitudes (agree) versus neutral or disagree	
Incorporating NCP/IDNT into my current practice will be inconvenient	62 (19.6)
Generally I would prefer to continue my routine rather than change	50 (15.9)
NCP/IDNT interferes with my professional autonomy	44 (14.0)
Educational enablers experienced by dietitians	
Self-directed readings	158 (33.3)
Presentations	154 (32.4)
Webinars	136 (28.6)
Workshops	133 (28.0)
Readings sent out	81 (17.1)
Management support	76 (16.0)
Internet site of the 'Academy'	55 (11.6)
Internet site of the International Confederation of Dietetic Associations	32 (6.7)
Electronic health records	17 (3.6)
Current barriers experienced by dietitians	
Lack of training and support	121 (25.5)
Lack of time	120 (25.3)
Lack of knowledge	113 (23.8)
Electronic health records unavailable	56 (11.8)
Lack of resources	55 (11.6)
Organisational constraints	50 (10.5)
Lack of management support	44 (9.3)
Do not see a reason to change	43 (9.1)

[a] Survey selections differed depending on country of work as countries tend to refer to clinical work in different terms, these have been grouped to produce a variable encompassing inpatient or outpatient hospital work, private practice, and individual counselling as clinical work.

classification percentage of 90.1%, and a Naglekerke R^2 value of 0.60.

Independent positive predictors of dietitians viewing NCPT as applicable to their practice were NCPT knowledge score ($P = 0.009$), seeing the value of NCPT ($P < 0.001$) and experiencing workshops or conferences ($P = 0.014$) (Table 2). The model containing these factors had a correct classification percentage of 87.1%, and a Naglekerke R^2 value of 0.35.

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Table 2 Predictive model for NCPT use, importance and applicability, as determined by forward stepwise logistic regression using all factors, adjusted for gender and country of practice

	Odds ratio (95% CI)	P-*value*
Whether the dietitian is a current NCPT user		
Knowledge score	1.59 (1.18–2.14)	0.003
Confidence to implement NCP		0.036
Not confident, or unsure	Ref	
Somewhat confident	2.92 (1.15–7.41)	0.025
Very confident	5.42 (1.19–24.71)	0.029
Confidence to write PES statements		0.002
Not confident, or unsure	Ref	
Somewhat confident	4.84 (1.93–12.14)	0.001
Very confident	9.08 (1.65–50.04)	0.011
'Do not see a reason to change' was selected as a barrier to implementation	0.18 (0.05–0.56)	0.003
'Management support' was selected as having been experienced	6.79 (1.83–25.18)	0.004
Whether NCPT is perceived as important by the dietitian		
I see minimal benefit in changing my clinical documentation to incorporate NCPT		<0.001
Disagree	Ref	
Neutral	0.32 (0.13–0.77)	0.029
Agree	0.04 (0.01–0.13)	<0.001
I feel incorporating the NCPT will improve patient care		<0.001
Disagree	Ref	
Neutral	2.35 (0.82–6.71)	0.112
Agree	12.45 (3.90–39.41)	0.025
Generally, I would prefer to continue my routine rather than change		0.015
Disagree	Ref	
Neutral	0.28 (0.11–0.68)	0.005
Agree	0.35 (0.12–1.03)	0.057
Whether NCPT is perceived as applicable to the dietitian's practice		
Knowledge score	1.36 (1.08–1.72)	0.009
I see the value of IDNT within my clinical practice		<0.001
Disagree	Ref	
Neutral	3.79 (1.13–12.77)	0.029
Agree	25.72 (7.76–85.21)	<0.001
'Workshops and conferences' was selected as having been experienced	3.60 (1.29–9.99)	0.014
'Electronic health records' was selected as having been experienced	0.17 (0.03–1.08)	0.061

IDNT, International Dietetics and Nutrition Terminology; NCPT, nutrition care process (and terminology); PES, problem, eitology, signs and symptoms (this statement is used in nutrition diagnosis).

