



# Moving Cancer Care Ontario's Exercise for People with Cancer guidelines into oncology practice: using the Theoretical Domains Framework to validate a questionnaire

Michelle B. Nadler<sup>1</sup> · Daryl Bainbridge<sup>2</sup> · Angela J. Fong<sup>3</sup> · Jonathan Sussman<sup>2</sup> · Jennifer R. Tomasone<sup>3</sup> · Sarah E. Neil-Sztramko<sup>2</sup>

Received: 24 October 2018 / Accepted: 5 February 2019 / Published online: 14 February 2019  
© Springer-Verlag GmbH Germany, part of Springer Nature 2019

## Abstract

Evidence supporting the benefits of exercise surrounding cancer treatment has led to internationally published guidelines, with minimal uptake by oncology care providers (OCPs). There is a need to understand how to implement research evidence into practice. Our team developed a questionnaire to assess OCPs' knowledge of exercise guidelines and barriers/facilitators to exercise counseling and program referral. We validated the questionnaire using the Theoretical Domains Framework, a knowledge translation (KT) framework used to implement evidence-based guidelines into practice. In this commentary, we describe this process and the rationale for integrating a KT framework into intervention development and implementation in oncology practice. The revised questionnaire, entitled *Clinicians Perspectives on Exercise in Patients with Cancer (CliPEEC)*, is shared to facilitate the implementation process and allow for comparison across oncology practices.

**Keywords** Oncology · Physical activity · Exercise · Guidelines · Knowledge translation · Implementation · Intervention design

## Introduction

Evidence supporting the multiple benefits of exercise during and after cancer treatment has led to the development of several international guidelines recommending exercise for people diagnosed with cancer [1–4]. Oncology care providers (OCPs), including physicians, nurses, and allied health professionals, appreciate the merits of exercise [5]; however, they self-report poor knowledge of exercise guidelines and do not routinely discuss exercise with their patients [6–8]. This

discrepancy suggests a knowledge to action gap, which can contribute to the low levels of physical activity (PA) reported by cancer survivors [9–11].

In 2015, Cancer Care Ontario published the Exercise for People with Cancer clinical practice guideline which discusses the benefits of exercise and states “clinicians should advise their patients to engage in exercise” [4]. It is known from other healthcare fields that passive guideline dissemination is insufficient to increase clinicians' knowledge; rather, active implementation strategies and multi-component interventions are more effective at increasing adherence to clinical practice guidelines [12, 13].

Currently, no questionnaires exist to survey a range of OCPs regarding knowledge of these guidelines and barriers/facilitators to exercise discussion, nor to identify actionable guideline implementation strategies. Therefore, our team designed a questionnaire based on the science of Knowledge Translation (KT). KT identifies methods to integrate research evidence into practice and can identify intervention strategies that are more likely to effectively move exercise oncology guidelines into practice [14]. We then validated our questionnaire against a commonly used KT framework.

The purpose of this commentary is to describe the process and rationale for integrating a KT framework into the formative

---

**Electronic supplementary material** The online version of this article (<https://doi.org/10.1007/s00520-019-04689-1>) contains supplementary material, which is available to authorized users.

---

✉ Michelle B. Nadler  
michelle.nadler@medportal.ca

<sup>1</sup> Princess Margaret Cancer Centre and University of Toronto, Toronto, ON, Canada

<sup>2</sup> McMaster University, Hamilton, ON, Canada

<sup>3</sup> School of Kinesiology and Health Studies, Queen's University, Kingston, ON, Canada

work needed to inform guideline dissemination in oncology. We also share the revised questionnaire (Appendix in the [ESM](#)) so that other researchers can benefit from gathering this data to design interventions tailored to their local context.

