Brief Methodological Report

An Exploratory Factor Analysis of the Scale Structure of the Patient Care Monitor Version 2.0

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Abstract

Context. The Patient Care Monitor (PCM), version 2.0, is an electronic patient-reported outcomes instrument designed to be embedded into oncology practices. One key psychometric component of an instrument is its factor structure.

Objectives. To validate the factor structure of the PCM.

Methods. The PCM was administered within various oncology clinics at our institution from 2006 to 2011 as part of standard of care, yielding a large ($n = 5624$) and diverse data set. An exploratory factor analysis was performed.

Results. The PCM performed well in terms of missing values and floor and ceiling effects. The three scales postulated by the PCM developers exhibited high internal consistency (Cronbach alpha 0.94–0.95); the six subscales exhibited good internal consistency (Cronbach alpha 0.80–0.95). A three-factor model approximated simple structure and was consistent with the constructs of emotional function, physical function, and physical symptoms suggested by the PCM developers. However, a six-factor model did not support the division of these three constructs into subscales of despair, distress, ambulation, impaired performance, treatment side effects, and general physical symptoms. Instead, we observed an emotional factor, a physical functioning factor, a factor including many of the treatment side effects, and three factors consisting of various clusters of physical symptoms.

Conclusion. Although six subscales postulated by its developers perform reasonably, allocation of the PCM items to three constructs is more accurate and likely more consistent with how symptoms and concerns are conceptualized by patients. J Pain Symptom Manage 2016;51:776–783 © *2016 American Academy of Hospice and Palliative Medicine. Published by Elsevier Inc. All rights reserved.*

Key Words
Exploratory factor analysis, instrument development, instrument validation, psychometrics, oncology

Introduction

Patient-reported outcome measures describe information that can best be reported by patients—for example, severity of symptoms and quality of life. Although traditional paper-based data collection remains possible, in real-time applications, patient-reported outcome data could be collected before the clinic visit (e.g., by tablet computer in a waiting area, via the web) and then forwarded to the clinician in the form of a report that highlights unresolved symptoms, worsening symptoms, and the like. This information would then be acted on during the clinic visit.

The 78-item Patient Care Monitor (PCM), version 2.0, has special potential for real-time application as previously mentioned, having been originally designed with the community oncology care provider in mind.[1] The first version of the PCM, termed the Cancer Care Monitor (CCM), was a 38-item instrument organized around three metaconstructs, each of which was divided into two subscales: physical

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symptoms (subdivided into impaired ambulation and impaired performance); emotional issues (subdivided into acute distress and despair); and physical symptoms (subdivided into general physical symptoms and treatment side effects). For the CCM, the assignment of items to subscales was based on a combination of factor analysis and clinical reasoning. Although most items loaded onto the anticipated subscales, some loaded onto multiple subscales, and the subscale with the strongest loading was not always linked with the item in question. Patients might or might not group these items in the same way as clinicians; for example, regardless of whether they are caused by disease progression or treatment side effects, patients might potentially just lump all physical symptoms together as sources of misery.

The initial validation of the CCM included various reports.[1–3] Although the PCM was based on the CCM, it is a substantially different instrument (discussed in the following) and thus merits validation on its own. Our validation efforts are primarily focused on factor structure.

Methods

The PCM was administered within various oncology clinics at our institution during the period from 2006 to 2011, thus producing a large and diverse cohort of patients. We used the first record from each patient within this cohort to perform an examination of the factor structure of the PCM.

Instruments and Data Collection

The PCM is based on the CCM but reflects substantial changes. Among these changes were the imposition of consistency on the answer set, rewording of various items, and addition of new items. The PCM, version 2.0, used in this study comprises 78 items for men and 86 items for women (i.e., the 78 items for men plus an additional eight items). Most of the new items pertained to physical symptoms, the intention being to assist clinicians by creating as inclusive a set of symptoms as possible, whether the symptom in question was common and whether it could be assigned to a subscale. Forty-seven items were assigned to subscales; 39 were not.

Patients completed the PCM in clinic waiting areas using touch-screen technology (Fig. 1, available at jpsmjournal.com, presents an illustrative screen shot). Patients also answered questions regarding demographics, personal habits (e.g., smoking), and disease characteristics. Appendix I, available at jpsmjournal.com, includes a column denoting the developers' recommendations for how the 86 items could be assigned to the six putative subscales of the CCM. The items about hot flashes and vaginal/menstrual symptoms were only administered to female patients.

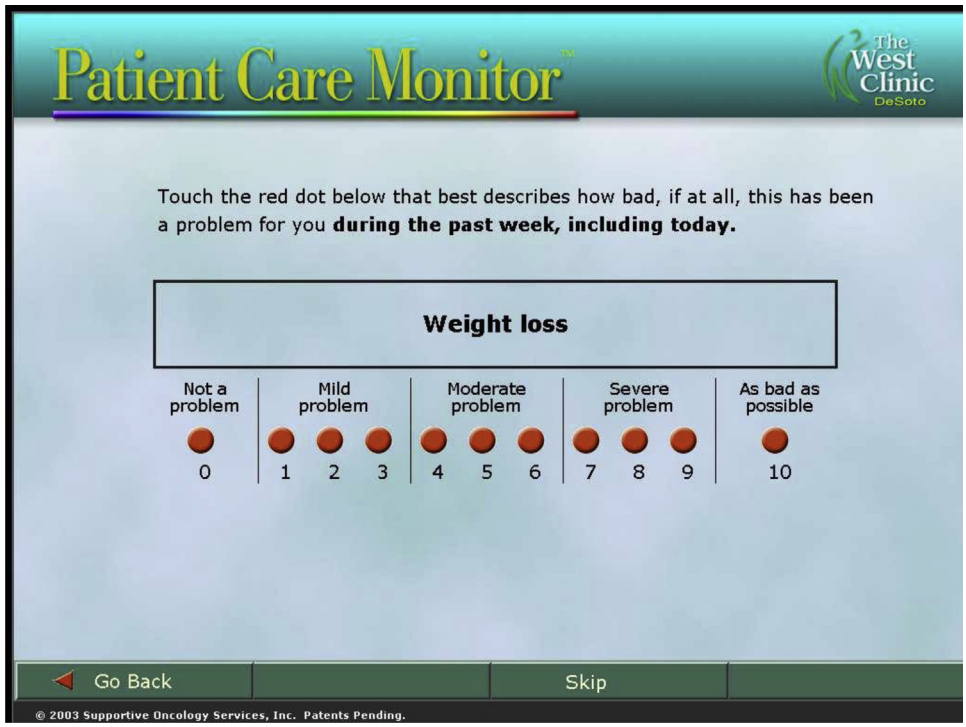

Fig. 1. A typical screen shot from a PCM 2.0 item. PCM = Patient Care Monitor.

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