BMJ Open

Psychometric properties of self-reported financial toxicity measures in cancer survivors: a COSMIN systematic review protocol

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2019-036365
Article Type:	Protocol
Date Submitted by the Author:	12-Dec-2019
Complete List of Authors:	Zhu, Zheng; Fudan University School of Nursing, Xing, Weijie; Fudan University School of Nursing, Lizarondo, Lucylynn; University of Adelaide, The Joanna Briggs Institute Peng, Jian; Fudan University School of Nursing Hu, Yan; Fudan University, School of Nursing So, WK; The Chinese University of Hong Kong
Keywords:	ONCOLOGY, Health economics < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, HEALTH ECONOMICS

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Psychometric properties of self-reported financial toxicity measures in cancer survivors: a COSMIN systematic review protocol

Authors:

Zheng Zhu[1,2], Weijie Xing[1,2*], Lizarondo Lucylynn[3], Jian Peng[1], Yan Hu[1,2], Winnie K. W. So[4]

Institutions:

1. School of Nursing Fudan University, Shanghai, China;

2. Fudan University Centre for Evidence-based Nursing: A Joanna Briggs Institute Centre of Excellence, Shanghai, China.

3. Joanna Briggs Institute, University of Adelaide, Adelaide, South Australia, Australia

4. The Nethersole School of Nursing, The Chinese University of Hong Kong, Hong Kong, China

Correspondence to:

*Dr. Weijie Xing

School of Nursing, Fudan University; Fudan University Centre for Evidence-Based Nursing: A Joanna Briggs Institute Centre of Excellence, 305 Fenglin Rd., Shanghai, China

Mail address: xingweijie@fudan.edu.cn

Psychometric properties of self-reported financial toxicity measures for cancer survivors: a COSMIN systematic review protocol

Abstract

Introduction: Due to the higher costs associated with advancements in cancer treatment and longer duration of cancer survivorship, increasing financial toxicity has become a great threat to survivors, caregivers, and public healthcare systems. Since accurate and reproducible measures are prerequisites for robust results, choosing an acceptable measure with strong psychometric properties to assess financial toxicity is essential. However, a description of the psychometric properties of existing measures is still lacking. The aim of this study is to apply COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) methodology to systematically review the content and structural validity of patient-reported outcome measures (PROMs) of financial toxicity for cancer survivors.

Methods and analysis: PubMed/MEDLINE, MEDLINE (Ovid), EMBASE (Ovid), CINAHL (EBSCO), Web of Science, ProQuest Dissertations and Theses, and Cochrane Library (Wiley) will be comprehensively searched from database inception to November 15, 2019. Studies that report the measurement properties of PROMs assessing financial toxicity for cancer survivors will be included. The evaluation of measurement properties, data extraction, and data synthesis will be conducted according to the COSMIN methodology.

Ethics and dissemination: No individual data are involved in this systematic review. The results will be disseminated to a clinical audience and policy makers though peer-reviewed journals and conferences and will support researchers in choosing the best measure to evaluate the financial toxicity of cancer survivors.

Keywords: cancer; oncology; financial toxicity; systematic review; COSMIN; PROM

Word count: 2030

Strengths and limitations of this study

- This is the first systematic review that will identify generic and cancer-specific patient-reported outcome measures (PROMs) to assess FT for cancer survivors and provide a comprehensive picture of their measurement properties.
- The results will enable guideline developers to better understand the underlying measurement properties of existing PROMs measuring FT for cancer survivors.
- The conclusion may apply only to specific properties of PROMs.

INTRODUCTION

Given the higher costs associated with advancements in cancer treatment and longer duration of cancer survivorship, the increasing financial burden is currently becoming a great threat to survivors, caregivers, and public healthcare systems.[1,2] The total global spending on cancer care medicines increased from US$ 96 billion in 2013 to US$ 133 billion in 2017 at a compound annual growth rate of 6.5%, which is almost two times larger than the global GDP growth rate.[3,4] Cancer treatment and survivorship are estimated to cost US$ 173 billion in 2020.[5] Notably, middle-income and low-income countries relying on out-of-pocket payments contribute to global disparities in healthcare spending and inequity in financial vulnerability for cancer survivors.[6,7]

The term "financial toxicity" (FT) is defined as an economic side effect of cancer treatment.[2,8] It describes the financial burden experienced by cancer survivors with high out-of-pocket medical payments. "Financial burden" and "financial distress" are terms commonly used interchangeably with FT.[9,10] Financial toxicity, first mentioned in 2011, gained traction as a significant impact of cancer treatment in the age of precision medicine.[11] In this systematic review, we used the definition proposed by Witte et al., which described FT as "the patient-reported outcome measure (PROM) of perceived subjective financial distress resulting from objective financial burden".[10] A number of studies highlighted the prevalence of FT for cancer survivors in various contexts globally.[9,10,12-15] Azzani et al. found that 14.8% to 78.8% of cancer survivors experienced FT, especially in low-income populations.[12] Atlice's systematic review revealed that in the US, the mean annual economic costs of cancer treatment ranged from US$ 380 to US$ 8236 and that 12% to 62% of survivors were in debt.[14]

Azzani et al., Gordon et al., and Altice et al. reviewed the measures of FT and categorized them as monetary measures, objective measures, and subjective measures.[9,12,14] The majority of current studies used monetary and objective indicators to describe cancer survivors' experience with FT. Previous studies on FT suggested that FT, which is related to financial distress, should be measured using patient-reported outcomes. A few cancer-specific and generic PROMs are widely used to evaluate cancer survivors' FT. Among all measures, the Comprehensive Score for financial Toxicity (COST) was the most commonly used PROM and was developed and validated by de Souza and colleagues in

2014.[16] The COST measure demonstrated high internal consistency (Cronbach's α=0.92) and high test-retest reliability (ICC=0.80 [0.57-0.92]). Other PROMs included the Breast Cancer Finances Survey Inventory (BCFS), [17] Socioeconomic Wellbeing scale (SWBS),[18] and InCharge Financial Distress/Financial Wellbeing Scale (InCharge).[19] Additionally, validated subscales, such as Social Difficulties Inventory Cancer Care Outcomes (SDI) and the Research and Surveillance Consortium Patient survey (CanCPRS), were also used to evaluate FT.[20, 21] However, the development and validation of current PROMs varied significantly, and none of them are considered the gold standard.

In accordance with our definition of FT, Witte et al. summarized methods for measuring subjective financial distress in cancer survivors.[10] However, they did not report the psychometric properties of PROMs, making it hard for researchers to choose one measure from the existing PROMs to assess FT. Since accurate and reproducible PROMs are a prerequisite for robust results, choosing an acceptable PROM with strong psychometric properties is essential.[22,23] However, a description of the psychometric properties of existing PROMs is still lacking.

Therefore, to obtain robust evidence and enable a better understanding of the psychometric properties of PROMs assessing FT for cancer survivors, our study adopted the COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) approach to comprehensively report psychometric properties from multiple validation studies.[24] As a method for selecting PROMs both in research and in clinical practice, this approach is used for the first time to focus on the various psychometric properties of the validation studies rather than reporting the content of PROMs.