Discussion

Our survey of dietitians working in the Asia-Pacific region revealed interesting findings around factors predicting NCPT use, along with perceived applicability and importance. Significant predictors of NCPT use by dietitians were confidence, knowledge, seeing a reason to change and management support. As could be expected, a higher knowledge of NCPT was associated with higher use, independently of enablers or barriers experienced in gaining of this knowledge. A good understanding of NCPT is important to ensure the framework and terminologies are being used in an appropriate and effective way. For example, omission of certain details from the assessment section may flow on to a poor monitoring and evaluation section.

In addition to knowledge, confidence was also particularly important in predicting NCPT use. Dietitians who said they were 'very confident' with writing Problem, (A) Eitology, Signs and Symptoms (PES) statements were over nine times more likely to use NCPT, and those 'very confident' with NCPT implementation were over five times more likely to use NCPT in their practice. Knowledge alone is not enough—dietitians who have a good knowledge of NCPT also need to be confident that they are applying the principles properly. This self-confidence in applying skills, also known as a sense of competence, is also recognised in the medical literature as being important when implementing new processes.[15]

Management support was also an important independent predictor of NCPT use, with dietitians who had experienced this support almost seven times as likely to use NCPT compared with dietitians who did not. Managers in large health-care organisations can help foster change by working to develop factors such as teamwork and tolerance for mistakes, which is thought to improve readiness for

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change within a department.[16] The support of senior leaders in an organisation, along with middle-level managers (who have the opportunity to enhance or sabotage efforts), can influence the speed and effectiveness of implementation of new processes.[16]

The only negative predictor of NCPT use identified in our study was dietitians reporting that they did not see a reason for change. Recommendations to use NCPT from dietetic associations alone may not result in desired changes in clinical practice. Motivation has been previously observed to be an important domain to explain behaviour change in health-care professionals, with incentives, intrinsic motivation and commitment noted.[17] There are currently no monetary incentives for using NCPT, although some dietitians may consider that it provides incentives in other ways, such as saving time in the long term and improving record keeping and communication. Intrinsic motivation can be defined as performing an activity for inherent satisfaction rather than for an external consequence, and is promoted by factors such as enjoying a challenge, curiosity, and growing knowledge and skills.[18] Commitment to a goal can help to keep momentum when motivation starts to slow, but may also be influenced by other work factors including job satisfaction and staff turn-over.[19]

Three factors significantly predicted whether or not dietitians would view NCPT implementation as important: feeling that the NCPT will improve patient care, seeing benefits and a willingness to change routine. The motivation of practitioners to provide good quality care for their patients has previously been identified as important for quality improvement initiatives in health care.[20] Similarly, trying to convince clinicians who believe they are *already* working at a high standard to then change is likely to be difficult, unless they can be shown that this change will really make a difference.[20]

Investigation into predicting whether or not dietitians view NCPT as applicable to their practice did not provide as strong a model as the previous outcomes. This suggests that whether dietitians view NCPT as applicable to their practice is harder to predict and depends on a wider variety of factors. As with NCPT use, knowledge was again identified as important. Seeing the value of IDNT within practice was also a strong predictor of applicability, with dietitians agreeing with this statement 25 times more likely to see NCPT as applicable to them. Attendance at workshops and conferences was also an independent predictor of dietitians viewing NCPT as applicable for them. Workshops and conferences provide excellent opportunities for networking, being able to ask questions, discuss ideas and brainstorm solutions in real-time. Small group interactive education sessions that incorporate active participation such as case studies are more likely to be associated with change in professional health practice than passive, didactic education.[21] The value of small group education for NCPT has been confirmed through evaluation of a statewide implementation.[5,22] Experiencing case studies in these settings may also assist dietitians to picture how they could apply NCPT in their own settings. Unexpectedly, experiencing electronic health records (eHRs) trended towards being negatively associated with NCPT applicability ($P = 0.06$). This may reflect that some eHR systems used by dietitians were not designed to optimise NCPT use. Examples may include a lack of (i) options to select NCPT diagnoses and thus minimise writing, (ii) means to identify problem resolution or (iii) reporting mechanisms including types of diagnoses or days until resolution. Increasing dietitian involvement in the early stages of eHR planning and integration may help to address these barriers.