## Questionnaire development, validation, and results

We designed a questionnaire to explore OCPs' knowledge, beliefs, practices, barriers, and facilitators to the discussion of exercise guidelines with oncology patients. It was optimized for face and content validity through pilot testing, administered via an online survey at a tertiary cancer center in Ontario, Canada, and the results were reported in a previous publication [5]. Notably, OCPs expressed interest in increasing their knowledge of exercise guidelines and participating in discussion with patients.

In order to offer more strategic and precise data collection, and to inform the development of interventions with a higher likelihood of applicability and success, we validated the questionnaire based on the updated 14-item Theoretical Domains Framework (TDF) [15]. The TDF is a KT framework used to identify potential targets for health professional behavior change related to evidence-based practice [15, 16].

Based on published recommendations [17, 18], our team agreed that certain domains (social influences, optimism, goals, reinforcement, and emotion) were less contextually relevant to changing practitioners' counseling behavior and were omitted

[15]. Using the original questionnaire, two researchers (MBN, SNS) independently mapped each item to one of nine relevant TDF domains (see examples in [Table 1](#)), using published descriptions [17]. Discrepancies were resolved by discussion.

Statistical analyses were then used to confirm appropriate grouping. Based on the data collected from the initial administration [5], reliability (internal consistency) was tested by calculating Cronbach's alpha between items within each domain (SPSS version 24, IBM, USA [19]; [Table 1](#)). Using the results, we reworded items for clarity to assessment of the relevant domain and to ensure that each domain was adequately represented. We removed four items that reduced internal consistency within each domain. Cronbach's were recalculated for these domains.

Construct validity was assessed by examining associations between variables conforming to expected patterns. For example, OCPs who reported meeting Canada's Physical Activity guidelines were more likely to report good knowledge on how to provide exercise counseling ( $\chi^2 = 6.44, p = 0.011$ ) and OCPs tested guideline knowledge was associated with self-reported ability to provide exercise counseling ( $\chi^2 = 8.28, p = 0.004$ ). We were unable to assess criterion validity as there is no gold standard or external criterion for comparison.

## Discussion

Based on the TDF [15], we validated and refined a questionnaire that can inform the development of interventions to

**Table 1** Summary of Theoretical Domains Framework domains captured in the questionnaire

Theoretical domain	Sample item	Number of items within Domain	Cronbach's alpha
Knowledge	Please indicate to what extent you agree or disagree: Patients with cancer should avoid exercise when they experience cancer related fatigue	15	0.744
Skills (cognitive & interpersonal)	Of the patients you feel are safe to exercise, how likely are you to advise to "keep active" after treatment	6	0.817
Memory, Attention, & Decision	Please indicate the extent of your knowledge: I know which patients can be referred to a supervised exercise program	3	0.949
Behavioral Regulation	Please indicate how helpful this would be in providing exercise counselling or referral in your current practice: Automatic paper or electronic referral process	5	0.723
Environmental Context & Resources	Indicate how strongly you agree or disagree with the statement: There is limited time during a patient visit to discuss exercise	9	0.922
Social/Professional Role & Identity	Indicate how strongly you agree or disagree with the statement: My training does not qualify me to discuss exercise or refer to an exercise program	11	0.779
Beliefs About Capabilities	Please indicate the extent of your knowledge: I know how to counsel based on the exercise guidelines	6	0.913
Beliefs About Consequences	Indicate how strongly you agree or disagree with the statement: It feels futile to recommend exercise to a patient I know has a poor prognosis	13	0.41
Intentions	Please indicate to what extent you agree or disagree: Exercise counselling should be a component of care I provide	2	0.422

translate exercise guidelines into clinical oncology practice. To our knowledge, there are no other instruments that can collect multi-faceted information regarding exercise guideline implementation within oncology practice. Data collected through this questionnaire, guided by the TDF, can be used to identify contextually appropriate implementation strategies [17]. Other KT models and frameworks, such as the COM-B model and Behaviour Change Wheel framework [18] can help researchers to guide the planning and execution of such interventions, as has been described in other fields [20].