METHODS AND ANALYSIS

Aim and design

The aim of this study is to apply COSMIN methodology to systematically review the content and structural validity of PROMs measuring FT for cancer survivors.[24] This systematic review will be conducted according to the guidance of COSMIN and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement (PRISMA).[25]

Search strategy

The comprehensive search strategy will be developed in conjunction with a senior health research librarian. A comprehensive three-step search of published studies will be undertaken. The first step will involve a limited search via PubMed/MEDLINE to capture keywords by analyzing the text in the title and abstract and the index terms used to describe each paper. This will inform the development of a search strategy specific to each database, which will be the second step. Finally, references in all included studies will be manually reviewed to supplement the database search.

Papers will be collected from the following databases: PubMed/MEDLINE, MEDLINE (Ovid), EMBASE (Ovid), CINAHL (EBSCO), PsycINFO (EBSCO), Web of Science, ProQuest Dissertations and Theses, and Cochrane Library (Wiley). In PubMed/Medline, we will search for papers in English using MeSH terms ([cancer OR neoplasms] AND ["cancer survivors" OR patient OR survivors] AND "cost of illness") combined with (cancer OR [patient* OR survivor*] AND [cost OR bill* OR expense OR productivity loss OR "out-of-pocket" OR "economic burden" OR "financial toxicity" OR "financial hardship" OR "financial burden"] AND "COSMIN search filter"). A COSMIN search filter was developed instead of using keywords, such as questionnaire, survey, and scale, to find studies on measurement properties. The search strategies are presented in Supplementary file I. Finally, references in all included studies will be manually reviewed to supplement the database search.

Inclusion and exclusion criteria

The inclusion criteria are as follows: 1) studies that focus on individuals with any type of cancer who are still living;[26] 2) studies that aim to assess the FT (or financial hardship, financial distress, or financial burden) of cancer survivors, which is related to the economic side effects of cancer treatment, by using PROMs; 3) studies that evaluate one or more measurement proprieties of a PROM, including but not limited to structural validity, internal consistency, reliability, measurement error, hypothesis testing for construct validity, cross-cultural validity/measurement invariance, criterion validity, and responsiveness; and 4) studies published in English. Original studies in any country or setting and with any sample size are eligible for inclusion. Studies that provide indirect evidence of the measurement

properties (e.g., using the PROM to compare with another instrument) are excluded.

Study screening and selection

All identified citations will be imported into Endnote X8 (Clarivate Analytics, PA, USA). After removal of duplicates, two reviewers will independently perform the screening and selection (ZZ & WX) based on the established inclusion and exclusion criteria. Any disagreements that arise between the two reviewers will be resolved by a third reviewer (YH).

Quality appraisal

The measurement properties will be evaluated in three steps. First, we will apply the COSMIN Risk of Bias Checklist to assess the methodological quality of PROM development. This domain contains 35 items grouped into two sections: PROM design and cognitive interview studies. Second, we will assess the methodological quality in terms of content validity. This section includes 38 items divided into patient and professional sections that ask about the relevance, comprehensiveness, and comprehensibility of the PROM. Finally, we will evaluate eight measurement properties: structural validity, internal consistency, cross-cultural validity, reliability, measurement error, criterion validity, hypothesis testing, and responsiveness. Each measurement property will be rated as "very good", "adequate", "doubtful" or "inadequate quality". The methodological quality of the study will be rated based on the worst score counts method. For example, if any items of the domain are scored as "inadequate quality", the overall quality of the study will be rated as "inadequate quality". Two reviewers (ZZ & WX) will independently appraise the studies, and disagreements will be resolved by a third reviewer (YH).

Data extraction

Two reviewers (ZZ & WX) will independently extract data from the included papers, including the authors, date of publication, PROM, country/language, study design, study population, sample size, measurement domains, number of items, and main findings. Additionally, data from the COSMIN Checklist will be extracted. Any discrepancies will be resolved through discussion between the two reviewers.

Data synthesis

Data synthesis will comprise two steps. First, the results of the single study will be rated against the updated criteria for good measurement properties, including structural validity, internal consistency, reliability, measurement error, hypothesis testing for construct validity, cross-cultural validity/measurement invariance, criterion validity, and responsiveness. Each measurement property will be rated as sufficient (+), insufficient (−), or indeterminate (?). If the ratings for each study are all sufficient or insufficient, the results can be pooled, and the overall rating will be either sufficient or insufficient. If the ratings are inconsistent, explanations of inconsistency will be explored. If the explanation is reasonable, ratings will be provided in the subgroup (e.g., different languages of a PROM); however, if the explanation is not reasonable, the overall rating of this measurement property will be inconsistent (±). If there is no information supporting the rating, the overall rating will be indeterminate (?). Consequently, the evidence will be summarized and graded according to the modified GRADE system (e.g., high, medium, low, and very low evidence). Four of the five GRADE factors have been adopted in the COSMIN methodology, including risk of bias, inconsistency, imprecision, and indirectness. The quality of the evidence is graded for each measurement property and each PROM separately. Two reviewers will independently assess the quality of the evidence with GRADE, and any discrepancies will be resolved by a third reviewer (YH).

Patient and public involvement

No patients or members of the public were involved in the design of this systematic review.

Ethics and dissemination

No individual data are involved in this systematic review. The results will be disseminated to a clinical audience and policy makers though peer-reviewed journals and conferences and will support researchers in choosing the best measure to evaluate the FT of cancer survivors.

DISCUSSION

To our knowledge, this is the first systematic review that will identify generic and cancer-specific

PROMs to assess FT for cancer survivors and provide a comprehensive picture of their measurement properties. The synthesized results will allow healthcare professionals and policy-makers to choose a validated PROM based on its psychometric properties. This study will also enable guideline developers to better understand the underlying measurement properties of existing PROMs measuring FT for cancer survivors.

While we will develop a systematic review based on the COSMIN criteria and PRISMA guidelines, some potential challenges may exist. First, according to the COSMIN criteria, nine psychometric properties should be assessed: content validity, structural validity, internal consistency, reliability, measurement error, hypothesis testing for construct validity, cross-cultural validity/measurement invariance, criterion validity, and responsiveness. However, the included studies may report only a of these different psychometric properties. Our conclusion may therefore apply only to specific properties of PROMs. Second, the discordant use of FT leads to a very large variety of scales and questionnaires used to measure this issue. Among them, many studies used self-made questionnaires and did not provide enough information on validation. Therefore, we will include only studies that aimed to develop or validate a PROM. Last, potential publication bias may still exist, as with all systematic reviews. We will extensively search multiple electronic databases without time restrictions to minimize the likelihood of missing relevant studies.

This review will be the first to evaluate the psychometric properties of FT measures for cancer survivors. The results of the present systematic review will provide a foundation for future studies assessing FT. We will publish this study in a peer-reviewed academic journal to reach both academic and non-academic audiences interested in the topic. We will also present the results at both national and international conferences. A summary of the results will be presented to healthcare professionals and health consumer groups. In addition, policy-makers will be reached via briefing notes and other potential avenues.

Acknowledgement

None

Contributors

Study design: ZZ; study screening and selection: ZZ, WX, YH; quality appraisal: ZZ, WX, YH; data extraction: ZZ, WX; data analysis: ZZ, WX, YH; supervision: LY, YH, JP; protocol and manuscript writing: ZZ, WX; critical revisions: LY, YH, WS. All authors revised and accepted the final draft.