Most of the respondents in our study were from Australia (69%). This may limit applicability of these findings to other countries, although our results suggest that country of work was not a significant predictor of NCPT use, importance or applicability. Being a study of NCPT practices, it is likely that a self-selection bias would have existed, whereby dietitians who are interested in NCPT were more likely to complete the survey. The overall response rate of 6% suggests that non-response bias may limit the generalisability of the results. Due to budget restraints, we were not able to use mail based surveys or incentives, factors that have been demonstrated to improve response rates when surveying health professionals.[23] A further limitation is that not all questions were answered by all participants. As we did not make all questions compulsory in order to reduce potential subject burden and frustration, it is possible that lack of data in some areas could skew the findings. Questions on age, state of practice (within the country) and position type (e.g. managerial *vs* clinician) were not included and these may have provided additional insight into NCPT use. The use of qualitative research methods may also provide a greater depth of understanding in this area.

Nevertheless, our study provides important direction for future projects focusing on NCPT implementation. Confidence and knowledge are key aspects in both NCPT use and for dietitians seeing NCPT as applicable to practice. Knowledge results in better understanding of the concepts behind how the assessment, diagnosis, intervention, and monitoring and evaluation parts of the framework link together. Dietitians are therefore better able to appreciate the NCP, see it as relevant and apply it to their own work. Access to educational opportunities, experienced colleagues, and resources including the Academy of Nutrition and Dietetics terminology reference sheets can help to improve knowledge of NCPT and should be prioritised in NCPT implementation. Our results highlighted the importance of confidence in addition to knowledge, and this can be achieved through active participation in hands-on exercises, writing PES statements and going through case studies. Larger workplaces such as hospitals need to consider a focus on managerial support, as implementation will take time and effort and is likely to be difficult for dietitians venturing to do it on their own.

Our findings suggest that implementation programs would benefit from clearly outlining the advantages to patient care, as well as benefits for the dietitians and

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organisations from moving to NCPT, and providing motivation to change current practice. Use of Kotter's eight stages of change management, beginning with establishing a sense of urgency,[24] has been successfully used for NCPT implementation in the past.[25]

A proactive stance on incorporating NCPT into eHR may help to change the perception of NCPT being less applicable if using this technology. If done effectively, incorporation of NCPT into eHR has the potential to improve confidence using NCPT, provide guidance through the framework, save time, and improve storage and accessibility of records.[26] The 2018 Framework for eHealth Readiness of Dietitians may be useful in guiding dietitians who are likely to move to eHR in the future.[27] This framework has similar dimensions to NCPT aspects identified in this project, such as aptitude ('confidence to implement NCP', 'confidence to write PES statement', 'knowledge'), advocacy ('management support'), access (access to information and resources to develop 'knowledge', NCPT inclusion in eHR systems) and attitude ('do not see a reason to change'). These can all help to guide the dietetics profession in its successful transition to eHealth. Incorporation of NCPT into an eHR can also provide opportunities to efficiently analyse data to report on caseloads, intervention effectiveness and identify areas to improve practice.

As recognised for many years, the ability to change and adapt to new challenges and opportunities is critical for ongoing success in health care.[28] Change interventions targeted at specific factors are likely to be more effective than interventions that are not.[15] To our knowledge, this is the first study to identify specific factors that are independent predictors of NCPT use, importance and applicability in dietetics. Incorporation of our findings into future NCPT implementation projects will provide an evidence base to assist with achieving a successful and worthwhile change valued by dietitians.

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Conflict of interest

The authors confirm there are no conflicts of interest.

Authorship

AV and TOS were involved in the study design and drafted the manuscript, AV conducted the data collection, TOS and JL analysed the data, TOS and AV interpreted the findings. All authors critically reviewed the manuscript and approved the final version submitted for publication. The authors would like to thank the Dietitians Association of Australia, Dietitians NZ and Lyn Lloyd, Singapore Nutrition and Dietetics Association and Yen Peng Lim for their support and assistance with distributing the survey and for previous support of the NCPT. Thanks also goes to the many dietitians participating in this research.

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