Our original questionnaire used different scales for each item, which limited our ability to conduct a factor analysis [21]. In the refined questionnaire, we used a 7-point Likert scale for easier comparison across domains. The lower Cronbach's alpha for the domain "Beliefs about consequences" is expected due to the previous inclusion of unique dichotomous items (e.g., checklist of perceived barriers) which may not necessarily correlate. For the "intentions" domain, the low Cronbach's alpha may be explained by inconsistency across intended practitioner behaviors.

Providers' barriers to exercise counseling or referral will vary across provider type, practice settings, geographic location, and local resources; therefore, the strategies needed to overcome these barriers and elicit effective behavior change will also vary. We ensured all relevant TDF domains were incorporated to ensure collection of comprehensive information required to detect specific differences about a local context that may be crucial to appropriately tailor an implementation strategy [17]. Using a standardized questionnaire, researchers can compare internally consistent responses across cancer centers; this may allow them to implement similar interventions if similar barriers are identified. Otherwise, the CliPEC questionnaire can be triangulated with other methods such as document analysis or key informant interviews to gather the data required to create new or tailor existing interventions that are most likely to support OCPs in overcoming barriers to exercise discussion. These additional methods can also be utilized to confirm that participants are accurately reporting current knowledge or behaviors. We anticipate testing this hypothesis in our future work and share this questionnaire to invite other researchers to do the same.

Many KT frameworks emphasize context in developing and assessing the effectiveness of implementation strategies. Our questionnaire, based on a commonly used KT framework, has the potential to assist researchers to collect valuable contextual data prior to designing interventions to promote exercise discussion in oncology practice. Researchers who undertake this process and integrate a KT framework into intervention development have a greater likelihood of success in closing the gap between the known benefits of exercise in people with cancer and its inclusion in oncology practice.

## Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflict of interest.

**Publisher's note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

## References

1. Clinical Oncology Society of Australia (2018) COSA Position Statement on Exercise in Cancer
2. National Comprehensive Cancer Network (2018) NCCN Clinical Practice Guidelines in Oncology: Survivorship vol 2.2018
3. Schmitz KH, Courneya KS, Matthews C, Demark-Wahnefried W, Galvao DA, Pinto BM, Irwin ML, Wolin KY, Segal RJ, Lucia A, Schneider CM, von Gruenigen VE, Schwartz AL, American College of Sports M (2010) American College of Sports Medicine roundtable on exercise guidelines for cancer survivors. *Med Sci Sports Exerc* 42(7):1409–1426. <https://doi.org/10.1249/MSS.0b013e3181e0c112>
4. Segal R, Zwaal C, Green E, Tomasone JR, Loblaw A, Petrella T, Exercise for People with Cancer Guideline Development G (2017) Exercise for people with cancer: a clinical practice guideline. *Curr Oncol* 24(1):40–46. <https://doi.org/10.3747/co.24.3376>
5. Nadler M, Bainbridge D, Tomasone J, Cheifetz O, Juergens RA, Sussman J (2017) Oncology care provider perspectives on exercise promotion in people with cancer: an examination of knowledge, practices, barriers, and facilitators. *Support Care Cancer* 25(7):2297–2304. <https://doi.org/10.1007/s00520-017-3640-9>
6. Park JH, Oh M, Yoon YJ, Lee CW, Jones LW, Kim SI, Kim NK, Jeon JY (2015) Characteristics of attitude and recommendation of oncologists toward exercise in South Korea: a cross sectional survey study. *BMC Cancer* 15:249. <https://doi.org/10.1186/s12885-015-1250-9>
7. Fong AJ, Faulkner G, Jones JM, Sabiston CM (2018) A qualitative analysis of oncology clinicians' perceptions and barriers for physical activity counseling in breast cancer survivors. *Support Care Cancer* 26(9):3117–3126. <https://doi.org/10.1007/s00520-018-4163-8>
8. Clifford BK, Mizrahi D, Sandler CX, Barry BK, Simar D, Wakefield CE, Goldstein D (2018) Barriers and facilitators of exercise experienced by cancer survivors: a mixed methods systematic review. *Support Care Cancer* 26(3):685–700. <https://doi.org/10.1007/s00520-017-3964-5>
9. Eng L, Pringle D, Su J, Shen X, Mahler M, Niu C, Charow R, Tiessen K, Lam C, Halytskyy O, Naik H, Hon H, Irwin M, Pat V, Gonos C, Chan C, Villeneuve J, Harland L, Shani RM, Brown MC, Selby P, Howell D, Xu W, Liu G, Alibhai SMH, Jones JM (2018) Patterns, perceptions, and perceived barriers to physical activity in adult cancer survivors. *Support Care Cancer* 26:3755–3763. <https://doi.org/10.1007/s00520-018-4239-5>
10. Neil SE, Gotay CC, Campbell KL (2014) Physical activity levels of cancer survivors in Canada: findings from the Canadian Community Health Survey. *J Cancer Surviv* 8(1):143–149. <https://doi.org/10.1007/s11764-013-0322-6>
11. De Groef A, Geraerts I, Demeyer H, Van der Gucht E, Dams L, de Kinkelder C, Dukers-van Althuis S, Van Kampen M, Devoogdt N (2018) Physical activity levels after treatment for breast cancer: two-year follow-up. *Breast* 40:23–28. <https://doi.org/10.1016/j.breast.2018.04.009>