Funding

This work was supported by the Youth Program of Shanghai Municipal Commission of Health and Family Planning (Grant No. 20174Y0114) and Shanghai Pujiang Program (2019PJC017).

Competing interests

None declared

Reference

1. Bosland MC. Global health and cancer. *Lancet* 2019;393: 983.
2. De Souza JA, Wong YN. Financial distress in cancer patients. *J Med Person* 2013;11:73-7.
3. Stewart BW, Wild CP. *World cancer report* 2014.
4. IQVIA institute for Human Data Science. *Global Oncology Trends 2018* 2018.
5. Mariotto AB, Yabroff KR, Shao Y, et al. Projections of the cost of cancer care in the United States: 2010-2020. *J Natl Cancer Inst* 2011;103:117-128.
6. ACTION Study Group. Financial catastrophe, treatment discontinuation and death associated with surgically operable cancer in South-East Asia: Results from the ACTION Study. *Surgery* 2015;157:971-82.
7. Mackintosh M, Channon A, Karan A, et al. What is the private sector? Understanding private provision in the health systems of low-income and middle-income countries. *Lancet* 2016;388:596-605.
8. Yousuf Zafar S. Financial toxicity of cancer care: It's time to intervene. *J Natl Cancer Inst* 2015;108:djv370.

9. Gordon LG, Merollini KM, Lowe A, Chan RJ. A systematic review of financial toxicity among cancer survivors: we can't pay the co-pay. *Patient* 2017;10:295-309.
10. Witte J, Mehlis K, Surmann B, et al. Methods for measuring financial toxicity after cancer diagnosis and treatment: a systematic review and its implications. *Ann Oncol* 2019;30:1061-70.
11. Carrera PM, Kantarjian HM, Blinder VS. The financial burden and distress of patients with cancer: understanding and stepping-up action on the financial toxicity of cancer treatment. *CA Cancer J Clin* 2018,68:153-65
12. Azzani M, Roslani AC, Su T T. The perceived cancer-related financial hardship among patients and their families: a systematic review. *Support Care Cancer* 2015;23:889-98.
13. Bestvina CM, Zullig LL, Yousuf Zafar S. The implications of out-of-pocket cost of cancer treatment in the USA: a critical appraisal of the literature. *Future Oncol* 2014;10:2189-99.
14. Altice CK, Banegas MP, Tucker-Seeley RD, et al. Financial hardships experienced by cancer survivors: a systematic review. *J Natl Cancer Inst* 2017;109:djw205.
15. Perrone F, Jommi C, Di Maio M, et al. The association of financial difficulties with clinical outcomes in cancer patients: secondary analysis of 16 academic prospective clinical trials conducted in Italy. *Ann Oncol* 2016;27:mdw433.
16. de Souza JA, Yap BJ, Hlubocky FJ et al. The development of a financial toxicity patient-reported outcome in cancer: the COST measure. *Cancer* 2014;120:3245-53.
17. Given BA, Given CW, Stommel M. Family and out-of-pocket costs for women with breast cancer. *Cancer Pract* 1994;2:187-93.
18. Head BA, Faul AC. Development and validation of a scale to measure socioeconomic well-being in persons with cancer. *J Support Oncol* 2008;6(4):183-92.
19. Prawitz AD, Garman ET, Sorhaindo B et al. InCharge financial distress/ financial well-being scale: development, administration, and score interpretation. *Financial Counsel Plann* 2006;17:34–50.
20. Wright P, Smith AB, Keding A, Velikova G. The social difficulties inventory (SDI): development of subscales and scoring guidance for staff. *Psychooncology* 2011;20:36-43.
21. Malin JL, Ko C, Ayanian JZ et al. Understanding cancer patients' experience and outcomes: development and pilot study of the Cancer Care Outcomes Research and Surveillance patient survey. *Support Care Cancer* 2006;14:837-48.

22. Terwee CB, Prinsen CAC, Chiarotto A, et al. COSMIN methodology for evaluating the content validity of patient-reported outcome measures: a Delphi study. *Qual Life Res* 2018;27:1159-70.
23. Prinsen CAC, Vohra S, Rose MR, et al. How to select outcome measurement instruments for outcomes included in a "Core Outcome Set"–a practical guideline. *Trials* 2016;17:449.
24. Prinsen CAC, Mokkink LB, Bouter LM, et al. COSMIN guideline for systematic reviews of patient-reported outcome measures. *Qual Life Res* 2018;27:1147-57.
25. Moher D, Liberati A, Tetzlaff J, et al. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Ann Intern Med* 2009;151:264-69.
26. Denlinger CS, Ligibel JA, Are M, et al. NCCN guidelines insights: survivorship, version 1.2016. J *Natl Compr Canc Netw* 2016;14:715-24.

Supplementary file I Search strategy for PubMed/Medline

Search	Query
#1	Cancer[Title/Abstract] OR neoplasms[MeSH]
#2	Patient?[Title/Abstract] OR survivor?[Title/Abstract] OR patients[MeSH] OR "cancer survivors"[MeSH] OR survivors[MeSH]
#3	Cost[Title/Abstract] OR bill?[Title/Abstract] OR expense[Title/Abstract] OR "productivity loss"[Title/Abstract] OR "out-of-pocket"[Title/Abstract] OR "economic burden"[Title/Abstract] OR "financial toxicity"[Title/Abstract] OR "financial hardship"[Title/Abstract] OR "financial burden"[Title/Abstract] OR "financial effect"[Title/Abstract] OR "financial stress"[Title/Abstract] OR "economic burden"[Title/Abstract] OR "economic hardship"[Title/Abstract] OR "co-payment"[Title/Abstract])) OR "cost of illness"[MeSH]
#4	Scale?[Title/Abstract] OR "patient reported outcome measur*"[Title/Abstract] OR PROM? [Title/Abstract] OR measure* [Title/Abstract] OR "Patient Reported Outcome Measures*"[MeSH] OR "Surveys and Questionnaires"[MeSH]
#5	(instrumentation[sh] OR methods[sh] OR "Validation Studies"[pt] OR "Comparative Study"[pt] OR "psychometrics"[MeSH] OR psychometr*[tiab] OR clinimetr*[tw] OR clinometr*[tw] OR "outcome assessment (health care)"[MeSH] OR "outcome assessment"[tiab] OR "outcome measure*"[tw] OR "observer variation"[MeSH] OR "observer variation"[tiab] OR "Health Status Indicators"[Mesh] OR "reproducibility of results"[MeSH] OR reproducib*[tiab] OR "discriminant analysis"[MeSH] OR reliab*[tiab] OR unreliab*[tiab] OR valid*[tiab] OR "coefficient of variation"[tiab] OR coefficient[tiab] OR homogeneity[tiab] OR homogeneous[tiab] OR "internal consistency"[tiab] OR (cronbach*[tiab] AND (alpha[tiab] OR alphas[tiab])) OR (item[tiab] AND (correlation*[tiab] OR selection*[tiab] OR reduction*[tiab])) OR agreement[tw] OR precision[tw] OR imprecision[tw] OR "precise values"[tw] OR test-retest[tiab] OR (test[tiab] AND retest[tiab]) OR (reliab*[tiab] AND (test[tiab] OR retest[tiab])) OR stability[tiab] OR interrater[tiab] OR inter-rater[tiab] OR intrarater[tiab] OR intra-rater[tiab] OR intertester[tiab] OR inter-tester[tiab] OR intratester[tiab] OR intra-tester[tiab] OR interobserver[tiab] OR inter-observer[tiab] OR intraobserver[tiab] OR intra-observer[tiab] OR intertechnician[tiab] OR inter-technician[tiab] OR intratechnician[tiab] OR intra-technician[tiab] OR interexaminer[tiab] OR inter-examiner[tiab] OR intraexaminer[tiab] OR intra-examiner[tiab] OR interassay[tiab] OR inter-assay[tiab] OR intraassay[tiab] OR intra-assay[tiab] OR interindividual[tiab] OR inter-individual[tiab] OR intraindividual[tiab] OR intra-individual[tiab] OR interparticipant[tiab] OR inter-

	participant[tiab] OR intraparticipant[tiab] OR intra-participant[tiab] OR kappa[tiab] OR kappa's[tiab] OR kappas[tiab] OR repeatab*[tw] OR ((replicab*[tw] OR repeated[tw]) AND (measure[tw] OR measures[tw] OR findings[tw] OR result[tw] OR results[tw] OR test[tw] OR tests[tw])) OR generaliza*[tiab] OR generalisa*[tiab] OR concordance[tiab] OR (intraclass[tiab] AND correlation*[tiab]) OR discriminative[tiab] OR "known group"[tiab] OR "factor analysis"[tiab] OR "factor analyses"[tiab] OR "factor structure"[tiab] OR "factor structures"[tiab] OR dimension*[tiab] OR subscale*[tiab] OR (multitrait[tiab] AND scaling[tiab] AND (analysis[tiab] OR analyses[tiab])) OR "item discriminant"[tiab] OR "interscale correlation*"[tiab] OR error[tiab] OR errors[tiab] OR "individual variability"[tiab] OR "interval variability"[tiab] OR "rate variability"[tiab] OR (variability[tiab] AND (analysis[tiab] OR values[tiab])) OR (uncertainty[tiab] AND (measurement[tiab] OR measuring[tiab])) OR "standard error of measurement"[tiab] OR sensitiv*[tiab] OR responsive*[tiab] OR (limit[tiab] AND detection[tiab]) OR "minimal detectable concentration"[tiab] OR interpretab*[tiab] OR ((minimal[tiab] OR minimally[tiab] OR clinical[tiab] OR clinically[tiab]) AND (important[tiab] OR significant[tiab] OR detectable[tiab]) AND (change[tiab] OR difference[tiab])) OR (small*[tiab] AND (real[tiab] OR detectable[tiab]) AND (change[tiab] OR difference[tiab])) OR "meaningful change"[tiab] OR "ceiling effect"[tiab] OR "floor effect"[tiab] OR "Item response model"[tiab] OR IRT[tiab] OR Rasch[tiab] OR "Differential item functioning"[tiab] OR DIF[tiab] OR "computer adaptive testing"[tiab] OR "item bank"[tiab] OR "cross-cultural equivalence"[tiab])
#6	("addresses"[Publication Type] OR "biography"[Publication Type] OR "case reports"[Publication Type] OR "comment"[Publication Type] OR "directory"[Publication Type] OR "editorial"[Publication Type] OR "festschrift"[Publication Type] OR "interview"[Publication Type] OR "lectures"[Publication Type] OR "legal cases"[Publication Type] OR "legislation"[Publication Type] OR "letter"[Publication Type] OR "news"[Publication Type] OR "newspaper article"[Publication Type] OR "patient education handout"[Publication Type] OR "popular works"[Publication Type] OR "congresses"[Publication Type] OR "consensus development conference"[Publication Type] OR "consensus development conference, nih"[Publication Type] OR "practice guideline"[Publication Type]) NOT ("animals"[MeSH Terms] NOT "humans"[MeSH Terms])
#7	#1 AND #2 AND #3 AND #4 AND #5
#8	#7 NOT #6

Supplementary file for editor only: PRISMA-P 2015 Checklist

Section/topic	#	Checklist item	Information reported		Line number(s)
			Yes	No	
ADMINISTRATIVE INFORMATION					
Title					
Identification	1a	Identify the report as a protocol of a systematic review	√		P2, line 20-21
Update	1b	If the protocol is for an update of a previous systematic review, identify as such		√	NA
Registration	2	If registered, provide the name of the registry (e.g., PROSPERO) and registration number in the Abstract		√	
Authors					
Contact	3a	Provide name, institutional affiliation, and e-mail address of all protocol authors; provide physical mailing address of corresponding author	√		P1, line 4-18
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review	√		P10, line 233-237
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments		√	NA
Support					
Sources	5a	Indicate sources of financial or other support for the review	√		P10, line 239-241
Sponsor	5b	Provide name for the review funder and/or sponsor	√		P10, line 239-241
Role of sponsor/funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol		√	NA
INTRODUCTION					
Rationale	6	Describe the rationale for the review in the context of what is already known	√		P4-P5, line 80-93
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	√		P5, 102-103
METHODS					
Eligibility criteria	8	Specify the study characteristics (e.g., PICO, study design, setting, time frame) and report characteristics (e.g., years considered, language, publication status) to be used as criteria for eligibility for the review	√		P6-P7, line 136-145
Information sources	9	Describe all intended information sources (e.g., electronic databases, contact with study authors, trial registers, or other grey literature sources) with planned dates of coverage	√		P6, line 125-127
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	√		P6, line 127-133 + Supplementary file I

Section/topic	#	Checklist item	Information reported		Line number(s)
			Yes	No	
STUDY RECORDS					
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	√		P7, line 148
Selection process	11b	State the process that will be used for selecting studies (e.g., two independent reviewers) through each phase of the review (i.e., screening, eligibility, and inclusion in meta-analysis)	√		P7, line 139-151
Data collection process	11c	Describe planned method of extracting data from reports (e.g., piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	√		P7, line 169-173
Data items	12	List and define all variables for which data will be sought (e.g., PICO items, funding sources), any pre-planned data assumptions and simplifications	√		P7, line 169-173
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	√		P8, line 176-179
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	√		P7, line 153-166
DATA					
Synthesis	15a	Describe criteria under which study data will be quantitatively synthesized		√	NA
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data, and methods of combining data from studies, including any planned exploration of consistency (e.g., I^2, Kendall's tau)		√	NA
	15c	Describe any proposed additional analyses (e.g., sensitivity or subgroup analyses, meta-regression)		√	NA
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned	√		P8, line 175-191
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (e.g., publication bias across studies, selective reporting within studies)		√	NA
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (e.g., GRADE)	√		P8, line 186-191

BMJ Open

Psychometric properties of self-reported financial toxicity measures in cancer survivors: a systematic review protocol using COSMIN methodology