12. Bloom BS (2005) Effects of continuing medical education on improving physician clinical care and patient health: a review of systematic reviews. *Int J Technol Assess Health Care* 21(3):380–385
13. Prior M, Guerin M, Grimmer-Somers K (2008) The effectiveness of clinical guideline implementation strategies—a synthesis of systematic review findings. *J Eval Clin Pract* 14(5):888–897. <https://doi.org/10.1111/j.1365-2753.2008.01014.x>
14. Straus SE, Tetroe J, Graham I (2009) Defining knowledge translation. *CMAJ* 181(3–4):165–168. <https://doi.org/10.1503/cmaj.081229>
15. Cane J, O'Connor D, Michie S (2012) Validation of the theoretical domains framework for use in behaviour change and implementation research. *Implement Sci* 7:37. <https://doi.org/10.1186/1748-5908-7-37>
16. Atkins L, Francis J, Islam R, O'Connor D, Patey A, Ivers N, Foy R, Duncan EM, Colquhoun H, Grimshaw JM, Lawton R, Michie S (2017) A guide to using the Theoretical Domains Framework of behaviour change to investigate implementation problems. *Implement Sci* 12(1):77. <https://doi.org/10.1186/s13012-017-0605-9>
17. French SD, Green SE, O'Connor DA, McKenzie JE, Francis JJ, Michie S, Buchbinder R, Schattner P, Spike N, Grimshaw JM (2012) Developing theory-informed behaviour change interventions to implement evidence into practice: a systematic approach using the Theoretical Domains Framework. *Implement Sci* 7:38. <https://doi.org/10.1186/1748-5908-7-38>
18. Mangurian C, Niu GC, Schillinger D, Newcomer JW, Dilley J, Handley MA (2017) Utilization of the Behavior Change Wheel framework to develop a model to improve cardiometabolic screening for people with severe mental illness. *Implement Sci* 12(1):134. <https://doi.org/10.1186/s13012-017-0663-z>
19. IBM Corp. Released 2016. IBM SPSS Statistics for Windows, Version 24.0. IBM Corp, Armonk, NY
20. Michie S, van Stralen MM, West R (2011) The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implement Sci* 6:42. <https://doi.org/10.1186/1748-5908-6-42>
21. Fabrigar LRWD, MacCallum RC, Strahan EJ (1999) Evaluating the use of exploratory factor analysis in psychological research. *Psychol Methods* 4(3):272–299