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2019-036365.R1
Article Type:	Protocol
Date Submitted by the Author:	17-Mar-2020
Complete List of Authors:	Zhu, Zheng; Fudan University School of Nursing, Xing, Weijie; Fudan University School of Nursing, Lizarondo, Lucylynn; University of Adelaide, The Joanna Briggs Institute Peng, Jian; Fudan University School of Nursing Hu, Yan; Fudan University, School of Nursing So, WK; The Chinese University of Hong Kong
Primary Subject Heading:	Oncology
Secondary Subject Heading:	Health economics, Health services research
Keywords:	ONCOLOGY, Health economics < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, HEALTH ECONOMICS

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Psychometric properties of self-reported financial toxicity measures in cancer survivors: a systematic review protocol using COSMIN methodology

Authors:

Zheng Zhu[1,2], Weijie Xing[1,2*], Lizarondo Lucylynn[3], Jian Peng[1], Yan Hu[1,2], Winnie K. W. So[4]

Institutions:

1. School of Nursing Fudan University, Shanghai, China;

2. Fudan University Centre for Evidence-based Nursing: A Joanna Briggs Institute Centre of Excellence, Shanghai, China.

3. Joanna Briggs Institute, University of Adelaide, Adelaide, South Australia, Australia

4. The Nethersole School of Nursing, The Chinese University of Hong Kong, Hong Kong, China

Correspondence to:

*Dr. Weijie Xing

School of Nursing, Fudan University; Fudan University Centre for Evidence-Based Nursing: A Joanna Briggs Institute Centre of Excellence, 305 Fenglin Rd., Shanghai, China

Mail address: xingweijie@fudan.edu.cn

Psychometric properties of self-reported financial toxicity measures in cancer survivors: a systematic review protocol using COSMIN methodology

Abstract

Introduction: Due to the higher costs associated with advancements in cancer treatment and longer duration of cancer survivorship, increasing financial toxicity has become a great threat to survivors, caregivers, and public healthcare systems. Since accurate and reproducible measures are prerequisites for robust results, choosing an acceptable measure with strong psychometric properties to assess financial toxicity is essential. However, a description of the psychometric properties of existing measures is still lacking. The aim of this study is to apply COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) methodology to systematically review the content and structural validity of patient-reported outcome measures (PROMs) of financial toxicity for cancer survivors.

Methods and analysis: PubMed/MEDLINE, MEDLINE (Ovid), EMBASE (Ovid), CINAHL (EBSCO), Web of Science, ProQuest Dissertations and Theses, and Cochrane Library (Wiley) will be comprehensively searched from database inception to November 15, 2019. Studies that report the measurement properties of PROMs assessing financial toxicity for cancer survivors will be included. The evaluation of measurement properties, data extraction, and data synthesis will be conducted according to the COSMIN methodology.

Ethics and dissemination: No individual data are involved in this systematic review. The results will be disseminated to a clinical audience and policy makers though peer-reviewed journals and conferences and will support researchers in choosing the best measure to evaluate the financial toxicity of cancer survivors.

Keywords: cancer; oncology; financial toxicity; systematic review; COSMIN; PROM

Word count: 2030

Strengths and limitations of this study

- This is the first systematic review that will identify generic and cancer-specific patient-reported outcome measures (PROMs) to assess FT for cancer survivors and provide a comprehensive picture of their measurement properties.
- A robust three-step search of published studies will be undertaken to capture a large range of papers.
- COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) approach will be followed to comprehensively report psychometric properties from multiple validation studies.
- The COSMIN approach will allow healthcare professionals and policy-makers to choose a validated PROM based on its psychometric properties.
- This systematic review will only include studies published in English which may bias the results against non-English speaking countries.

INTRODUCTION

Given the higher costs associated with advancements in cancer treatment and longer duration of cancer survivorship, the increasing financial burden is currently becoming a great threat to survivors, caregivers, and public healthcare systems.[1,2] The total global spending on cancer care medicines increased from US$ 96 billion in 2013 to US$ 133 billion in 2017 at a compound annual growth rate of 6.5%, which is almost two times larger than the global GDP growth rate.[3,4] Cancer treatment and survivorship are estimated to cost US$ 173 billion in 2020.[5] Notably, middle-income and low-income countries relying on out-of-pocket payments contribute to global disparities in healthcare spending and inequity in financial vulnerability for cancer survivors.[6,7]

The term "financial toxicity" (FT) is defined as an economic side effect of cancer treatment.[2,8] It describes the financial burden experienced by cancer survivors with high out-of-pocket medical payments. "Financial burden" and "financial distress" are terms commonly used interchangeably with FT. [9,10] Financial toxicity, first mentioned in 2011, gained traction as a significant impact of cancer treatment in the age of precision medicine.[11] FT covers both "objective financial burden" and "subjective financial distress". The objective financial burden is directly due to the cost of cancer treatment which increases over time. Subjective financial distress captures all negative emotions, uncomfortable experience and psychological stress of cancer survivors resulting from objective financial burden [9,11].

A number of studies highlighted the prevalence of FT for cancer survivors in various contexts globally.[9,10,12-15] Azzani et al. found that 14.8% to 78.8% of cancer survivors experienced FT, especially in low-income populations.[12] Atlice's systematic review revealed that in the US, the mean annual economic costs of cancer treatment ranged from US$ 380 to US$ 8236 and that 12% to 62% of survivors were in debt.[14]

Azzani et al., Gordon et al., and Altice et al. reviewed the measures of FT and categorized them as monetary measures, objective measures, and subjective measures.[9,12,14] The majority of current studies used monetary and objective indicators to describe cancer survivors' experience with FT. Previous

studies suggested that FT should be measured using patient-reported outcomes to reflect cancer survivors' thoughts, complaints, and opinions that any numbers or observers can't.[10] The financial burden of cancer and its treatment needs to be understood within the context of the patient's personal experiences and circumstances. A few cancer-specific and generic PROMs are widely used to evaluate cancer survivors' FT. Among all measures, the Comprehensive Score for financial Toxicity (COST) was the most commonly used PROM and was developed and validated by de Souza and colleagues in 2014.[16] The COST measure demonstrated high internal consistency (Cronbach's α=0.92) and high test-retest reliability (ICC=0.80 [0.57-0.92]). Other PROMs included the Breast Cancer Finances Survey Inventory (BCFS), [17] Socioeconomic Wellbeing scale (SWBS),[18] and InCharge Financial Distress/Financial Wellbeing Scale (InCharge).[19] Additionally, validated subscales, such as Social Difficulties Inventory Cancer Care Outcomes (SDI) and the Research and Surveillance Consortium Patient survey (CanCPRS), were also used to evaluate FT.[20, 21] However, the development and validation of current PROMs varied significantly, and none of them are considered the gold standard.

In accordance with our definition of FT, Witte et al. summarized methods for measuring subjective financial distress in cancer survivors.[10] However, they did not report the psychometric properties of PROMs, making it hard for researchers to choose one measure from the existing PROMs to assess FT. Since accurate and reproducible PROMs are a prerequisite for robust results, choosing an acceptable PROM with strong psychometric properties is essential.[22,23] However, a description of the psychometric properties of existing PROMs is still lacking.

Therefore, to obtain robust evidence and enable a better understanding of the psychometric properties of PROMs assessing FT for cancer survivors, our study adopted the COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) approach to comprehensively report psychometric properties from multiple validation studies.[24] As a method for selecting PROMs both in research and in clinical practice, this approach is used for the first time to focus on the various psychometric properties of the validation studies rather than reporting the content of PROMs.

METHODS AND ANALYSIS

Aim and design

The aim of this study is to apply COSMIN methodology to systematically review the content and structural validity of PROMs measuring FT for cancer survivors.[24] This systematic review will be conducted according to the guidance of COSMIN and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement (PRISMA).[25]

Search strategy

The comprehensive search strategy will be developed in conjunction with a senior health research librarian. A comprehensive three-step search of published studies will be undertaken. The first step will involve a limited search via PubMed/MEDLINE to capture keywords by analyzing the text in the title and abstract and the index terms used to describe each paper. This will inform the development of a search strategy specific to each database, which will be the second step. Finally, references in all included studies will be manually reviewed to supplement the database search.

Papers will be collected from the following databases from inception to 1st March 2020: PubMed/MEDLINE, MEDLINE (Ovid), EMBASE (Ovid), CINAHL (EBSCO), PsycINFO (EBSCO), Web of Science, ProQuest Dissertations and Theses, and Cochrane Library (Wiley). In PubMed/Medline, we will search for papers in English using MeSH terms ([cancer OR neoplasms] AND [“cancer survivors” OR patient OR survivors] AND “cost of illness”) combined with (cancer OR [patient* OR survivor*] AND [cost OR bill* OR expense OR productivity loss OR “out-of-pocket” OR “economic burden” OR “financial toxicity” OR “financial hardship” OR “financial burden”] AND “COSMIN search filter”). A COSMIN search filter was developed instead of using keywords, such as questionnaire, survey, and scale, to find studies on measurement properties. The search strategies are presented in Supplementary file I. Finally, references in all included studies will be manually reviewed to supplement the database search.

Inclusion and exclusion criteria

The inclusion criteria are as follows: 1) studies that focus on individuals with any type of cancer

who are still living;[26] 2) studies that aim to assess the FT (or financial hardship, financial distress, or financial burden) of cancer survivors, which is related to the economic side effects of cancer treatment, by using PROMs; 3) studies that evaluate one or more measurement proprieties of a PROM, including but not limited to structural validity, internal consistency, reliability, measurement error, hypothesis testing for construct validity, cross-cultural validity/measurement invariance, criterion validity, and responsiveness; and 4) studies published in English. Original studies in any country or setting and with any sample size are eligible for inclusion. Studies that provide indirect evidence of the measurement properties (e.g., using the PROM to compare with another instrument) are excluded.

Study screening and selection

All identified citations will be imported into Endnote X8 (Clarivate Analytics, PA, USA). After removal of duplicates, two reviewers will independently perform the screening and selection (ZZ & WX) based on the established inclusion and exclusion criteria. Any disagreements that arise between the two reviewers will be resolved by a third reviewer (YH).

Quality appraisal

The measurement properties will be evaluated in three steps. First, we will apply the COSMIN Risk of Bias Checklist to assess the methodological quality of PROM development. This domain contains 35 items grouped into two sections: PROM design and cognitive interview studies. Second, we will assess the methodological quality in terms of content validity. This section includes 38 items divided into patient and professional sections that ask about the relevance, comprehensiveness, and comprehensibility of the PROM. Finally, we will evaluate eight measurement properties: structural validity, internal consistency, cross-cultural validity, reliability, measurement error, criterion validity, hypothesis testing, and responsiveness. Each measurement property will be rated as “very good”, “adequate”, “doubtful” or “inadequate quality”. The methodological quality of the study will be rated based on the worst score counts method. For example, if any items of the domain are scored as “inadequate quality”, the overall quality of the study will be rated as “inadequate quality”. Two reviewers (ZZ & WX) will independently appraise the studies, and disagreements will be resolved by a third reviewer (YH).

Data extraction

Two reviewers (ZZ & WX) will independently extract data from the included papers, including the authors, date of publication, PROM, country/language, study design, study population, sample size, measurement domains, number of items, and main findings. Additionally, data from the COSMIN Checklist will be extracted. Any discrepancies will be resolved through discussion between the two reviewers.

Data synthesis

Data synthesis will comprise two steps. First, the results of the single study will be rated against the updated criteria for good measurement properties, including structural validity, internal consistency, reliability, measurement error, hypothesis testing for construct validity, cross-cultural validity/measurement invariance, criterion validity, and responsiveness. Each measurement property will be rated as sufficient (+), insufficient (−), or indeterminate (?). If the ratings for each study are all sufficient or insufficient, the results can be pooled, and the overall rating will be either sufficient or insufficient. If the ratings are inconsistent, explanations of inconsistency will be explored. If the explanation is reasonable, ratings will be provided in the subgroup (e.g., different languages of a PROM); however, if the explanation is not reasonable, the overall rating of this measurement property will be inconsistent (±). If there is no information supporting the rating, the overall rating will be indeterminate (?). Consequently, the evidence will be summarized and graded according to the modified GRADE system (e.g., high, medium, low, and very low evidence). Four of the five GRADE factors have been adopted in the COSMIN methodology, including risk of bias, inconsistency, imprecision, and indirectness. The quality of the evidence is graded for each measurement property and each PROM separately. Two reviewers will independently assess the quality of the evidence with GRADE, and any discrepancies will be resolved by a third reviewer (YH).

Patient and public involvement

No patients or members of the public were involved in the design of this systematic review.

Ethics and dissemination

No individual data are involved in this systematic review. The results will be disseminated to a clinical audience and policy makers though peer-reviewed journals and conferences and will support researchers in choosing the best measure to evaluate the FT of cancer survivors.

DISCUSSION

To our knowledge, this is the first systematic review that will identify generic and cancer-specific PROMs to assess FT for cancer survivors and provide a comprehensive picture of their measurement properties. The synthesized results will allow healthcare professionals and policy-makers to choose a validated PROM based on its psychometric properties. This study will also enable guideline developers to better understand the underlying measurement properties of existing PROMs measuring FT for cancer survivors.

While we will develop a systematic review based on the COSMIN criteria and PRISMA guidelines, some potential challenges may exist. First, according to the COSMIN criteria, nine psychometric properties should be assessed: content validity, structural validity, internal consistency, reliability, measurement error, hypothesis testing for construct validity, cross-cultural validity/measurement invariance, criterion validity, and responsiveness. However, the included studies may report only some of these psychometric properties. Our conclusion may therefore apply only to specific properties of PROMs. Second, the discordant use of FT leads to a very large variety of scales and questionnaires used to measure this issue. Among them, many studies used self-made questionnaires and did not provide enough information on validation. Therefore, we will include only studies that aimed to develop or validate a PROM. Last, potential publication bias may still exist, as with all systematic reviews. We will extensively search multiple electronic databases without time restrictions to minimize the likelihood of missing relevant studies. Despite the challenges, based on our preliminary search, it will be highly possible to draw valid conclusions on the content and structural validity of PROMs measuring FT for cancer survivors.

This review will be the first to evaluate the psychometric properties of FT measures for cancer

survivors. The results of the present systematic review will provide a foundation for future studies assessing FT. We will publish this study in a peer-reviewed academic journal to reach both academic and non-academic audiences interested in the topic. We will also present the results at both national and international conferences. A summary of the results will be presented to healthcare professionals and health consumer groups. In addition, policy-makers will be reached via briefing notes and other potential avenues.

Acknowledgement

None

Contributors

Study design: ZZ; study screening and selection: ZZ, WX, YH; quality appraisal: ZZ, WX, YH; data extraction: ZZ, WX; data analysis: ZZ, WX, YH; supervision: LY, YH, JP; protocol and manuscript writing: ZZ, WX; critical revisions: LY, YH, WS. All authors revised and accepted the final draft.

Funding

This work was supported by the Youth Program of Shanghai Municipal Commission of Health and Family Planning (Grant No. 20174Y0114) and Shanghai Pujiang Program (2019PJC017).

Competing interests

None declared

Reference

1. Bosland MC. Global health and cancer. *Lancet* 2019;393: 983.
2. De Souza JA, Wong YN. Financial distress in cancer patients. *J Med Person* 2013;11:73-7.
3. Stewart BW, Wild CP. *World cancer report* 2014.
4. IQVIA institute for Human Data Science. *Global Oncology Trends 2018* 2018.
5. Mariotto AB, Yabroff KR, Shao Y, et al. Projections of the cost of cancer care in the United

States: 2010-2020. *J Natl Cancer Inst* 2011;103:117-128.

6. ACTION Study Group. Financial catastrophe, treatment discontinuation and death associated with surgically operable cancer in South-East Asia: Results from the ACTION Study. *Surgery* 2015;157:971-82.
7. Mackintosh M, Channon A, Karan A, et al. What is the private sector? Understanding private provision in the health systems of low-income and middle-income countries. *Lancet* 2016;388:596-605.
8. Yousuf Zafar S. Financial toxicity of cancer care: It's time to intervene. *J Natl Cancer Inst* 2015;108:djv370.
9. Gordon LG, Merollini KM, Lowe A, Chan RJ. A systematic review of financial toxicity among cancer survivors: we can't pay the co-pay. *Patient* 2017;10:295-309.
10. Witte J, Mehlis K, Surmann B, et al. Methods for measuring financial toxicity after cancer diagnosis and treatment: a systematic review and its implications. *Ann Oncol* 2019;30:1061-70.
11. Carrera PM, Kantarjian HM, Blinder VS. The financial burden and distress of patients with cancer: understanding and stepping-up action on the financial toxicity of cancer treatment. *CA Cancer J Clin* 2018,68:153-65
12. Azzani M, Roslani AC, Su T T. The perceived cancer-related financial hardship among patients and their families: a systematic review. *Support Care Cancer* 2015;23:889-98.
13. Bestvina CM, Zullig LL, Yousuf Zafar S. The implications of out-of-pocket cost of cancer treatment in the USA: a critical appraisal of the literature. *Future Oncol* 2014;10:2189-99.
14. Altice CK, Banegas MP, Tucker-Seeley RD, et al. Financial hardships experienced by cancer survivors: a systematic review. *J Natl Cancer Inst* 2017;109:djw205.
15. Perrone F, Jommi C, Di Maio M, et al. The association of financial difficulties with clinical outcomes in cancer patients: secondary analysis of 16 academic prospective clinical trials conducted in Italy. *Ann Oncol* 2016;27:mdw433.
16. de Souza JA, Yap BJ, Hlubocky FJ et al. The development of a financial toxicity patient-reported outcome in cancer: the COST measure. *Cancer* 2014;120:3245-53.
17. Given BA, Given CW, Stommel M. Family and out-of-pocket costs for women with breast cancer. *Cancer Pract* 1994;2:187-93.

18. Head BA, Faul AC. Development and validation of a scale to measure socioeconomic well-being in persons with cancer. *J Support Oncol* 2008;6(4):183-92.
19. Prawitz AD, Garman ET, Sorhaindo B et al. InCharge financial distress/ financial well-being scale: development, administration, and score interpretation. *Financial Counsel Plann* 2006;17:34–50.
20. Wright P, Smith AB, Keding A, Velikova G. The social difficulties inventory (SDI): development of subscales and scoring guidance for staff. *Psychooncology* 2011;20:36-43.
21. Malin JL, Ko C, Ayanian JZ et al. Understanding cancer patients' experience and outcomes: development and pilot study of the Cancer Care Outcomes Research and Surveillance patient survey. *Support Care Cancer* 2006;14:837-48.
22. Terwee CB, Prinsen CAC, Chiarotto A, et al. COSMIN methodology for evaluating the content validity of patient-reported outcome measures: a Delphi study. *Qual Life Res* 2018;27:1159-70.
23. Prinsen CAC, Vohra S, Rose MR, et al. How to select outcome measurement instruments for outcomes included in a "Core Outcome Set"–a practical guideline. *Trials* 2016;17:449.
24. Prinsen CAC, Mokkink LB, Bouter LM, et al. COSMIN guideline for systematic reviews of patient-reported outcome measures. *Qual Life Res* 2018;27:1147-57.
25. Moher D, Liberati A, Tetzlaff J, et al. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Ann Intern Med* 2009;151:264-69.
26. Denlinger CS, Ligibel JA, Are M, et al. NCCN guidelines insights: survivorship, version 1.2016. J *Natl Compr Canc Netw* 2016;14:715-24.

Supplementary file I Search strategy for PubMed/Medline

Search	Query
#1	Cancer[Title/Abstract] OR neoplasms[MeSH]
#2	Patient?[Title/Abstract] OR survivor?[Title/Abstract] OR patients[MeSH] OR "cancer survivors"[MeSH] OR survivors[MeSH]
#3	Cost[Title/Abstract] OR bill?[Title/Abstract] OR expense[Title/Abstract] OR "productivity loss"[Title/Abstract] OR "out-of-pocket"[Title/Abstract] OR "economic burden"[Title/Abstract] OR "financial toxicity"[Title/Abstract] OR "financial hardship"[Title/Abstract] OR "financial burden"[Title/Abstract] OR "financial effect"[Title/Abstract] OR "financial stress"[Title/Abstract] OR "economic burden"[Title/Abstract] OR "economic hardship"[Title/Abstract] OR "co-payment"[Title/Abstract])) OR "cost of illness"[MeSH]
#4	Scale?[Title/Abstract] OR "patient reported outcome measur*"[Title/Abstract] OR PROM? [Title/Abstract] OR measure* [Title/Abstract] OR "Patient Reported Outcome Measures*"[MeSH] OR "Surveys and Questionnaires"[MeSH]
#5	(instrumentation[sh] OR methods[sh] OR "Validation Studies"[pt] OR "Comparative Study"[pt] OR "psychometrics"[MeSH] OR psychometr*[tiab] OR clinimetr*[tw] OR clinometr*[tw] OR "outcome assessment (health care)"[MeSH] OR "outcome assessment"[tiab] OR "outcome measure*"[tw] OR "observer variation"[MeSH] OR "observer variation"[tiab] OR "Health Status Indicators"[Mesh] OR "reproducibility of results"[MeSH] OR reproducib*[tiab] OR "discriminant analysis"[MeSH] OR reliab*[tiab] OR unreliab*[tiab] OR valid*[tiab] OR "coefficient of variation"[tiab] OR coefficient[tiab] OR homogeneity[tiab] OR homogeneous[tiab] OR "internal consistency"[tiab] OR (cronbach*[tiab] AND (alpha[tiab] OR alphas[tiab])) OR (item[tiab] AND (correlation*[tiab] OR selection*[tiab] OR reduction*[tiab])) OR agreement[tw] OR precision[tw] OR imprecision[tw] OR "precise values"[tw] OR test-retest[tiab] OR (test[tiab] AND retest[tiab]) OR (reliab*[tiab] AND (test[tiab] OR retest[tiab])) OR stability[tiab] OR interrater[tiab] OR inter-rater[tiab] OR intrarater[tiab] OR intra-rater[tiab] OR intertester[tiab] OR inter-tester[tiab] OR intratester[tiab] OR intra-tester[tiab] OR interobserver[tiab] OR inter-observer[tiab] OR intraobserver[tiab] OR intra-observer[tiab] OR intertechnician[tiab] OR inter-technician[tiab] OR intratechnician[tiab] OR intra-technician[tiab] OR interexaminer[tiab] OR inter-examiner[tiab] OR intraexaminer[tiab] OR intra-examiner[tiab] OR interassay[tiab] OR inter-assay[tiab] OR intraassay[tiab] OR intra-assay[tiab] OR interindividual[tiab] OR inter-individual[tiab] OR intraindividual[tiab] OR intra-individual[tiab] OR interparticipant[tiab] OR inter-

	participant[tiab] OR intraparticipant[tiab] OR intra-participant[tiab] OR kappa[tiab] OR kappa's[tiab] OR kappas[tiab] OR repeatab*[tw] OR ((replicab*[tw] OR repeated[tw]) AND (measure[tw] OR measures[tw] OR findings[tw] OR result[tw] OR results[tw] OR test[tw] OR tests[tw])) OR generaliza*[tiab] OR generalisa*[tiab] OR concordance[tiab] OR (intraclass[tiab] AND correlation*[tiab]) OR discriminative[tiab] OR "known group"[tiab] OR "factor analysis"[tiab] OR "factor analyses"[tiab] OR "factor structure"[tiab] OR "factor structures"[tiab] OR dimension*[tiab] OR subscale*[tiab] OR (multitrait[tiab] AND scaling[tiab] AND (analysis[tiab] OR analyses[tiab])) OR "item discriminant"[tiab] OR "interscale correlation*"[tiab] OR error[tiab] OR errors[tiab] OR "individual variability"[tiab] OR "interval variability"[tiab] OR "rate variability"[tiab] OR (variability[tiab] AND (analysis[tiab] OR values[tiab])) OR (uncertainty[tiab] AND (measurement[tiab] OR measuring[tiab])) OR "standard error of measurement"[tiab] OR sensitiv*[tiab] OR responsive*[tiab] OR (limit[tiab] AND detection[tiab]) OR "minimal detectable concentration"[tiab] OR interpretab*[tiab] OR ((minimal[tiab] OR minimally[tiab] OR clinical[tiab] OR clinically[tiab]) AND (important[tiab] OR significant[tiab] OR detectable[tiab]) AND (change[tiab] OR difference[tiab])) OR (small*[tiab] AND (real[tiab] OR detectable[tiab]) AND (change[tiab] OR difference[tiab])) OR "meaningful change"[tiab] OR "ceiling effect"[tiab] OR "floor effect"[tiab] OR "Item response model"[tiab] OR IRT[tiab] OR Rasch[tiab] OR "Differential item functioning"[tiab] OR DIF[tiab] OR "computer adaptive testing"[tiab] OR "item bank"[tiab] OR "cross-cultural equivalence"[tiab])
#6	("addresses"[Publication Type] OR "biography"[Publication Type] OR "case reports"[Publication Type] OR "comment"[Publication Type] OR "directory"[Publication Type] OR "editorial"[Publication Type] OR "festschrift"[Publication Type] OR "interview"[Publication Type] OR "lectures"[Publication Type] OR "legal cases"[Publication Type] OR "legislation"[Publication Type] OR "letter"[Publication Type] OR "news"[Publication Type] OR "newspaper article"[Publication Type] OR "patient education handout"[Publication Type] OR "popular works"[Publication Type] OR "congresses"[Publication Type] OR "consensus development conference"[Publication Type] OR "consensus development conference, nih"[Publication Type] OR "practice guideline"[Publication Type]) NOT ("animals"[MeSH Terms] NOT "humans"[MeSH Terms])
#7	#1 AND #2 AND #3 AND #4 AND #5
#8	#7 NOT #6

Supplementary file for editor only: PRISMA-P 2015 Checklist

Section/topic	#	Checklist item	Information reported		Line number(s)
			Yes	No	
ADMINISTRATIVE INFORMATION					
Title					
Identification	1a	Identify the report as a protocol of a systematic review	√		P2, line 20-21
Update	1b	If the protocol is for an update of a previous systematic review, identify as such		√	NA
Registration	2	If registered, provide the name of the registry (e.g., PROSPERO) and registration number in the Abstract		√	
Authors					
Contact	3a	Provide name, institutional affiliation, and e-mail address of all protocol authors; provide physical mailing address of corresponding author	√		P1, line 4-18
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review	√		P10, line 248-251
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments		√	NA
Support					
Sources	5a	Indicate sources of financial or other support for the review	√		P10, line 254-256
Sponsor	5b	Provide name for the review funder and/or sponsor	√		P10, line 254-256
Role of sponsor/funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol		√	NA
INTRODUCTION					
Rationale	6	Describe the rationale for the review in the context of what is already known	√		P4-P5, line 74-112
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	√		P6, 123-125
METHODS					
Eligibility criteria	8	Specify the study characteristics (e.g., PICO, study design, setting, time frame) and report characteristics (e.g., years considered, language, publication status) to be used as criteria for eligibility for the review	√		P6-P7, line 150-158
Information sources	9	Describe all intended information sources (e.g., electronic databases, contact with study authors, trial registers, or other grey literature sources) with planned dates of coverage	√		P6, line 138-139
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits,	√		P6, line 140-144 +

Section/topic	#	Checklist item	Information reported		Line number(s)
			Yes	No	
		such that it could be repeated			Supplementary file I
STUDY RECORDS					
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	√		P7, line 161
Selection process	11b	State the process that will be used for selecting studies (e.g., two independent reviewers) through each phase of the review (i.e., screening, eligibility, and inclusion in meta-analysis)	√		P7, line 162-164
Data collection process	11c	Describe planned method of extracting data from reports (e.g., piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	√		P8, line 181-186
Data items	12	List and define all variables for which data will be sought (e.g., PICO items, funding sources), any pre-planned data assumptions and simplifications	√		P8, line 181-186
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	√		P8, line 184
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	√		P8, line 189-204
DATA					
Synthesis	15a	Describe criteria under which study data will be quantitatively synthesized		√	NA
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data, and methods of combining data from studies, including any planned exploration of consistency (e.g., I^2, Kendall's tau)		√	NA
	15c	Describe any proposed additional analyses (e.g., sensitivity or subgroup analyses, meta-regression)		√	NA
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned	√		P8, line 189-204
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (e.g., publication bias across studies, selective reporting within studies)		√	NA
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (e.g., GRADE)	√		P8, line 203-204